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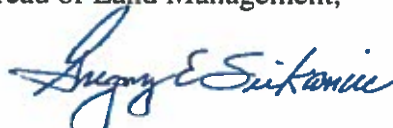
U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199



AUG 09 2019

Memorandum

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

From: Regional Director – Alaska Region 

Subject: Comments on the Preliminary Final Environmental Impact Statement (EIS) 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) Preliminary Final EIS for the proposed Coastal Plain Oil and Gas Leasing Program in the 1002 Coastal Plain area of the Arctic National Wildlife Refuge (Arctic Refuge) for which Congress directed the BLM to establish a competitive oil and gas program for the leasing, development, production, and transportation of oil and gas in and from the Coastal Plain. We are a cooperating agency pursuant to the National Environmental Policy Act.

We recognize that we share a mandate with the BLM to develop a successful oil and gas program for the 1002 Coastal Plain. For the last year, we have worked with the BLM on development of alternatives to help ensure that all purposes of the Coastal Plain as outlined in Public Land Order 2214 and Alaska National Interest Lands Conservation Act (ANILCA), as amended by the Tax Cuts and Jobs Act of 2017 (Tax Act), are met. We appreciate the opportunity to work with the BLM and provide recommendations for your consideration as you design and implement the oil and gas program. In our attached comments, we have identified areas of particular environmental value and sensitivity where we recommend consultation between the Service Refuge Manager and the BLM Authorizing Officer to determine appropriate buffer areas to provide adequate protection to springs and subsurface groundwater and aufeis.

The Service and the BLM will be required to manage refuge lands and waters in a way that is consistent with applicable legislation. Public comments on the Draft EIS reveal questions of how the purposes of the Coastal Plain will be affected by the oil and gas program. We feel many of our comments will add clarity to the document that is important to the public reviewer. Comments specific to caribou and provided by the U.S. Geological Survey are also included because of the agency's involvement with technical studies that may inform the implementation of the leasing program.

Consultation and coordination between the BLM Authorizing Officer and the Service Refuge Manager in implementing the oil and gas program is important. We would like to work with the BLM to identify necessary and needed studies and to develop a post-leasing process for collaborating. The Tax Act assigned the BLM to administer sub-surface resources for an oil and gas program on the Coastal Plain within the Arctic Refuge. The Arctic Refuge Manager continues to be responsible for surface resource management and fulfilling the Refuge's purposes and the requirements of the Refuge Administration Act. Effective communication and coordination between the BLM and the Service will ensure the required balance among the purposes of the Coastal Plain of Arctic Refuge. Clarifying this process between the Service and the BLM will serve to provide regulatory certainty for lessees in the post-leasing period.

The Tax Act directed the BLM to manage the oil and gas program on the Coastal Plain in a manner similar to the administration of lease sales under the National Petroleum Reserve in Alaska (NPRA). To the extent practicable and where applicable and appropriate, we recommend applying stipulations and required operating procedures in the Coastal Plain similar to those applied in the NPRA. This practice would be consistent with the congressional direction and provide some level of consistency for operators and managers.

A clear set of lease terms and conditions and operating procedures would best provide potential lease holders with the information to pursue exploration and development in an environmentally compatible manner and help ensure compliance with the Endangered Species Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Fish and Wildlife Coordination Act, and the international and bilateral treaties and agreements identified in the preliminary Final EIS.

The Service appreciates the opportunity to provide the attached comments and recommendations, and the opportunity to participate as a cooperating agency. Please contact Dr. Wendy Loya, Arctic Science Program Coordinator at 907-786-3532 or via email wendy_loya@fws.gov, should you have any questions.

Attachment

Cmt #	Page #	Row # or Line #	Reviewer Name/ Agency	Comment	A/R/M¹	Remarks / How Resolved (Reviewers: Leave this column blank)
1.	ES-1	12-13	FWS	We recommend listing the all designated purposes of the Arctic Refuge under ANILCA and the Tax Act within this section of the document, rather than referring the reader to ANILCA in the Introduction of the Executive Summary.		
2.	1.1	9-10	FWS	The Act added the new oil and gas purpose to the other existing purposes, implying that all purposes of the Refuge are to be achieved and maintained. We recommend the EIS include a detailed explanation of how BLM and FWS will coordinate to ensure management to achieve all Refuge purposes.		
3.	ES-1 1-2	28-29 7-8	FWS	Specific accounting for the Refuge purposes in all the action alternatives are not clearly spelled out or readily identified in the document. The FEIS should explicitly identify the ability of each alternative to meet Section 20001 of PL 115-97 and to account for all purposes of the Arctic Refuge, consistent with the following statement in the EIS. "All action alternatives are designed to meet Section 20001 of PL 115-97 and to account for all purposes of the Arctic Refuge."		
4.	1-6	1	FWS	We recommend adding the Migratory Bird Treaty Act signed between the U.S., Canada, Mexico, Russia, and Japan to this section.		
5.	1-7	7-8	FWS	We recommend that land under pipelines be considered part of the 2000-acre development limit. The pipe, although elevated, can temporarily or permanently affect the land beneath it and wildlife behavior, making it less suitable for wildlife.		

6.	1-7	9-15	FWS	<p>We are pleased to see that gravel mines are now being considered part of the 2,000 acre limit. We recommend moving gravel mines to the other bulleted items (starting at line 3) as a facility that is counted toward the 2,000 acre limit on lines 3-6 pg. 1-7. As the paragraph reads now, it is not clear that gravel mines are counting toward the 2,000 acre limit. The comparison of gravel mines to mills that supply steel for off-site construction of pipelines and other facilities is not appropriate and makes it seem like gravel is not being accounted for, and thus may be an oversight in the revision of the EIS. The Service recommends the final EIS incorporate gravel mines into the impact analysis for each of the action alternatives analyzed in the EIS.</p>		
7.	2-14	LS 7	FWS	<p>The FWS recommends that the caribou calving grounds be designated for No Surface Occupancy under Alternative B based on the sensitivity of caribou with calves. If the above recommendation is not adopted, we recommend that requirements similar to NPRA Lease Stipulation 5a be considered and that lessees develop plans for stopping work and minimizing traffic disturbance when caribou calving is occurring. We further recommend that lessees conduct multi-year studies to evaluate the efficacy of the proposed minimization measures.</p>		

8.	2-18	Table 2-3	FWS	For Lease Stipulation 10, Wilderness Boundary, we recommend that a NSO setback of appropriate size be considered in order to ensure protection of the wilderness values of the designated Mollie Beattie Wilderness area from impacts associated with development activities.		
9.	2-19	ROP 1	FWS	<p>We recommend changing ROP 1 Requirement/Standard from “Areas of operation would be left clean of all debris” to read, “Areas of operation would be left clean of all surface and sub-surface debris, and any residual soil or surface water contamination caused by debris.”</p> <p>Under the Preferred Alternative, ROPs currently identified to address pollution generated by oil and gas activities need to be enhanced to address the other four purposes of the Arctic Refuge.</p>		
10.	2-20	ROP 4	FWS	This ROP and other sections of the EIS reference adherence to the current North Slope Incidental Take Regulation (ITR) that expires in 2021. We recommend this language be changed to “The plans would include specific measures identified by the USFWS for petroleum activities on the Coastal Plain, which may include updated measures and/or may include similar measures identified in the current USFWS Incidental Take Regulations (81 FR 52318; § 18.128) that have been promulgated and applied to petroleum activities to the west of the Coastal Plain.”		

11.	2-21	ROP 6	FWS	The EIS 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, the NPRA, GMT2, and the BOEM Air Modeling Study (BLM 2012, BLM 2018a, and BOEM 2016, 2017 respectively), quantitative analyses have been performed using a low, medium, and high projected level of development. We recommend a similar approach be taken for the analysis within the FEIS. While qualitative analyses can be included in EISs, where it is possible to include quantitative analysis we would recommend to do so.		
12.	2-21	ROP6	FWS	Correct terminology editorial comment: ensure that “federal land manager” is not capitalized throughout this ROP 6.		
13.	2-22	ROP 4	FWS	We recommend completely separating the requirements and guidance for grizzly bears and polar bears. Given that some, but not all, methods and measures apply to both species, it would be clearer for operators if they were dealt with separately. It may be more appropriate and easier to include grizzly bears in the other wildlife management plan section.		
14.	2-22	ROP 8	FWS	We recommend editing the Objective for ROP 8 to read: “In flowing waters (rivers, springs, and streams) ensure water of sufficient quality and quantity to conserve fish, waterbirds, and wildlife populations and habitats in their natural diversity.”		
15.	2-23	ROP 9	FWS	We recommend a modeling and monitoring plan to address lake recharge be adopted to help ensure adequate protection of habitat for waterbirds.		

16.	2-24 3-143	ROP 10 24-26	FWS	<p>Currently, the EIS states that “grizzly bear dens identified by ADFG” will be avoided (by 0.5.km). We recommend revising this statement to indicate that the lessee should work with FWS to identify denning sites, which will be confirmed by FWS. Management of bears on refuge lands is the responsibility of both ADFG and FWS; however, management of the surface estate, including bear denning habitat and actions occurring in the vicinity of dens, is the responsibility of FWS.</p> <p>Additionally, we recommend that ROP 10 require the development of a bear den survey/monitoring plan, similar to the bear interaction plan described in ROP 4.</p> <p>Within the NPRA, cross-country use of heavy equipment and seismic activities is prohibited within 0.5 mile of identified occupied grizzly bear dens identified unless alternative protective measures are approved by the authorized officer in consultation with the ADFG (NPRA IAP, 2012). Without additional study, we recommend a minimum buffer distance of 0.5 miles of identified grizzly bear dens be employed.</p>		
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17.	2-25	ROP II Alt B	FWS	<p>We recommend including the requirement that snow depth and density amounts to no less than a snow water equivalent (SWE) of 3 inches above the highest tussocks. Allowing for only ‘three inches of snow depth over the highest tussocks,’ as the requirement is currently worded, is not a suitable replacement for the SWE measurement, which accounts for both snow depth and density. If SWE is not included, we recommend that 3” be changed to 6” to meet the minimum protective depth needed under average snow density for the Refuge. If the SWE metric will not be used in the standard for Alternative B, then average depth <u>and</u> depth over tussocks should both be elements of the requirement; ‘whichever is less’ should be omitted. Thus, if the SWE requirement is not adopted, our recommended language is: Ground operations would be allowed when soil temperatures at 12 inches below the tundra surface (defined as the top of the organic layer) reaches 23F and snow depths are an average of 9 inches, with at least 6 inches above the highest tussock.’</p>		
18.	2-24	ROP 10	FWS	<p>To clarify, operators may not all be in possession of an LOA. This is one form of authorization under the MMPA, but it is possible that another form (IHA) may be in use. In addition, polar bear dens may occur offshore as well as onshore and both could be impacted by disturbance which this ROP is intended to prevent. Hence, the Service suggests re-phrasing this ROP, for example to “Operators seeking to carry out onshore or offshore activities in known or suspected....”</p>		

19.	2-28	ROP 18	FWS	<p>The Requirement/Standard developed for ROP 18 Objective does not address the last half of the Objective to, “minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources”.</p> <p>We recommend amending the language in the ROP 18 Objective from “Protect subsistence use and access to subsistence hunting and fishing areas and minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources” to, “Protect subsistence use and access to subsistence hunting and fishing areas.” to better align with the current Requirement/Standard.</p>		
20.	2-32	ROP 27	FWS	<p>We recommend adding the following to ROP 27 Requirement/Standard: To reduce the likelihood of birds landing on any temporary pool or pits that may contain hazardous materials or waste, including but not limited to sewage, petroleum products, or drilling muds, all such pools or pits are managed according to current best management practices, and monitored to ensure no entanglement.</p>		
21.	2-33	ROP 30	FWS	<p>In order to “prevent” the loss of nesting habitat, we recommend adding a Requirement/Standard that states “the extraction of gravel from cliffs would be prohibited,” consistent with language contained in NPRA ROPs (E-15 best management practice).</p>		
22.	2-34	ROP 33	FWS	<p>We recommend editing the Requirement/Standard to read: “A representation, in the form of ArcGIS-compatible shape-files, of all new infrastructure construction would be provided to the BLM Authorized Officer, FWS Arctic Refuge Manager, and State of Alaska by the operator...”</p> <p>As the surface land manager of the Refuge, FWS should be provided copies of all data, including metadata, and information generated within the Refuge.</p>		

23.	2-35	ROP 35	FWS	<p>We recommend the following changes to ROP 35 for all alternatives: a) Replace the phrase “hydrological, vegetation, and habitat condition” with “hydrological, vegetation, and habitat condition, including contamination;” and b) Replace the phrase “stability, visual, hydrological, and productivity objectives” with “stability, visual, hydrological, contamination, and productivity objectives.”</p> <p>Additionally, we recommend the Requirement/Standard for ROP 35 under all Alternatives include the following language:</p> <ul style="list-style-type: none"> a. Oil and gas infrastructure, including gravel pads, roads, airstrips, wells and production facilities, would be removed and the land restored on an ongoing basis, as extraction is complete. The BLM Authorized Officer may grant exceptions to satisfy stated environmental or public purposes. b. Before final abandonment, land used for oil and gas infrastructure – including well pads, production facilities, access roads, and airstrips – would be restored to ensure eventual restoration of ecosystem function and meet minimal standards to restore previous wild characteristics. The leaseholder would develop and implement a BLM-approved abandonment and reclamation plan. The plan would describe short-term stability, visual, hydrological and productivity objectives and steps to be taken to ensure eventual ecosystem restoration to the land’s previous hydrological, vegetation and habitat condition, wild and scenic river (WSR) eligibility/suitability, and intent to restore previous wild characteristics of the area. The BLM Authorized Officer may grant 		
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				exceptions to satisfy stated environmental or public purposes.		
24.	2-35	ROP 35	FWS	Within the Requirement/Standard, we recommend clarifying who has the ability to request an exception to reclamation requirements.		
25.	2-36	ROP 36	FWS	In addition to consulting with communities, we recommend the lessee/operator/contractor consult with the Alaska Nannut Co-management Council (ANCC), as the Alaska Native Organization established by polar bear hunting villages to represent them and their interests related to subsistence hunting of polar bears		
26.	2-4	1-37	FWS	Given the complex nature of separate management authorities that both the BLM and FWS have in the 1002 Area, we recommend providing additional information on what operating procedures the Authorizing Officer will follow when making decisions on waivers and other aspects of the oil and gas program where objectives overlap with FWS management of natural resources. We are specifically interested in obtaining a better understanding of when and how the Authorizing Officer will consult and coordinate with FWS in making decisions affecting our management responsibilities.		
27.	2-42	ROP 45	FWS	The Requirement/Standard does not appear to address the stated objective. Surveys alone for sensitive species would not, "Minimize loss of individuals and habitat for mammalian, avian, fish, and invertebrate species designated as sensitive by the BLM in Alaska". Please consider changing, "The results of these surveys would be submitted to the BLM with the application for development" to "The results of these surveys and plans to minimize impacts would be submitted to the BLM with the application for development".		

28.	2-44	Lease Notice 2	FWS	<p>The language in Lease Notice 2 is not consistent with the language provided in the Biological Assessment or BLM's Memo for the Record dated July 3, 2019. Because our Biological Opinion is predicated in part upon the assumptions and assurances of this language, it is essential that it is consistent and clear. We recommend including the following language in Lease Notice 2, which is the language which was agreed upon:</p> <p><i>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 the applicants/operators seek and obtain incidental take authorization under the MMPA. The BLM would require a copy of any Incidental Take Authorization and the Incidental Take Statement (ITS) prior to conducting activities.</i></p>		
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29.	2-5	LS 1	FWS	<p>We reiterate our recommendation for a 1 mile buffer for all streams and rivers encompassed by the high density area for polar bear denning as provided in the FWS produced maps. Without these restrictions, it is unlikely that leaseholders will be able to comply with MMPA and/or ESA requirements for polar bears.</p> <p>Citation: MacGillivray, A.O., D.E. Hannay, R.G. Racca, C.J. Perham, S.A. MacLean, M.T. Williams. 2003. Assessment of industrial sounds and vibrations received in artificial polar bear dens, Flaxman Island, Alaska. Final report to ExxonMobil Production Co. by JASCO Research Ltd., Victoria, British Columbia and LGL Alaska Research Associates, Inc., Anchorage, Alaska, USA.</p>		
30.	2-6	LS 2	FWS	We recommend adopting a NSO for Canning River Delta and adjacent lakes to ensure the FEIS addresses all Refuge purposes.		
31.	2-6	LS 2	FWS	LS-2 is specific to the Canning River Delta and lakes due to wildlife, particularly bird, use. Please consider changing, “and the loss of migratory bird habitat”, to “and adverse effects to migratory birds”.		

32.	2-7	LS 3	FWS	<p>To ensure the unique habitats, subsistence uses, cultural resources, and natural diversity of fish and wildlife habitats and populations are maintained, we recommend that all alternatives consider adopting the following language:</p> <p>Requirement/Standard: Addition of the following areas identified that would not be offered for lease sale or identified as NSO:</p> <p>a. No leasing and no new non-subsistence infrastructure would be permitted adjacent to or above Sadlerochit Spring (04N031E) nor adjacent to or below the spring to where it enters the Sadlerochit River and along the aufeis formation (04N031E and 05N031E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. This spring supports an isolated, dwarf population of Dolly Varden, unique plant and invertebrate communities, and an extensive aufeis field that persists through much of the summer, providing insect relief habitat for caribou.</p> <p>b. No leasing would be permitted adjacent to or above the perennial spring at Fish Hole I on the Hulahula River (05N032E). Further, no new non-subsistence infrastructure would be permitted adjacent to the perennial spring at Fish Hole I on the Hulahula River (05N032E), per Lease Stipulation I, nor adjacent to the aufeis field (05N032E and 06N032E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. The Fish Hole I spring provides overwintering habitat for arctic grayling and a large</p>		
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				<p>population of anadromous Dolly Varden. Residents of Kaktovik routinely harvest Dolly Varden in Fish Hole I during winter. The spring produces an extensive aufeis field that persists through much of the summer.</p> <p>c. No leasing would be permitted adjacent to or above the perennial Tamayariak Spring, and no new non-subsistence infrastructure would be permitted adjacent to the associated aufeis field (07N026E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis.</p> <p>d. No leasing would be permitted adjacent to or above the perennial Okerokavik Spring (04N036E), and no new non-subsistence infrastructure would be permitted adjacent to the associated aufeis field in the Iago River drainage (05N035E and 05N036E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis.</p> <p>e. NSO would be permitted adjacent to the eastern bank of the Canning River, including through the delta without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. The Canning River is the largest river crossing the Coastal Plain. It has several perennial springs originating upstream of the Coastal Plain that provide steady flow under ice across the Coastal Plain. The river supports several fish species, including arctic grayling and a large population of anadromous Dolly Varden. Aufeis fills the river corridor across the Coastal</p>		
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				Plain and extends well into the delta, providing insect relief to caribou during the early summer.		
33.	2-7	LS 3	FWS	Recommend including language in the Requirement/Standard that prohibits utilizing auffs for industrial purposes.		
34.	3-100	9, 37	FWS	<p>We recommend changing line 9 to read, “It would also increase sedimentation and turbidity, with potential increases in heavy metal or mineral contaminant loads, which may decrease suitable habitat for some species.”</p> <p>We recommend changing line 37-39 to read, “Dust could increase turbidity and heavy metal or mineral contaminant concentrations in water bodies next to road and construction areas, which may inhibit normal physiological function in fish (e.g., oxygen uptake across gill membranes or liver function), and could increase sediment, contaminant, and gravel inputs to existing substrates.”</p>		
35.	3-102	17	FWS	Recommend changing line 17 to read, “...dust from vehicle traffic could also increase local turbidity and heavy metal concentrations in streams around gravel infrastructure.”		
36.	3-105	39	FWS	<p>Contaminant concentrations in lagoons by Kaktovik are higher than at uninhabited sections of the Arctic Refuge coast (except DEW line sites).</p> <p>Therefore, we recommend changing line 39 to read, “...and species by contributing dust and gravel spray, and contaminants to streams....”</p>		

37.	3-106	29	FWS	<p>The statement, “With few exceptions described below, 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, presumably 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 (<i>Bubo scandiacus</i>) 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). Post-breeding staging and foraging birds occurs in the program area, some throughout October and into November for some marine species; they leave with advancing sea ice. In the immediate area offshore, such species groups include larids, murres, puffins, guillemots, sea ducks, and sometimes shearwaters (Kuletz et al. 2015; Kuletz and Labunski 2017, Appendix I; USFWS data). Please change to, “With some exceptions described below, most birds in the program area are migratory and are only present May to September”.</p> <p>Citations: Holt, D. W., M. D. Larson, N. Smith, D. L. Evans, and D. F. Parmelee. 2015. Snowy Owl (<i>Bubo scandiacus</i>). in P. G. Rodewald, editor. The Birds of North America. Cornell Lab of Ornithology, Ithaca, NY, USA.</p> <p>Kochert, M. N., K. Steenhof, C. L. McIntyre, and E. H. Craig. 2002. Golden Eagle (<i>Aquila chrysaetos</i>). In A. F. Poole, and F. B. Gil, editors. The Birds of North America. Cornell Lab of Ornithology, Ithaca, NY, USA.</p>		
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38.	3-106	36	FWS	<p>“Larids (gulls, jaegers, and terns), raptors and owls, and seabirds are less abundant but important components of the bird community” is incomplete as written. While larids are less common on the Arctic Refuge Coastal Plain than some other guilds, relative abundance of jaegers is higher in surveyed areas of the Arctic Refuge Coastal Plain than areas within NPRA and Prudhoe Bay (Amundson et al. 2019). Please consider changing to, “Some larid species (e.g., jaegers) occur in greater densities in surveyed areas of Arctic Refuge Coastal Plain than the NPRA. Raptors, owls, and seabirds are less abundant but important components of the bird community”.</p>		

39.	3-106	38	FWS	“Of the 157 species considered likely to occur on the Arctic Refuge Coastal Plain, 40 are classified as common, fairly common, or abundant in one or more seasons, all but one of these (snow geese) also are breeders or possible breeders on the Arctic Refuge Coastal Plain”, is incorrect. Snow geese have been documented breeding on the Arctic Refuge Coastal Plain at the Canning River Delta (USFWS, unpublished data).		
40.	3-107	17	FWS	“Species” is misspelled.		
41.	3-108	20	FWS	The statement “The spectacled eider is an uncommon breeder in the program area, and nests have been documented only on the Canning River delta” is incomplete. The Canning River Delta study site has been primarily used in recent years for studying the ecology of shorebirds, not sea ducks, and the area has not recently been systematically surveyed. 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 implies that a few spectacled eider nests were found as part of other operations (primarily shorebird research) at a single small study site on Canning River delta. There have been no systematic ground surveys specifically targeting tundra-breeding eider anywhere in the program area in the recent past. Please change, to “The spectacled eider is an uncommon breeder in the program area (USFWS 2015a). Nests have been documented on the Canning River delta (Kendall and Villa 2006), but contemporary systematic ground surveys have not been conducted.”		

42.	3-108	36	FWS	The statement, “The North American Waterfowl Management Plan (USFWS 2012) and updates (USFWS 2018a) outline the population status and abundance objectives of agency wildlife managers for waterfowl (ducks, geese, and swans) on the Arctic Refuge Coastal Plain” is not accurate. These management plans are not specific to the Arctic Refuge Coastal Plain. Please edit to accurately reflect the plan objectives.		
43.	3-108	42	FWS	The statement, “All occur as breeders or possible breeders except snow geese, which occur as abundant migrants,” is incorrect. Snow geese have been documented breeding on the Arctic Refuge Coastal Plain at the Canning River Delta. (USFWS, unpublished data) Please change to, “All occur as breeders or possible breeders.”		

44.	3-108	43	FWS	<p>The modeling done by Bart et al. (2012) has been updated by Amundson et al. (2019) to adjust for survey intensity and timing and more recent data. Please consider changing, “Using data collected over a decade starting in the late 1990s, Bart et al. (2012) found that northern pintails were by far the most abundant waterbirds in tundra habitats in the Arctic Refuge Coastal Plain (estimated number 18,071), followed by long-tailed duck (8,415). Waterbirds, including northern pintails and long-tailed ducks, geese, swans, and loons, all occur at lower densities in the Arctic Refuge Coastal Plain than in areas to the west where the highest waterbird densities are found in the Colville delta and NPRA (Bart et al. 2012). Although the Arctic Refuge Coastal Plain is a low-density breeding area for brant and king eider, both species are abundant along the coast during spring and fall migration, and are an important subsistence resource harvested during those periods.” to “Using aerial-survey breeding waterbird data collected across the ACP from 1992-2016 for 20 species, Amundson et al. (2019) found that density on the Arctic Refuge Coastal Plain was greater than average for jaeger, tundra swan, red-throated loon, and cackling geese, and lower than average for greater white-fronted geese, pacific loon, Steller’s eider, white-winged scoter, yellow-billed loon, and Sabine’s gull. There was no difference in density between areas surveyed in NPRA and the Arctic Refuge Coastal Plain for snow geese, black brant, northern pintail, scaup, spectacled eider, king eider, long-tailed duck, red-breasted merganser, glaucous gull, and Arctic tern.”</p>		
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45.	3-109	33-35	FWS	The statement, "Most waterfowl ducks and geese from the Arctic Refuge Coastal Plain migrate through the Pacific and Central Flyways" is poorly defined and not correct as written. Please change to, "Most geese and dabbling ducks migrate through Pacific and Central Flyways after leaving the Arctic Refuge Coastal Plain.		
46.	3-112	7	FWS	Upland sandpipers are not abundant on the program area and should be removed from this list.		
47.	3-115	29	FWS	This sentence cites Kubelka et al. 2018. A recent publication by Bulla et al. Science 10.1126/science.aaw8529 (2019) disputes this information. Please re-evaluate these papers to ensure the best available science is utilized.		
48.	3-116	12-18	FWS	Recommend citing relevant information in Saalfeld et al. Ecology and Evolution 10.1002/ece3.5248 (2019) and Saalfeld et al. Ecology and Evolution 7:10492-10502 (2017) that describes how climate change is affecting shorebird nesting and chick growth.		

49.	3-120	9	FWS	<p>The statement, “New (<1.5 years) seismic lines, however, did not have measurable effects on bird abundance, despite demonstrable effects on vegetation structure and composition, possibly because of improvements in seismic methods and practices or possibly because negative effects of seismic lines take a long time to develop (e.g., thermokarst and resulting increases in surface water, etc., may require years to decades to develop or to stabilize)” is not supported by the findings in the cited manuscript. The authors state in the abstract, “Along new seismic lines...Significant impacts were found for passerines grouped in upland tundra and for savannah sparrow in sedge/willow”. The authors also stated the findings of no statistical difference for some species were, “probably because of small sample sizes”, not for the reasons stated in the EIS. We recommend correcting this sentence to reflect the findings of the cited paper.</p>		
50.	3-121	6	FWS	<p>The statement “Under all action alternatives, ROP 9 would set limits on percent volume removed and other standards for summer and winter withdrawals from lakes and ponds that specifically protect bird nesting sites and fish” does not appear to match requirements in ROP 9. Impacts to how water removal would affect nesting bird habitat in ROP 9 apply to summer water removal only and how such information will be used is not defined. Please consider changing to, “Under all action alternatives, ROP 9 would set limits on percent volume removed and case-by-case standards for summer withdrawals for lakes and ponds that specifically protect bird nesting sites”</p>		

51.	3-121	6	FWS	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 confused by the term “ameliorated”. The species groups that are likely to use gravel pits filled with water will be different from those originally displaced; therefore the “impacts on birds” will not be ameliorated. Suggest changing to, “the impact on birds would be long-term. Reclamation may reduce habitat loss if pits are fully transferred back to the original state, 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).”		
52.	3-122	17	FWS	Please change “Such habitats are important to land birds (i.e., passerines and ptarmigan) and to some species of waterbirds” to “Such habitats are important to land birds (i.e., passerines and ptarmigan) and to some species of waterbirds and shorebirds”		
53.	3-122	25	FWS	The term “waterbirds” is used for waterfowl, grebes, and loons elsewhere, but appears here to include shorebirds. Please change to align with other text in EIS.		
54.	3-122	40	FWS	Please change line 40 to read, “...sediment plume that could further disrupt feeding and increase contaminant exposure in non-breeding...”		

55.	3-122	42	FWS	<p>The paragraph starting with, “The species most likely to be affected by nearshore barge activity is long-tailed duck”, appears to be poorly supported. The rationale for the first sentence appears to be that because more long-tailed ducks were counted in the lagoons in late July and early August, other species for which fewer birds were counted would be minimally impacted. Predicted abundance of breeding long-tailed ducks is higher on the Alaska ACP compared to most other species counted. For example breeding long-tailed ducks are about 10 and 20 times more abundant than spectacled eider and red-throated loons on the ACP (Amundson et al. 2019), but this doesn’t mean stakeholders are primarily concerned with anthropogenic effects to long-tailed ducks because they are more common and ignore less common, but more at-risk species, like spectacled eider and red-throated loons. Conservation status and ecology should be considered. For example, some red-throated loons counted in the survey may have been attending nests or young and using the lagoons to forage for fish. Fewer of these birds would be counted in surveys because their presence is only temporary. In addition, habitat loss may have a larger impact because the birds are foraging for themselves and young and cannot simply move to a new area because they are nesting or raising a brood in the area. Further, Rizzolo et al. (2014) reported poor foraging conditions during chick rearing can have important effects on productivity. Given these factors, a reasonable argument could be made that red-throated loons are more likely to be affected by nearshore barge activity compared to long-tailed ducks. We recommend this section be written to integrate species conservation status and species ecology into the estimates of potential effects.</p>		
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56.	3-125	42	FWS	<p>Although long-tailed ducks were the most common bird counted in late July and early August surveys in the Arctic Refuge Coastal Plain lagoons, other species, including BLM sensitive species and species of conservation concern, were also documented using lagoons during this time. For example, red-throated loons counted in the survey may have been attending nests or young and using the lagoons to forage for fish. Fewer of these birds would be counted in this survey because their presence is only temporary. In addition, habitat loss may have a larger impact because the birds are foraging for themselves and young and cannot simply move to a new area. Further, Rizzolo et al. (2014) reported poor foraging conditions during chick rearing can have important effects on productivity. Given these factors, a reasonable argument could be made that red-throated loons are more likely to be affected by ship traffic in the program area compared to long-tailed ducks, but less research has been conducted on the effects of disturbance to loons foraging in Beaufort Sea lagoons. Please consider adding, "Potential impacts for other species (such as red-throated loons that are foraging in the lagoons to feed chicks) have not been well studied on the ACP" to the end of this section.</p>		
57.	3-126	15	FWS	<p>The statement, "Similar altitude restrictions plus minimizing helicopter landings May 20 to June 20 for caribou calving range would temporarily reduce disturbance of nesting birds" is incomplete. Please consider changing to, "Similar altitude restrictions plus minimizing helicopter landings May 20 to June 20 for caribou calving range would temporarily reduce disturbance of nesting birds in some areas."</p>		

58.	3-132	34	FWS	The requirement that flight altitudes be above 1,500 feet for post-calving ranges and limiting helicopter landings through July 20 will reduce disturbance to birds. Please consider changing, “the requirement that flight altitudes be above 1,500 feet is extended to post-calving ranges and limited helicopter landings are extended to July 20 (ROP 34), or through the bird nesting season, both of which could reduce potential disturbance of nesting birds somewhat relative to other alternatives” to “the requirement that flight altitudes be above 1,500 feet is extended to post-calving ranges and limited helicopter landings are extended to July 20 (ROP 34), would reduce disturbance of nesting birds relative to other alternatives.”		
59.	3-135	32	FWS	Please include “Gwich’in” to the list of people for whom caribou are an important subsistence and cultural resource.		
60.	3-136	3	FWS	The phrase “That unprecedented movement...resulted in high mortality of TCH wintering near the program area” is inaccurate. As presented this information may lead readers to believe movement by the herd into the refuge caused mortality, when it was the icing weather that “resulted in high mortality” not the movement into the program area. Recommend rephrasing the statement to clarify that the mortality was not related to use of the program area.		
61.	3-138	26	FWS	Sentence beginning “The percent calving occurring in the area” is incomplete. Please correct as appropriate.		
62.	3-146	20-21	FWS	It is stated that increased bear predation on caribou and moose could occur. Plans for monitoring or objectively assessing this statement should be included. We recommend developing a grizzly bear monitoring plan that evaluates both impacts to grizzly bears as well as impacts of grizzly predation of caribou and moose, as we mentioned for ROP 10.		

63.	3-149	33	FWS	The section states that no studies have found impacts to movement across roads on the north slope, similar to Wilson et al. 2016 or Panzacchi et al. 2013. However, to our knowledge none of the published studies cited actually looked for that response. We are not familiar with Prichard's findings, given that is in review. Please provide further information on the Prichard study if it does study this effect.		
64.	3-163	14-16	FWS	Stating that BLM expects future mitigation/monitoring, etc., to be similar to current measures is unsupported. The document should state that they "assume" rather than "expect" because it is unclear what the expectation is based upon.		
65.	3-163	28	FWS	The I-I Agreement is voluntary in the U.S. but mandatory in Canada. This should be clarified.		
66.	3-179	38	FWS	<p>While it is true that two females emerged from dens successfully, it should not be implied that there was no impact to the reproductive success of the female as a result of being in close proximity to industry. Studies demonstrate that being forced to emerge from a den early can have significant survival impacts on cubs post emergence. Successful emergence from dens does not mean that denning near development did not have an impact or cause early emergence resulting in reduced cub survival.</p> <p>Citation: Rode, K.D., J. Olson, D. Eggett, D.C. Douglas, G.M. Durner, T.C. Atwood, E.V. Regehr, R.R. Wilson, T. Smith, and M. St. Martin. 2018. Den phenology and reproductive success of polar bears in a changing climate. Journal of Mammalogy 99:16-26.</p>		

67.	3-181	20-21	FWS	This is not accurate. It assumes that activity occurs in one half one year and the other half the next year, which may or may not be the case. Also, the statement does not account for the additional disturbance of access routes between two years, etc.		
68.	3-181	3-4	FWS	Recommend clarifying that this is detectability of dens that are available to be detected, and if you include those dens that are undetectable (e.g., due to too deep of snow) then the rates could be lower.		
69.	3-181	37-38	FWS	It is not necessarily true that disturbance would be short lived. If a missed den occurred along a transit corridor where equipment and personnel were transported during the whole season, the den could receive frequent and repeated disturbance.		
70.	3-182	31-32	FWS	<p>The statement that denning bears would infrequently encounter roads or pipelines because dens are concentrated along the coast should be removed. First, nothing in the preferred alternative would restrict the development of a pipeline or road near the coastline. Second, while denning is concentrated along the coast, dens can occur 20+ miles inland and a considerable number of dens are documented 5+ miles from the coast.</p> <p>Polar bear den information can be found at: https://pubs.er.usgs.gov/publication/ds568</p>		
71.	3-183	11-13	FWS	This statement is inaccurate. It should state that, depending on the specific proposal, seismic activities have the potential to cause moderate to severe impacts due to possibility of running over dens and directly killing bears, causing den abandonment and thus death of cubs, or early emergence leading to decreased survival rates of cubs.		

72.	3-183	1-5	FWS	While it might be true that behavioral responses of bears could be short-lived as bears move through the area, this statement fails to consider the increased risk to bears due to higher levels of human-bear interactions by placing facilities along core movement corridors. An analysis of this risk should be considered.		
73.	3-188	36	FWS	It is incorrect to say the “sole cautionary note” of potential injury and impacts to bears is seismic activity. While that is certainly a potentially large impact it is not the only one. The intent of the leasing program is to support oil and gas development activities which involve noise related activity during development and production, including surface travel. This noise, occurring in the highest density denning area for this polar bear population could create a disturbance and result in den abandonment		
74.	3-191	14	FWS	It is overly simplistic to say that because the entire coastal plain would be open for seismic, that the impacts of seismic activities across the different scenarios is equal. While it may be true that under each alternative seismic could occur across the entire region, if certain regions were unable to be leased under the different alternatives, it may also be true that seismic activities would be less likely to occur in those areas. The difference in potential levels of seismic activity between the alternatives should be considered.		

75.	3-191	19-20	FWS	There are approaches that have been published in the literature that could be used to quantify impacts among alternatives without knowing the future locations of activities. These approaches iteratively simulate possible development scenarios (that align with what's allowed under a given alternative) and can then summarize (with the inherent uncertainty) the relative impacts to the parameter of interest across all alternatives. This would better inform readers than a qualitative assessment alone. https://doi.org/10.1111/conl.12016 OR https://doi.org/10.1371/journal.pone.0007400		
76.	3-194	23-24	FWS	The conditions that affect detection should be described here as they are on Page 3-181: Using airborne FLIR, the best available data indicate a range of detectability from 50 percent to 83 percent, depending on the experience of the crew (a rate of 22 percent was obtained by one inexperienced crew), the number of surveys flown, the weather conditions prevailing at the time of the surveys, and seasonal timing and snow depth (Amstrup et al. 2004; York et al. 2004; Shideler 2014).		
77.	3-200	3.4.1	FWS	This document would be improved by describing in detail the effects on existing and future potential recreational and subsistence uses, under all action alternatives, and within each alternative.		
78.	3-22	4	FWS	This statement is inaccurate. On-road and off-road vehicles are prohibited unless permitted to access allotments. There are currently no permits issued, so only snow machines are allowed on the Refuge at this time.		
79.	3-22	6,9	FWS	Boats are listed twice. Please list them once with the activities they support, "village access, recreation access to remote sites, scientific research."		

80.	3-22	7-9	FWS	Aircrafts are listed three times. Please list them once with the activities they support, “village access, recreation access to remote sites, scientific research.”		
81.	3-233	23	FWS	Change line 23 to read, “...loss, increased turbidity and contamination from dust and gravel spray...”		
82.	3-25	ROP 35	FWS	We recommend inclusion of the following language in the Requirement/Standard for all alternatives: “Before final abandonment, land used for oil and gas infrastructure – including well pads, production facilities, access roads, and airstrips – would be restored to ensure eventual restoration of ecosystem function and meet minimal standards to restore previous wild characteristics. The leaseholder would develop and implement a BLM-approved abandonment and reclamation plan. The plan would describe short-term stability, visual, hydrological and productivity objectives and steps to be taken to ensure eventual ecosystem restoration to the land’s previous hydrological, vegetation, and habitat condition, wild and scenic river (WSR) eligibility/suitability, and intent to restore previous wild characteristics of the area. The BLM Authorized Officer may grant exceptions to satisfy stated environmental or public purposes.”		
83.	3-281	21-22	FWS	The two sentences describing access to the interior Arctic Refuge contradict each other. The second sentence including skiing is correct. Please delete the sentence “Access to inland areas is either aircraft or by foot.”		
84.	3-281 3-282	3-40 1-20	FWS	This section should be reorganized to describe the Polar Bear Viewing program near Kaktovik, Alaska, separate from the other uses, which are distributed across the Refuge. That would clarify for the reader the level of activity associated with each activity and the effects.		

85.	3-281	Lines 29-31	FWS	Numbers provided in the PFEIS are inconsistent with visitor data provided to BLM staff July 11, 2018. Suggest replacing with the following language to more accurately reflect visitor use within the Refuge: In general over the last five years, a minimum of 11,333 client use days occurred in the Coastal Plain; and visitors engaged predominantly in polar bear viewing, river floating, backpacking, base camping, and hunting. It is generally understood that all visitors engage in numerous wildlife-dependent activities during each visit, including birding and general wildlife watching or photography; fishing and hunting; and interpretation and education.		
86.	3-282	Line 40	FWS	Add “non-federally qualified” before “subsistence users” and wherever else this omission occurs in this section.		
87.	3-283	Line 36	FWS	Strike “improve recreation” and replace with “impact recreation less”.		
88.	3-284	Lines 3-4	FWS	Insert pack rafting as an additional unique use type.		
89.	3-289	32-33	FWS	Recommend the word “purposes” be replaced with “resources” in this sentence and in the table, the heading could be changed to state “EIS Section Describing Impacts on Select Resources Associated with Arctic Refuge Purpose.” The ability of the Refuge to fulfill its purposes is larger than the direct and indirect effects of oil and gas development on specific resources within the Refuge. Fulfilling the Refuge purposes also includes the Refuge Manager’s responsibility for surface resource management and subsequent decision making responsibility for a multitude of issues, which include, but are not limited to non-oil and gas permit requests, public use issues, subsistence harvests, water monitoring, and responses to conservation concerns.		

90.	3-290	Lines 23-24	FWS	Strike “that were recommended pursuant to a congressionally authorized WSR study” because Section 5(d)(1) of the WSR Act directs federal agencies to identify potential addition to the National System through their respective resource and management plans, and in 5(d)(1) studies federal managers are also obligated to use existing management authorities to protect the characteristics of rivers for the conditions under which they were found eligible and suitable.		
91.	3-290	Table 3-34	FWS	Move to the section “Arctic National Wildlife Refuge Purposes”.		
92.	3-291	29	FWS	Change line 29 to read, “...could reduce water quality by increasing sedimentation and turbidity, and increase contaminant loads, in these streams.”		
93.	3-291	37	FWS	The three original purposes of the Arctic Range, as per Public land Order 2214, were preservation of wildlife, wilderness, and recreational values. “Wildlife” should not be separated from “values.”		
94.	3-291	Line 18	FWS	Change “sizes” to “extent in river miles”.		
95.	3-291	Line 21	FWS	“Provide varying protections for ORVs” does not adequately protect the characteristics of rivers for the conditions under which they were found eligible and suitable for inclusion in the National Wild and Scenic River System. We recommend that the FWS and BLM work collaboratively post-leasing with the goal of using existing management authorities to ensure that authorized uses do not degrade recommended rivers’ ORVs, free flow, or preliminary classification.		
96.	3-291	Table 3-35	FWS	Combine setback information in Tables 3-35, 3-36, and 3-37 to more clearly show the setback differences between Alternatives B, C, and D.		

97.	3-292	14-21	FWS	Change to “The Wilderness Act describes 5 primary qualities of Wilderness.” The 5 are: 1) Untrammeled (essentially meaning wild); 2) natural; 3) undeveloped; 4) solitude or primitive and unconfined recreation; and 5) other features of value (unique wilderness features that significantly contribute to the character of a particular wilderness). Note: this list of qualities is taken from the interagency Keeping it Wild 2 protocol, adopted by all four wilderness managing agencies (the Bureau of Land Management, National Park Service, Fish and Wildlife Service, and Forest Service). https://www.fs.fed.us/rm/pubs/rmrs_gtr340.pdf		
98.	3-292	23-39	FWS	We recommend including analysis of the potential direct and indirect impacts of the alternative approaches to implementing an oil and gas program on all of the purposes of the Refuge. The appropriate placement for this analysis would be before the Marine Protected Areas discussion. The ability of the Refuge to fulfill its purposes includes the Refuge Manager’s ability to make management decisions in regards to the resources, such as non-oil and gas permit requests, public use issues, subsistence harvests, water monitoring, and responses to conservation concerns are a few examples.		
99.	3-295	14-15	FWS	Please revise text from “to maintain their preliminary classifications of wild.” to “...to maintain their preliminary classifications of Wild, their free-flowing condition, and the ORVs they were identified to possess.”		

100.	3-3	Table 3-1	FWS	The long-term average of conditions does not show the range of climatic variation currently observed in northern Alaska. An addition that would be helpful for readers to understand the climate of the region is a summary of climate projection data for the region during the proposed period of activity, in a manner similar to Appendix C in the NPRA IAP (2012).		
101.	3-301	17	FWS	The text states “Summer all-terrain vehicle travel is low to nonexistent and does not leave visible trails.” It is true that summer all-terrain vehicle travel in this area is low to nonexistent, but if that were to change, all-terrain vehicles are known to create highly visible scars in tundra landscapes. Reword this sentence to state “Summer all-terrain vehicle travel is low to nonexistent and no trails are currently visible.”		
102.	3-304	5	FWS	Add “Over the long-term, subtle changes in vegetation due to changes in microclimates resulting from track lines holding snow and water longer can create slight, but visible differences in vegetation color in regular patterns making them even more visible.”		

103.	3-340	16+	FWS	<p>Insert additional bulleted item:</p> <p>“Loss or alteration of current and future economic contributions and opportunities for local businesses.”</p> <p>In 2017, the Refuge issued 19 permits for air operator businesses, 21 permits for recreational guide businesses, 17 polar bear viewing guide and/or boat operator businesses, and 11 hunting guide businesses. The economic impacts to, and business opportunity loss to be incurred by, these 68 local businesses has not been adequately addressed in this document. These businesses supported approximately 3,000 client use days in 2017.</p> <p>The <i>Banking On Nature 2017: Individual Analyses for Sampled Refuges</i> describes the “Economic Contributions of Recreational Visitation at Arctic National Wildlife Refuge” as follows: “Spending in the local area generates and supports economic activity within the State of Alaska. The contribution of recreational spending in local communities was associated with about 218 jobs, \$8.9 million in employment income, \$1.4 million in total tax revenue, and \$29.8 million in economic output. See: https://www.fws.gov/economics/divisionpublications/bankingonnature/bon2017/refuges/Arctic%20R%207.pdf.”</p>		
104.	3-4	19	FWS	<p>Editing the following words: ‘of only about’ since the average is quoted (with 1 decimal) and needs no value statement or approximation.</p>		

105.	3-5	16-18	FWS	<p>The Service is concerned about statements in the EIS that refer to the issuance of oil and gas leases as having no direct impacts on the environment “because by itself a lease does not authorize any on-the-ground activities.” While it can be recognized the act of issuing a lease sale has no direct impacts on the environment, the nature and extent of the proposed leasing program will determine the extent and the magnitude of environmental impacts for each alternative under a leasing and future development program.</p>		
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106.	3-58	23	FWS	<p>Dust and sedimentation do not simply impair water quality (increased turbidity and sedimentation); but also mobilize naturally occurring minerals and elements (e.g., copper, phosphate, and rare earth elements; U.S.G.S. 2008); heavy metals and other pollutants from numerous small and large spills of fuel, lubricants, or cargo (e.g., drilling muds); and concentrated heavy metals from vehicle traffic. Even on non-asphalt, low-traffic (Apeagyei et al. 2011), roads heavy metals from vehicle emissions, brake wear, and tire wear concentrate in roadside “dust” (Herngren et al. 2006; Li et al. 2015), particularly in fine particles (McKenzie et al. 2008).</p> <p>Change sentence beginning at the end of line 23 to read, “Dust accumulation can also affect the pH, and increase heavy metal and mineral concentrations of the surrounding soils, which may lead to changes in the health and growth of vegetation that hold soil in place.”</p> <p>Citations: Apeagyei et al. 2011: https://doi.org/10.1016/j.atmosenv.2010.11.015</p> <p>Herngren et al. 2006: https://doi.org/10.1016/j.jaca.2006.04.064</p> <p>Li et al. 2015: https://doi.org/10.1007/s11442-015-1244-1</p> <p>McKenzie et al. 2008: https://doi.org/10.1016/j.scitotenv.2008.02.052</p> <p>U.S. Geological Survey, 2008, Alaska Resource Data File (ARDF): https://mrdata.usgs.gov/mrds/</p>		
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107.	3-59	11, 23, 35	FWS	Multiple values are given for gravel mine acreage. We recommend selecting a value/range and integrating it into the 2,000 acre development limit throughout the document. The Tax Act states that BLM shall authorize up to 2,000 surface acres of Federal land to be covered by production and support facilities (including airstrips and any area covered by gravel berms or piers for support of pipelines).		
108.	3-60	2	FWS	Multiple values are given for gravel mine acreage. We recommend selecting a value/range and integrating it into the 2,000 acre development limit throughout the document		
109.	3-70	36	FWS	Consider changing the sentence beginning on line 35 to, "The sediments and dust would be introduced into the water column, increasing turbidity, sedimentation, and contaminant concentrations."		
110.	3-71	6-8	FWS	Consider changing sentence beginning on line 6 to read, "Fugitive dust that enters surface water bodies would also increase turbidity, sedimentation, and heavy metal and mineral contaminant concentrations."		
111.	3-72 3-73		FWS	Impacts to water quality due to aerial deposition are omitted. Recommend using language identified in the Air Quality section (p. 3-13, L.23-29), with minor edits italicized: "atmospheric deposition, air pollutants are removed from the atmosphere and subsequently deposited in aquatic and land-based ecosystems. This can occur through precipitation or through the dry gravitational settling of particles onto soil, water, and vegetation. A primary issue of atmospheric deposition is the formation of acids, particularly nitrogen and sulfur species. This can happen as acid rain and snow, <i>and results in</i> the subsequent deterioration of lakes, streams, soils, nutrient cycling, and biological diversity."		

112.	3-72	39	FWS	Consider changing sentence beginning on line 39 to read, "Turbidity and heavy metal and mineral contamination would increase in water bodies from dust fallout, flooding, erosion, or bank failure."		
113.	3-75	2-12	FWS	<p>In addition to existing stipulations and ROPs, Alternative B is recommended to include NSO requirements to protect the high value and unique values of Sadlerochit Springs and the Canning River delta. To ensure these valued areas are adequately protected, we recommend including the following language:</p> <p>"NSO: Permanent oil and gas facilities, including gravel pads, roads, airstrips and pipelines, are prohibited within close proximity of the ordinary high-water mark of any waterbody in Townships 8 and 9, north of the Canning and Tamyariak watersheds, without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. On a case-by-case basis, essential pipelines, road crossings and other permanent facilities may be considered through the permitting process in these areas where the lessee/operator/contractor can demonstrate on a site-specific basis that impacts would be minimal." And "NSO: Adjacent to Sadlerochit Spring (04N031E) and below the spring to where it enters the Sadlerochit River and along the aufeis formation (04N031E and 05N031E), without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis."</p>		

114.	3-77	27	FWS	<p>The DEIS used lower volume spill (10,000 gallons or greater) compared to this version (100,000 gallons or greater) to illustrate the probability of spill impacts. This change implies that only “very large” spills, which are low probability events, will have an impact on the Arctic Refuge and its resources and may lead a reader that smaller volume spill will have no impact to refuge resources.</p> <p>Because the public can more easily envision gallons versus bbls, use gallons as the primary unit of measure and place barrels in parentheses.</p> <p>Consider revising the wording in the paragraph that starts on line 27, beginning with the sentence on line 29 that starts, “The probability of a spill...” to, “Although spills greater than 10,000 gallons (238 barrels) are uncommon, such spills could pose substantial risks to migratory birds and their habitats, depending on location and timing. ADEC recorded an annual average of nearly 400 spills between 1995 and 2018, including 44 spills greater than 10,000 gallons (238 barrels) and six were greater than 100,000 gallons (2380 barrels (Appendix I, ADEC 2018d).”</p> <p>We recommend the reference to BLM (2014) be removed because it is not comprehensive. We do support the incorporation of data from ADEC (2018d) referenced in this section.</p> <p>Citation: ADEC. 2018d. 2014/2016. Final Integrated Water Quality Monitoring and Assessment Report.</p>		
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115.	3-80	6-7	FWS	This states that impacts from solid and hazardous waste would be equivalent among the alternatives because the same area of development (2000 acres) is allowed in each. However, because the area of development is the same does not mean that the potential impacts would be same. There are clearly differences in the alternatives that could affect the level of impact from, for example, an oil spill. If a spill were to occur, it would have a lower probability of entering rivers/streams under Alternatives with larger setbacks from streams and rivers. We recommend the EIS fully explore the different potential impacts of the alternatives.		
116.	3-80	Table 3-17	FWS	Edit Table 3-17: <ol style="list-style-type: none"> 1. Change "Source Pipeline" to "Source." 2. Add Tugs (for barges) to list of sources. Large Tugs, especially those that would be expected to travel up to Kaktovik, can have fuel capacities from 10,000 - 100,000 gallons. 		

117.	3-9	39-40	FWS	<p>This statement implies that sea ice decline has leveled off recently, when the reality is that the long-term trend is still clear and last year's ice extent is likely only the result of inter-annual variation (which is expected with the long-term decline). We recommend not using a single year to say that ice extent has risen from lows of the past decade. The Arctic Ocean is on track this summer to see conditions on par with 2012 (or worse). We recommend removing or clarifying this sentence.</p> <p>Citation: "All about Sea Ice." National Snow & Ice Data Center. Accessed 7 August 2019.</p> <p>IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.</p>		
118.	Abstract	Line 33	FWS	<p>"(...including marine protected areas, water bodies eligible for designation as Wild and Scenic Rivers..." should be changed to "...including marine protected areas, water bodies eligible and suitable for designation as Wild and Scenic Rivers..."</p>		
119.	B-12	23	FWS	<p>The document provides an example of an additional water source that could be used by industry to construct ice roads that is prohibited by ROP 8 for Alternative B (without authorization). Please delete "...and pools along rivers that do not freeze to the bottom in winter ..." as this language is inconsistent with ROP 8 which states: Withdrawal of unfrozen water from springs, rivers and streams during winter is prohibited.</p>		
120.	B-25	Table B-5	FWS	<p>Line 25 on pg. B-24 estimated 280-300 acres of surface development for gravel mines and it is not included for any of the alternatives in Table B-5</p>		

121.	D-1		FWS	The requirements of The Wilderness Act and The Wild and Scenic River Act should be included in Appendix D.		
122.	D-3	36	FWS	We recommend editing Under the National Wildlife Refuge System Administration Act, "each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established."		
123.	E-19	17-21	FWS	With the rapid rate of change and impacts observed in recent years, a more thorough discussion is warranted. Winter rain events that result in ice crust on snow have impacted multiple ungulate species in recent years, including migration impacts to preferred areas such as calving grounds by caribou and forage availability for caribou and other ungulates. Changes to habitat that result from flow alteration, wetland drainage or impounding, and thermokarst, along with displacement due to infrastructure and associated fragmentation of habitat will have cumulative impacts to be considered. Including stipulations to avoiding core calving area is recommended across all Alternatives to protect the calving grounds.		
124.	E-6	15-27	FWS	The Section 810 analysis identifies potential impacts to caribou including aircraft traffic and displacement of maternal caribou during calving, as well as habitat loss associated with thermokarst, flow alteration, and impoundments. Alternative B, as well as other alternatives, propose mitigation measures to minimize impacts, however, it is acknowledged that displacement of maternal caribou during calving will not be mitigated. With the potential to impact recruitment and potentially the viability of the population, adoption of measures to prevent the displacement of caribou from portions of the core calving area is a viable mitigation measure.		

125.	E-6	33-35	FWS	The Section 810 analysis mentions caribou foraging within the total footprint of a CPF. We recommend the FEIS indicate if subsistence hunters will be allowed to discharge firearms within the vicinity of a CPF, and if not in the immediate vicinity, within what proximity and how this will be regulated.		
126.	E-8	14-28	FWS	The Section 810 analysis identifies studies and discusses potential impacts to caribou calf survival and recruitment, and acknowledges that less or no surface development would result in less, negligible, or no displacement that ultimately affects recruitment. Impacts to the caribou population and associated subsistence use should be carefully evaluated and provided sufficient protection to ensure consistency with Refuge purposes.		
127.	E-9	10-14	FWS	The Section 810 analysis discusses future development under Alternative B and displacement of caribou, stating, "It is not likely that widespread displacement would occur under Alternative B", but given that development could occur in high value calving habitat, displacement could occur. Displacement from high-value calving habitat over time could have significant population impacts and the potential for this to occur can compromise refuge purposes.		
128.	ES-6	Table ES-3	FWS	Line 25 on pg. B-24 estimated 280-300 acres of surface development for gravel mines and it is not included for any of the alternatives in Table B-5		
129.	F-37	Lines 2-3	FWS	It is unclear why protections required by the WSR Act be managed under BLM Manual 6400, and not the USFWS Interim Management Prescriptions identified in the Refuge CCP, until Congress makes a decision regarding WSR designation into the NWSRS. The Tax Act specifies that BLM will manage the leasing program, but FWS will continue to manage lands and waters of the Refuge.		
130.	Map 3-36		FWS	First map panel: area covered by LS 7 is incorrectly drawn.		

131.	Pages 2-5 2-7 Maps 2-2 2-4 2-6 2-8	LS 1 LS 3	FWS	<p>Regarding lease stipulations 1 (Rivers and streams) and 3 (Springs/aufeis): While the river setbacks are minimal in Alternative B, they do provide some protection for the rivers that support overwintering fish (Canning, Sadlerochit, Hulahula, and Aichilik).</p> <p>However, in lease stipulation 3, for Alternatives B and C, there is simply a general guideline indicating that springs should not be disturbed with no mention of any specific springs. We recommend specifically identifying the major springs with a consultation process specified to establish specific setbacks identified for the springs and the aufeis fields they create, along with the reasons the springs are critical habitats in each of the alternatives. The recommended language is as follows:</p> <p>a. No leasing and no new non-subsistence infrastructure would be permitted adjacent to or above Sadlerochit Spring (04N031E) nor below the spring to where it enters the Sadlerochit River and along the aufeis formation (04N031E and 05N031E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. This spring supports an isolated, dwarf population of Dolly Varden, unique plant and invertebrate communities, and an extensive aufeis field that persists through much of the summer, providing insect relief habitat for caribou.</p> <p>b. No leasing would be permitted adjacent to or above the perennial spring at Fish Hole 1 on the Hulahula River (05N032E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. Further, no new non-subsistence infrastructure would be permitted</p>		
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				<p>adjacent to the perennial spring at Fish Hole I on the Hulahula River (05N032E), per Lease Stipulation I, nor adjacent to the aufeis field (05N032E and 06N032E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis. The Fish Hole I spring provides overwintering habitat for arctic grayling and a large population of anadromous Dolly Varden. Residents of Kaktovik routinely harvest Dolly Varden in Fish Hole I during winter. The spring produces an extensive aufeis field that persists through much of the summer.</p> <p>c. No leasing would be permitted adjacent to or above the perennial Tamayariak Spring, and no new non-subsistence infrastructure would be permitted adjacent to the associated aufeis field (07N026E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis.</p> <p>d. No leasing would be permitted adjacent to or above the perennial Okerokavik Spring (04N036E), and no new non-subsistence infrastructure would be permitted adjacent to the associated aufeis field in the Jago River drainage (05N035E and 05N036E) without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and subsurface groundwater and aufeis.</p> <p>e. NSO adjacent to the eastern bank of the Canning River, including through the delta without coordination between the Service Refuge Manager and the BLM Authorizing Officer to identify a sufficient buffer adequate to protect spring and</p>		
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				<p>subsurface groundwater and aufeis. The Canning River is the largest river crossing the Coastal Plain. It has several perennial springs originating upstream of the Coastal Plain that provide steady flow under ice across the Coastal Plain. The river supports several fish species, including arctic grayling and a large population of anadromous Dolly Varden. Aufeis fills the river corridor across the Coastal Plain and extends well into the delta, providing insect relief to caribou during the early summer. The inclusion of these details in all alternatives is necessary to adequately protect these important habitats, particularly Sadlerochit Spring, which originates on a bench just to the west of the Sadlerochit River and flows downstream, outside of the 0.5 mile setback prescribed for the Sadlerochit River, to the Iteklyariak River and eventually to the Sadlerochit River many miles downstream. Protection for the Sadlerochit Spring, its isolated population of dwarf Dolly Varden, unique plant and invertebrate communities, and its large aufeis field downstream, is essential in all alternatives to ensure compatibility with Refuge purposes.</p>		
132.	S-187	495	FWS	<p>All information pertaining to biological resources of the Refuge should be shared with FWS. We request it be stated which types of data will be released to the public and which types may be considered proprietary or with limited distribution. We recommends that a data management plan be developed in order to ensure that scientific and management information is properly collected, stored, and maintained so that this information may be easily accessed and shared to advance biological and social science research and Arctic Refuge management information needs.</p>		

133.	S-227	45	FWS	The conclusion of no impact to subsistence users other than Kaktovik residents is of concern, given the substantial potential for alteration of caribou behavior and/or abundance and the unknown effectiveness in this situation of mitigation measures developed elsewhere.		
134.	2-41	ROP 43	FWS	<p>The FWS recommends minor revisions to the Requirement/Standards to add clarity and identify primary mechanisms for the introduction of invasive species:</p> <ul style="list-style-type: none"> a. Certify that all equipment, supplies (e.g., gravel, lumber, erosion control material), and vehicles (including helicopters, planes, boats, off-road vehicles, trucks, tracked vehicles and barges) intended for use either off- or on-roads are free of invasive species before transiting into the Coastal Plain. b. Survey annually along roads, drilling platforms, and barge access points for invasive species and begin effective eradication measures on evidence of their introduction. c. Before beginning operations into the Coastal Plain, submit a plan, for BLM and FWS approval, detailing the methods for: 1) cleaning equipment, supplies, and vehicles, including off-site disposal of cleaning fluids or materials and detected organisms, 2) early detection surveys, and eradication response measures (including post treatment monitoring) for all invasive species, noxious plants and animals, and weeds. 		
135.	3-91	16	FWS	The statement that eradication efforts of Elodea are cost prohibitive and not effective is not consistent with our experience. The FWS and partners have effectively surveyed for and eradicated Elodea in other remote areas of Alaska, including Totchaket Slough, Kenai Peninsula waterbodies and are now treating remote lakes in the Susitna Valley.		

136.	Ch 3		FWS	The EIS lacks discussion about the potential impacts of non-plant invasive species, including rodents and invertebrates. With the barging activity and transportation of building materials, we believe the potential of an introduction of rodents or invertebrates remains a threat should be described in the EIS. If BLM has information to indicate that probability is low, we request such information be provided in the EIS.		
137.	F-20 F-21 F-24		FWS	The EIS identifies invasive species as a type of impact that may occur, but fails to identify Impact Indicators and to evaluate the impacts in the Environmental Consequences chapters.		
138.	P-8	33	FWS	The ROP identified for invasive species is ROP 43, not 44 in the current draft of the EIS.		
139.	F-24		FWS	Appendix F (e.g., F.4.13 Fish and Aquatic Species) identifies Invasive invertebrate and fish species introduced from released ballast water as a potential impact, but no Impact Indicators identified and no subsequent analyses of impacts is present in the EIS.		
140.	3-137	1-8	USGS for FWS	It would be useful if this section mentioned that Barboza et al. (2018) recently found that forage nitrogen is higher on the coastal plain than in the foothills or mountains, which is likely a key reason that caribou migrate to the coast during early summer. Additionally, forage nitrogen on the coastal plain is maximized during peak lactation (during the post-calving season; Johnson et al. 2018) when the nutritional demands of female caribou are highest (Parker et al. 1990), coinciding with the greatest concentration of PCH on the coastal plain (Map 3-31).		

141.	3-139	35-57	USGS for FWS	The EIS correctly reports that some portion of the CAH herd uses the 1002 program area during the insect season, but does not clarify that this is the only portion of the CAH's coastal insect relief habitat without development (see comments below about depicting the footprint of energy development within the CAH range on maps in Appendix A, as they currently only show the Dalton Highway).		
142.	3-142	5-10	USGS for FWS	Given that forage protein for caribou on the North Slope already appears to be limiting (Barboza et al. 2018), declines in forage nitrogen due to earlier phenology could be of concern. It would be useful if the "climate change" section of the EIS more clearly discussed these points.		
143.	3-142	22-23	USGS for FWS	It is unclear from this statement <i>how</i> PCH demographic parameters are influenced by freezing rain, seasonal temperatures and snow depth.		
144.	3-147	2-6	USGS for FWS	It is important to adequately review the findings of Johnson and Russell (2014) as they explicitly assess the long-term responses of PCH to development on their winter range. Currently, this section of the text is confusing and unclear, as the Zone Of Influence (ZOI) is not defined until a later paragraph (line 15) and there is no information describing how caribou responses changed over time (i.e., habituation). Instead, all that is provided are the recent ZOI distances. While it is stated that these are larger than those reported for CAH, the specific distances for CAH are not provided, so the comparison for readers is unclear.		
145.	3-147	35	USGS for FWS	It appears that this sentence is intended to reference Map 3-28 or 3-31 instead of 3-35, which is a map of post-calving group movements.		
146.	3-148	42-43	USGS for FWS	A specific citation could be provided for this statement.		
147.	3-148	42-45	USGS for FWS	These statements cite an analysis in a draft ABR report to Exxon Mobile as justification (Prichard et al. 2018). Is this report available to the public? If not, then the data should be presented in the FEIS.		

148.	3-147 3-159		USGS for FWS	Prichard et al. (In Review) is cited multiple times, with extensive text about the results of this unpublished analysis. What are the standards for citations for EIS documents? Do citations need to be available to the public?		
149.	3-152	21-24	USGS for FWS	While impacts to PCH are stated in terms of acres of habitat affected by the different development scenarios, the impacts to CAH are stated in terms of the percent of the population estimated to be contained within the developed area. This calculation is problematic, as the acreage does not clearly equate to a proportion of the CAH population, given the high movement capacity of caribou and high annual variation in habitat selection. Calculations of acres of habitat that will likely be impacted by development are easier to interpret and more defensible. This comment applies to all Alternatives.		

150.	3-153 3-155	35 32	USGS for FWS	<p>The text states that “caribou are generally able to navigate these structures, especially following habituation” and cites Cronin et al. 1994, Murphy and Lawhead 2000, and Lawhead et al. 2006, none of which demonstrate that caribou habituate to development. Cronin et al. (1994) is a synthesis that includes an appendix with a detailed literature review on habituation in ungulates. It states that “Evidence for habituation to anthropogenic stimuli by the CAH in and around the oil fields is fragmentary and anecdotal”. Murphy and Lawhead (2000) is a book chapter with a section on habituation that says, “Despite the importance of this issue, empirical evidence documenting habituation generally is lacking”. The chapter goes to say that “The CAH experience indicates that female caribou with newborn calves are not likely to habituate to oil-field activity and infrastructure”. Lawhead et al. (2006) writes that “Quantitative comparisons have not been conducted to compare the current reaction of CAH caribou with those recorded in the early 1980s. Habituation to human structure and activities likely depends on the perception of threat by caribou, and there is no evidence to suggest that maternal cows have habituated to vehicles when their calves are less than ~3 weeks old (Lawhead et al. 2004). This lack of habituation to predator-like stimuli is reasonable in an evolutionary context because animals that habituate to such stimuli are likely to have lower survival.” Thus, here and throughout the text on caribou, statements about habituation (and the literature on this subject) appear incorrect and misleading.</p>		
151.	3-157	23	USGS for FWS	<p>This citation (Murphy et al. 2000) is a theoretical modeling exercise, and does not actually quantify the influence of development on caribou demography, which is unclear in the text.</p>		

152.	3-157	26-27	USGS for FWS	Again, it is assumed that habituation will occur, despite evidence to the contrary (see previous comments for page 3-153).		
153.	3-158	4	USGS for FWS	Quantifying the impact of development on caribou populations is also difficult because it requires assumptions about how changes in caribou distributions and behavior influence specific demographic rates, which is largely unknown.		
154.	3-158	3-24	USGS for FWS	It would be highly beneficial to describe the analysis from Griffith et al. (2002) in detail, as this is one of the key attempts that has been made to quantify the potential demographic response of PCH to development within the 1002 Area. The analysis is cited (in line 4), but not described, while Russell and Gunn (2019) is described in detail.		
155.	3-159	32-40	USGS for FWS	This paragraph discusses the challenge of predicting demographic impacts to caribou with increased infrastructure. It would be useful to more clearly detail the information required to adequately assess these impacts (e.g., quantifying the influence of development on caribou foraging rates and energy expenditure, the relationship between caribou foraging rates and body condition, etc.).		
156.	Maps (all) related to caribou		USGS for FWS	It is unclear to readers the extent of energy development within the CAH range and the juxtaposition to the 1002 Area. The only infrastructure shown on these maps (i.e., 3-32 and 3-33) is the Dalton Highway, which is not the full extent of infrastructure within the CAH range. The 1002 Program Area is the only coastal habitat (insect-relief habitat) within the summer range of CAH that is currently devoid of any infrastructure, but that cannot be assessed from the maps.		

157.	Map 3-32		USGS for FWS	Please state the number of years of telemetry data that were used to produce this figure. Can you make congruent figures between PCH and CAH (i.e., analyses were conducted for separate years for PCH, but appear to be lumped together for CAH, why the difference?). Page 3-140, lines 1-3, discuss annual variation in CAH use of the program area, but this cannot be assessed from this map.		
158.	E-3 thru E-15	General	USGS for FWS	The text in the caribou sections of Appendix E: ANILCA Section 810 Final Evaluation is poorly supported (there are few citations to support statements), and often contradictory to information provided in Chapter 3 (Affected Environment and Environmental Consequences), particularly related to the potential impacts of development on caribou behavior.		
159.	E-6	28-32	USGS for FWS	This section suggests that caribou forage will only be reduced on 2000 acres, and states that displacement will not be widespread. These statements are in opposition to the text in Chapter 3 (Affected Environment and Environmental Consequences) which discusses large displacement distances of caribou (with relevant citations) and uses a 2.49 mi buffer to quantify impacts (which, based on the literature, should be considered a minimum distance that caribou behavior is influenced by development).		
160.	E-7	5-10	USGS for FWS	As described in Chapter 3, caribou avoidance of roads can occur even at low levels of traffic (<15 vehicles/hour) which is demonstrated in the literature that is cited (Curatolo and Murphy 1986, Cronin et al. 1994, etc.). This text implies that impacts have only been estimated for traffic levels >15 vehicles/hour.		

161.	E-7	14	USGS for FWS	This sentence assumes caribou will habituate to development over time, but literature on CAH suggests that habituation has not occurred (Haskell and Ballard 2008, Cronin et al. 1994, Murphy and Lawhead 2000 and Lawhead et al. 2006), and research on other herds suggests that habituation may be weak if it does occur (Boulanger et al. 2012, Johnson and Russell 2014). Page E-7, lines 15-17: The suite of potential impacts to caribou described in Chapter 3 are not referenced or discussed in this section, but appear to be discounted.		
162.	E-7	23-24	USGS for FWS	Little is known about the influence of air traffic, as a disturbance type, on caribou behavior, yet these statements imply that it is the disturbance type of greatest concern with energy development within the 1002 Area.		
163.	E-8	4	USGS for FWS	What evidence is there that aircraft operating procedures within the NPRA are successful at reducing impacts? Most complaints about aircraft and caribou come from activity within the NPRA (as discussed in this analysis).		
164.	E-8	15	USGS for FWS	Caribou are likely to avoid development during the calving period by 2.49 mi or greater, based on studies of PCH, CAH and other herds (Cameron et al. 2005, Boulanger et al. 2012, Johnson and Russell 2014, Plante et al. 2018). If hunting is permitted from roads, the area of avoidance is likely to be larger (Plante et al. 2018).		
165.	E-8	33-34	USGS for FWS	The EIS states that “research has demonstrated that TLs (timing limitations) effectively mitigate the majority of impacts to caribou”. It would helpful to provide the supporting evidence (citations) for this statement.		
166.	E-9	13-14	USGS for FWS	This statement does not acknowledge or discuss the impacts to caribou presented in Chapter 3.		

167.	E-9	37-38, elsewhere	USGS for FWS	These statements cite unpublished literature reviews rather than the original peer-reviewed literature quantifying these effects (i.e., Cameron et al. 1992).		
168.	E-9	39-41	USGS for FWS	These statements are counter to published literature on PCH (Griffith et al. 2002, Russell and Gunn 2019).		