

**Final Regional Mitigation Strategy
for Northeastern NPR-A
August 2018**

TABLE OF CONTENTS

1. INTRODUCTION	2
Purpose of the Regional Mitigation Strategy (RMS) for the Northeastern National Petroleum Reserve in Alaska (NPR-A)	2
2. MITIGATION.....	3
Mitigation in the NPR-A.....	4
Mitigation on the North Slope	7
Regional Mitigation Strategies	7
NPR-A RMS Goals and Objectives.....	7
Stakeholder Involvement	8
3. RMS ELEMENTS: FUTURE DEVELOPMENT IMPACTS AND POTENTIAL MITIGATION.....	9
Future Oil and Gas Development	9
Primary Sources of Oil and Gas Development Impacts	9
Expected Impacts of Oil and Gas Development in the NPR-A	9
Effects of Oil and Gas Development on the Physical and Biological Environments	10
Effects of Oil and Gas Development on Social Systems	12
Mitigation Actions that Could Address Impacts.....	13
4. IMPLEMENTATION.....	19
How the RMS Will be Used by BLM.....	19
5. REFERENCES	20
6. GLOSSARY	21
 <u>APPENDICES</u>	
APPENDIX A: INTEGRATED ACTIVITY PLAN (IAP) LEASE STIPULATIONS AND BEST MANAGEMENT PRACTICES.....	25
APPENDIX B: MITIGATION PROGRAMS ADMINISTERED BY ENTITIES OTHER THAN THE BLM AND POTENTIALLY APPLICABLE IN THE NPR-A.....	65
APPENDIX C: ECOLOGICAL RESOURCES, CONDITIONS, AND TRENDS.....	69
APPENDIX D: SUBSISTENCE AND SOCIO-CULTURAL RESOURCES, CONDITIONS, AND TRENDS	91
APPENDIX E: POTENTIAL TYPES OF IMPACTS OF OIL AND GAS DEVELOPMENT IN NPR-A.....	99

NOTATION

ANCSA	Alaska Native Claims Settlement Act
AO	Authorized Officer
APD	Application for Permit to Drill
ASDP	Alpine Satellite Development Facility
BLM	Bureau of Land Management
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CPAI	ConocoPhillips Alaska Inc.
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act
FSEIS	Final Supplemental Environmental Impact Statement
GMT1	Greater Mooses Tooth 1
IAP	Integrated Activity Plan
LUP	Land Use Plan
MLA	Mineral Leasing Act
NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve in Alaska
NPRPA	Naval Petroleum Reserves Production Act
NSB	North Slope Borough
NSO	No Surface Occupancy
REA	Rapid Ecoregional Assessment
RMS	Regional Mitigation Strategy for the Northeastern National Petroleum Reserve in Alaska
ROD	Record of Decision
ROW	Right-of-Way
SEIS	Supplemental Environmental Impact Statement
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey

1. INTRODUCTION

Purpose of the Regional Mitigation Strategy (RMS) for the Northeastern National Petroleum Reserve in Alaska (NPR-A)

The National Petroleum Reserve in Alaska (NPR-A) Regional Mitigation Strategy (RMS) fulfills the requirements set forth in the Record of Decision (ROD) for the Greater Mooses Tooth 1 (GMT1) Development Project (see pages 38-41 of the GMT1 ROD). Specifically, Supplemental Best Management Practice 1--*Establishment of Compensatory Mitigation Fund and Regional Mitigation Strategy* directed the Bureau of Land Management (BLM) to prepare a Regional Mitigation Strategy to serve as a roadmap for mitigating impacts from GMT1 and future projects enabled or assisted by the existence of GMT1. The specific residual impacts of the GMT1 project that were identified include impacts to subsistence use resulting from the construction of a road within the Fish Creek and Tiŋmiaqsiġvik (Ublutuooh) River setbacks.

This RMS has been created to help the BLM manage the Northeastern NPR-A in a manner consistent with public law, and to fulfill the requirements of the National Environmental Policy Act (NEPA). The mission of the BLM is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations. To do this, the BLM manages public lands to maximize opportunities for commercial, recreational, and conservation activities. This promotes healthy and productive public lands that create jobs in local communities while supporting land uses such as responsible energy development, and hunting and fishing.

The Naval Petroleum Reserves Production Act of 1976, Public Law 96-514 (Dec 12, 1980), directs the BLM to:

... affect an expeditious program of competitive leasing of oil and gas in the National Petroleum Reserve in Alaska, ... Provided, That (1) activities undertaken ... shall include or provide for such conditions, restrictions, and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable and significantly adverse effects on the surface resources of the National Petroleum Reserve in Alaska (the Reserve)...

This RMS is an effort by the BLM to describe in one place current and potential future mitigation actions or opportunities that should be considered when approving an application for development. Appendix A presents the existing suite of Best Management Practices and lease stipulations that are applicable to surface management of oil and gas and other activities in the NPR-A. Appendix B provides a description of the benefits of other mitigation activities/actions not under the authority of the BLM that have been applied to various development projects on the North Slope. The RMS also contains detailed information regarding ecological and social resources, conditions and trends found in Appendices C and D, as well as information regarding impacts to resources from oil and gas development based on past research, environmental analysis, and stakeholder input found in Appendix E.

The overall goal of the NPR-A RMS is to facilitate the expeditious development of oil and gas resources, while mitigating reasonably foreseeable and significantly adverse effects on the surface resources of the NPR-A (94 STAT. 2964). The purpose of this strategy is to introduce the concept of mitigation to potential permittees and developers who intend to lease lands or operate in the NPR-A and on the North Slope in general, present the BLM's existing mitigation requirements, and introduce a wide range of mitigation options that can be used to address impacts to natural and social resources that could result from future development projects in the NPR-A.

The NPR-A RMS is not a decision document, nor does the BLM have a regulatory program or guidance requiring the use of compensatory mitigation. While under NEPA guidance compensatory mitigation is part of the mitigation hierarchy, and therefore explained within this document, it is only a requirement by law pursuant to the Clean Water Act administered by the Environmental Protection Agency and the US Army Corps of Engineers.

2. MITIGATION

The White House Council on Environmental Quality (CEQ) has defined mitigation in its regulations at 40 CFR 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing or eliminating impacts over time, and compensating for remaining residual effects.

Mitigation can include (40 CFR 1508.20):

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impact by limiting the degree of magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitation, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Collectively, the five aspects of mitigation (avoid, minimize, rectify, reduce/eliminate, compensate) are referred to as the mitigation hierarchy, because the levels are applied in order starting from the first to the last. In an EIS, all "relevant, reasonable mitigation measures that could improve the project are to be identified," even if they are outside the jurisdiction of the agency (40 CFR 1502.16(h), 1505.2(c)). This will serve to [46 FR 18032] alert agencies or officials who can implement these extra measures, and will encourage them to do so. According to the CEQ, because the EIS is the most comprehensive environmental document, it should include not only the full range of environmental impacts but also the full spectrum of appropriate mitigation.

The purpose of mitigating adverse impacts is to allow for development to occur while maintaining a healthy and productive natural environment. An assessment of the potential impacts of any proposed use of Federal land is required under NEPA, and those impacts are

taken into consideration in the decision to approve (or deny) the proposed activity. The potential impacts of a particular land-use activity vary according to the nature of the activity, the place it occurs, and the time period over which it occurs. Additionally, the Federal Land Policy and Management Act (FLPMA) requires the BLM to maintain the quality of the environment and the long-term productivity of the land while providing for its use. This is accomplished by allowing some land-uses to occur with mitigation designed to avoid, minimize, rectify, reduce or eliminate potential impacts, and, under some circumstances, to compensate for the residual impacts.

As part of the impact analysis, the BLM is required to analyze the impacts of the proposed action (including design features) and any mitigation measures applied, as well describe any further impacts caused by the mitigation measures themselves. The anticipated effectiveness of the mitigation measures in reducing or avoiding adverse impacts must be described in the analysis. Finally, the residual effects of any adverse impacts that remain after mitigation measures have been applied must be described. Residual impacts are those impacts that remain after all reasonable efforts are made to avoid, minimize, rectify, and reduce or eliminate impacts over time. Mitigation stipulations, which may include any combination of elements from the mitigation hierarchy, are unique for each approved development project, and are specified as a part of the decision that follows NEPA analysis.

Mitigation in the NPR-A

The mission of the BLM is to manage the public lands in a manner that best meets the current and future needs of the American people for the full array of natural resources found therein, and in a manner that is sustainable (where possible), and that maintains the quality of the environment and the productivity of the land. Potential mitigation for likely land-uses within a region administered by the BLM generally are identified ahead of time in land use plans, programmatic level analysis, or resource use plans. These plans will often designate areas where certain uses could occur (with stipulations), and other areas where they would not be permitted to occur. By designating these areas, the land-use plan decision itself is an example of an action taken to *avoid* potential impacts, the first step in the mitigation hierarchy. Land-use and resource use plans also often contain lists of potential measures designed to *minimize, rectify, and reduce or eliminate* impacts commonly associated with the activities that are likely to occur in the region covered by the plan. These can include seasonal restrictions, design features, and best management practices.

The BLM is obligated by law to provide for the development of oil and gas resources in the NPR-A while mitigating any significant associated adverse impacts. The BLM's management of the NPR-A is guided by the Integrated Activity Plan (IAP) ROD (BLM 2013). The plan made more than half of the land in the NPR-A (11.8 million acres) available for oil and gas leasing. The remaining land (11 million acres) is not open to leasing, in order to protect important ecological systems, including those that support the traditional practices of the resident Iñupiat people. Designating these areas in the IAP as not open to leasing is an application of the *avoidance* element of the mitigation hierarchy.

The IAP ROD also specifies best management practices (BMPs) that must be implemented to minimize impacts from activities that may occur in the NPR-A (Appendix A). The BMPs

consist of a full-suite of overarching protective measures that were derived from the environmental impact analysis that accompanied the IAP, and represent the best available mitigation ideas based on parameters of the selected alternative. Because the IAP covers the entirety of the 22.8 million acre reserve, the mitigation contained within the ROD is primarily general in terms of its application to lands or activities, and not site- or project-specific. Many of the BMPs address the first two levels of the mitigation hierarchy—avoidance and minimization. Individual development projects that have the potential to result in significant impacts must also be analyzed under NEPA, and will contain site- or project-specific mitigation based on the unique parameters or location of the project.

Several of the existing IAP BMPs that are applicable to a development project are examples of the *minimization* and *rectifying* elements of the mitigation hierarchy. In general, development BMPs specify measures that could be applied anywhere, such as the requirement to build pipelines at least 7 feet above the ground surface in order to minimize impacts to migrating caribou. Similarly, the requirement that a project proponent develop and implement an abandonment and reclamation plan that leads to the objective of returning the land to its previous condition serves to potentially rectify the impact of infrastructure on the landscape after the life of the development has concluded.

In February 2015, after conducting required additional NEPA analysis on an application from Conoco-Phillips Alaska, Inc. (CPAI), a ROD was issued by the BLM that authorized CPAI to construct the GMT1 oil development facility on BLM-managed lands in the Northeastern NPR-A. The mitigation specified in the ROD included supplemental BMPs to be executed on-site, and compensatory mitigation designed to offset residual impacts to the natural environment of the Fish Creek and Tiġmiasigvik (Ublutuooh) River setbacks and the cultural practices of the Iñupiat people that would be potentially affected by the GMT1 development.

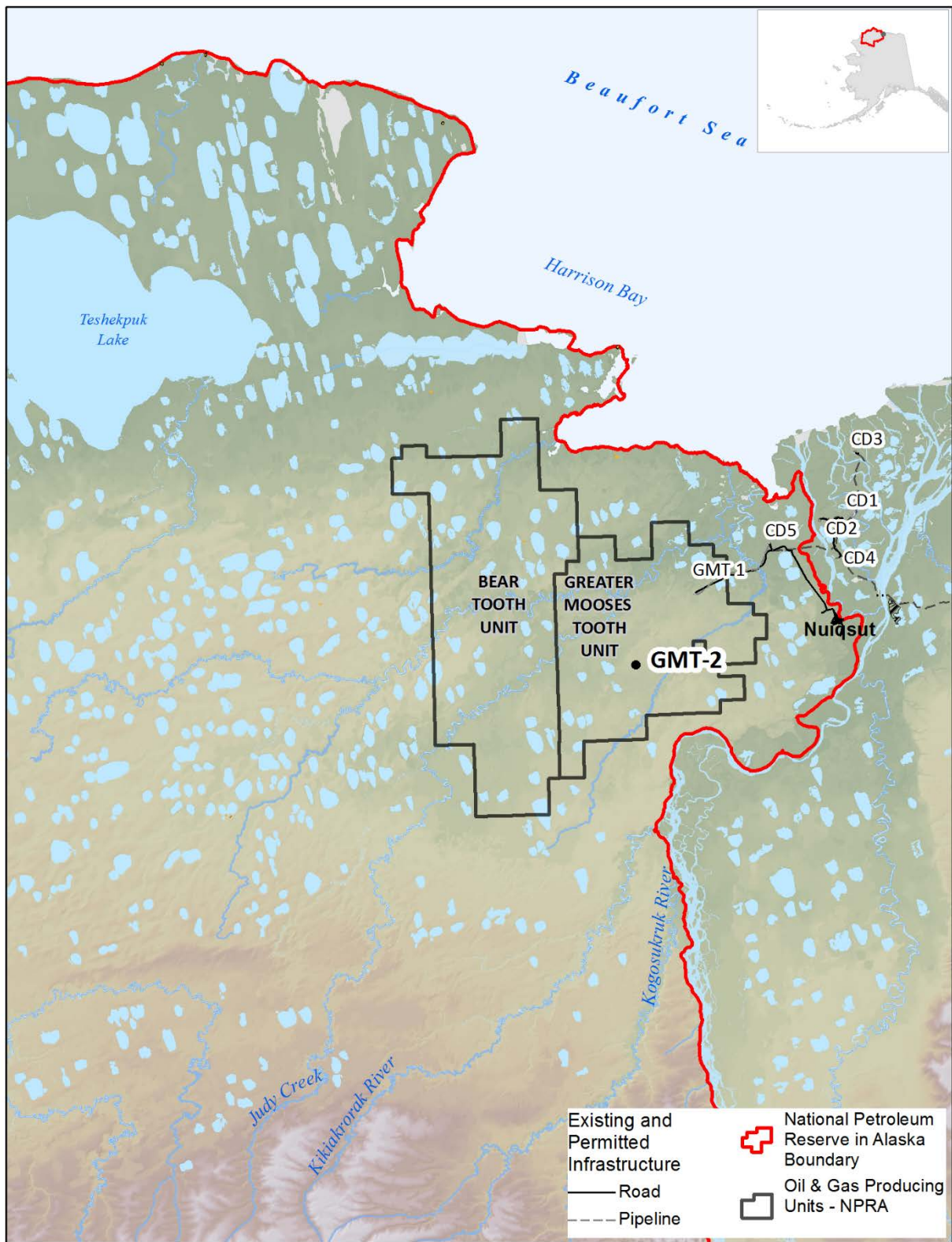


Figure 1-1 The Northeastern NPR-A

Mitigation on the North Slope

The BLM is not the only permitting agency that uses the concept of mitigation to reduce adverse impacts that result from development projects on the North Slope. There are many other Federal laws that require the agency responsible for carrying out the legislation to apply mitigation, and many of the processes used to derive the applicable mitigation are defined by regulation. In addition, state and local government entities with land management responsibilities frequently require mitigation allowed under state and municipal code to address negative effects resulting from development projects. Finally, private land owners, such as Alaska Native Corporations or allotment owners, will commonly enter into surface use agreements that contractually specify terms and conditions under which the land can be developed. As corporate entities that are also responsible for ensuring the self-sufficiency, cultural heritage and economic growth of the people they represent, Alaska Native Corporations frequently include measures that are comparable to mitigation within these surface use agreements.

Appendix B describes other mitigation activities/actions not under the authority of the BLM that have been applied to various development projects on the North Slope. During the process of developing the RMS, multiple stakeholders expressed the need for improved coordination between the entities managing these programs in order to avoid duplication and to better leverage mitigation actions. Stakeholders have also suggested that the potential exists to better leverage mitigation efforts across all mitigation programs.

Regional Mitigation Strategies

A RMS identifies potential opportunities to mitigate impacts of human activities on public lands in a region, based on projected activities, and ahead of any NEPA analysis of specific development projects. Developing a RMS ahead of proposed development allows for BLM and stakeholders to collaborate methodically in identifying all types of mitigation actions in the mitigation hierarchy that address anticipated impacts, and could be efficiently and effectively implemented, paying particular attention to actions that present opportunities for leveraging available resources. A RMS is strategy and is not a decision document. A RMS does identify potential mitigation actions and/or locations but it does not require mitigation. Instead, it is a document that can be used by the BLM or by other entities, including Federal or state agencies with regulatory authority, or private landowners entering into contractual agreement with developers, on potentially applicable actions or requirements that can be taken to mitigate adverse impacts from a particular project. In this way, it potentially serves as a strategy document in applying overall mitigation to a project by all relevant parties, and can assist with ensuring that mitigation requirements are not duplicative, overly onerous, and appropriate to address the identified impact.

NPR-A RMS Goals and Objectives

The GMT1 ROD specified that a RMS be developed for the Northeastern NPR-A to guide mitigation on future projects proposed in the region. The Northeastern NPR-A includes approximately the area between the Colville River on the east, the Chipp and Ikpiuk rivers on

the west, the Beaufort Sea on the north, and the boundary between the coastal plain and foothills on the south .

The region is home to the Iñupiat people, and contains a rich array of natural and cultural resources. The human and natural systems in place are strongly coupled, as most of the resident Iñupiat people practice a subsistence lifestyle, obtaining a majority of their food from the natural environment. Very few surface disturbing activities have occurred in the region, leaving the ecosystems largely intact.

The overall goal of the RMS is to facilitate the expeditious development of oil and gas resources, while mitigating reasonably foreseeable and significantly adverse effects on the surface resources of the NPR-A (94 STAT. 2964).

The following mitigation objectives were derived from input from regional and local stakeholders on values that need to be protected as oil and gas development is allowed to occur. These objectives serve as the guiding principles that all forms of mitigation should strive to achieve in the region.

- Sustain and enhance access to and use of traditional subsistence use areas.
- Sustain and enhance opportunities and rights for native peoples to live, practice, and pass on Iñupiaq culture and lifestyle.
- Sustain and enhance the functionality of the ecological system, including land, water, and landscapes that allow for sustainable populations of fish and wildlife and their natural movement and distribution.
- Sustain and enhance the health and safety of the residents.
- Sustain and enhance opportunities for economic and community development, such as job training and local contracting.

Stakeholder Involvement

The RMS was developed through a collaborative process involving a wide range of stakeholders, including people representing Alaska Natives, other Federal agencies, state and local governments, residents of the North Slope, industry, special interest groups, and other stakeholders who participated in workshops and/or submitted comments on draft documents.

3. RMS ELEMENTS: FUTURE DEVELOPMENT IMPACTS AND POTENTIAL MITIGATION

Future Oil and Gas Development

Oil and gas development is a function of many dynamic and interconnected variables, including the known locations and recoverable quantities of oil and gas, extraction and transportation technology, availability and/or feasibility of supporting infrastructure, environmental conditions and trends, and demand for oil and gas, among others. The dynamic nature of oil and gas development on the North Slope makes it difficult to project when, where, and to what extent development might occur. Therefore, the RMS does not attempt to do so. Rather, it focuses on resources and ecosystems that would most likely be adversely and unavoidably impacted by development in any location within the Northeastern NPR-A.

Primary Sources of Oil and Gas Development Impacts

Primary sources of impact associated with oil and gas development in the Arctic region include the construction, operation, and decommissioning of infrastructure, including roads, processing facilities, wells, well pads, pipelines, airstrips, bridges, communication towers, etc.; activities associated with the various phases of development (exploration, construction, operations, and decommissioning), including human activity, drilling, pumping and storage, operation of vehicles, aircraft, vessels, etc.; and effects from emissions (such as air pollution and dust), waste disposal (such as produced water, lubricants, and garbage), and spills and releases of oil or other hazardous materials.

Expected Impacts of Oil and Gas Development in the NPR-A

The IAP EIS (BLM 2012) and the GMT1 SEIS (BLM 2014) identified various potential impacts from oil and gas development in the NPR-A, including effects on:

- The **physical environment**, including air quality, surface and groundwater resources and water quality, soils resources, and paleontological resources.
- The **biological environment**, including birds, fish, terrestrial and marine mammals, vegetation, and special status species.
- **Social systems** and related resources, including socio-cultural systems, subsistence, environmental justice, public health, cultural resources, visual resources, recreation, wild and scenic rivers, and wilderness characteristics.

The mechanisms by which infrastructure, activities, and emissions associated with oil and gas development cause impacts on physical, biological, and social systems are varied and complex. Typically, a given impact source will have multiple effects across resources. For example, infrastructure development effects on biological systems include, but are not limited to, direct and indirect habitat destruction or alteration; changes to species distribution; disturbance; displacement; interference with movement/migration; mortality and health effects. These effects

may occur directly (e.g., bird mortality by collisions with structures) or indirectly by interfering with a natural process, such as drainage patterns that affect water availability that in turn affects the health and survival of vegetation and animals. Infrastructure development and operation may also affect social systems, for example, when facility construction requires disturbance of a cultural resource site and simultaneously creates a visual impact on nearby villages.

The IAP and GMT1 EISs also identified beneficial impacts from development, most importantly positive economic impacts for the North Slope Borough, Arctic Slope Regional Corporation (ASRC) and other Alaska Native regional corporations, and for communities and shareholders. The substantial positive impacts of oil and gas development are recognized and noted, though they are not the focus of this strategy because the BLM does not apply mitigation to positive effects. Instead, the identification of positive effects contribute to understanding and weighing the overall impact of a particular project, and in the decision to apply appropriate and reasonable mitigation.

Effects of Oil and Gas Development on the Physical and Biological Environments

Oil and gas development will impact ecological systems, including air and water resources, plants, fish, birds, mammals, and other wildlife, including threatened and endangered species. Impacts include wildlife habitat fragmentation; loss or alteration of habitat; behavioral disturbance by anthropogenic activities resulting in short-term displacement; deflection or delay of movement; mortality; or altered survival or productivity.

- **Air Quality.** During construction, there could be short-term and transient emissions from fuel-burning equipment, drilling emissions, and fugitive dust sources. During operation, there could be ongoing and long-term emissions from heaters, vehicles, and other stationary and mobile sources; emissions from flaring; and fugitive dust.
- **Water Quality.** Long-term impacts on local water resources could result from the placement of new infrastructure, including changes in drainage patterns and changes in stream flow. There would be short-term, temporary impacts from ice infrastructure (e.g., roads and pads).
- **Vegetation.** Expected direct impacts on vegetation include removal as a result of the construction of oil and gas infrastructure, including construction of roads and pads and gravel mine development. There could also be indirect impacts from gravel, spray, and dust deposition near graveled surfaces. Areas of direct and indirect impacts could be within potential wetlands.
- **Fish.** Expected impacts on fish would include injury at water-use intakes, barriers to fish movement, and impacts associated with altered water quality, physical habitat changes (water quantity, flow patterns, and geomorphology), point and non-point source pollution, and increased turbidity and sedimentation. Collectively, these impacts could contribute to reduced success at different life history stages, behavioral changes, diminished

condition, susceptibility to pollutants or disease, shifts in fish species distribution, and mortality.

- **Birds.** Expected impacts on birds include mortality and impacts on bird behavior, and nesting, brood-rearing, foraging, and molting habitats through habitat loss and alteration, disturbance from noise and visual activity, displacement from habitats, or attraction to habitats altered by thermokarst and early green-up adjacent to gravel infrastructure. If climate change over the next several decades were to result in substantial changes in weather patterns, then changes to vegetation types and distribution, insect abundance and timing of emergence could occur, and habitat disturbance impacts from oil and gas activities could be exacerbated.
- **Mammals.** Expected impacts on mammals include:
 - Physical habitat changes; displacement from (or attraction to) altered habitats; disturbance from noise or activity; obstruction of movement from construction activities.
 - Collisions (mortality); disturbance and obstruction of movement from vehicles or air traffic; defense of life and property (mortality); increased hunting; premature den emergence (grizzly bear) associated with vehicle and aircraft traffic and human activity during drilling and operations phases.
 - Obstruction of movement by pipelines and spills or leaks causing exposure to toxic materials from pipelines during drilling and operations phases.
 - Possible avoidance by parturient female caribou of marginal calving habitat.
- **Threatened and Endangered Species.** Threatened and endangered species subject to impacts include polar bear, spectacled eider, and Steller's eider; however, there are no Steller's eider found within the area of impact, and therefore no impacts are expected.

Expected impacts on polar bears include denning habitat loss or alteration, disturbance or displacement of denning females and cubs, incidental harassment of polar bears transiting the project study area, intentional hazing near occupied work sites, and mortality due to collisions or defense-of-life kills. There could be cumulative impacts from climate change and other development, including near-shore or offshore oil and gas development.

Expected impacts on spectacled eiders include habitat loss and alteration, disturbance and displacement, obstruction of movement, mortality from various causes, and impacts from spills. There could be impacts on a *small number* of nesting, brood-rearing, and staging spectacled eiders. Impacts could result from habitat destruction and fragmentation, disturbance, vehicle and air traffic, spills of hazardous materials, including oil spills and mortality from collisions with human infrastructure or vehicles.

Positive impacts include the application of adaptive management based on increased understanding of specific wildlife populations due to required research prior to submitting an application for development, and monitoring activities once the development is in place.

Effects of Oil and Gas Development on Social Systems

Oil and gas development will impact subsistence activities, and other social and cultural values, including public health. In addition, there are environmental justice issues associated with oil and gas development in the northeastern NPR-A. The information provided below is derived from stakeholder outreach at the RMS workshops; and through the public, cooperating agency, and consultation processes associated with NEPA analyses in the NPR-A.

Potential impacts to subsistence activities include:

- **Loss of Traditional Use Areas.** In addition to the project's "footprint," (i.e., the acreage that is actually occupied by facility components), hunters are likely to avoid areas up to several miles away from the facilities.
- **Access to Subsistence Areas.** The presence of oil and gas infrastructure and associated facilities (e.g., roads) can limit subsistence users' access to subsistence areas.
- **Aircraft Disturbance.** The noise and visual disturbance associated with aircraft overflights can disturb animals and disrupt hunts when low-flying aircraft spook the animals.
- **Disruption of Migrating Subsistence Species.** Noise, traffic, odors, and infrastructure associated with oil and gas exploration, facility construction and operation, and decommissioning could affect the availability of key resources such as caribou, waterfowl, and furbearers.
- **Direct Damage to or Contamination of Subsistence Resources and Habitats.** Fish, waterfowl, and wildlife could be injured or killed, or avoid traditional harvest locations. Oil spills that enter water could contaminate or cause concerns about contamination of marine mammals and fish.

Oil and gas development has a variety of positive and negative social and cultural impacts. Positive impacts include increased employment opportunities and easier commuting and other travel-related social benefits associated with road development (including seasonal connection via ice road to the Dalton Highway). As noted above, some impacts are indirect effects related to oil and gas impacts on subsistence resources and activities; however, oil and gas development also has social and cultural impacts beyond subsistence.

- Anxiety and intra- and inter-community conflict over the bureaucratic and legal processes involved with permitting and development, and the distribution of economic benefits that derive from development.
- Oil and gas development increases contacts between Alaska Natives and non-Natives, such as non-resident workers. While there are positive aspects to the cultural interactions, negative aspects include, but are not limited to, the importation of alcohol into villages or lifestyles in conflict with traditional cultural values, which have negative social and health impacts.
- Oil and gas development may have a variety of positive and negative effects on public health. Increased income for individuals or families may improve health in affected communities through increases in the standard of living, reductions in stress, and opportunities for personal growth and social relationships. Increased income and employment opportunities may also improve diet and nutrition by providing money to fund subsistence activities. There also may be positive impacts on public health as a result of increased access to health care and facilities. Negative impacts on public health could result through changes in diet, nutrition, exercise, environmental exposures, infectious disease, safety, and acculturative stress. Similar to social and cultural impacts, health impacts can result from impacts on subsistence resources and activities or from other causes not related to subsistence.

Oil and gas development is expected to have substantial environmental justice impacts on local communities, based on (1) findings that the community of Nuiqsut includes a minority population and (2) findings of major impacts on socio-cultural systems and subsistence. Negative impacts are anticipated to affect lower-income residents disproportionately, as they are more dependent on subsistence resources, but less capable of adapting to subsistence impacts. If subsistence harvests decrease as a result of oil and gas-related impacts, or subsistence-related travel costs increase, lower-income residents may be unable to spend more money on fuel and other subsistence-related expenses, and may be less able to shift to more expensive commercial food sources, thereby potentially experiencing decreased food security. The Iñupiat of the North Slope are also disproportionately impacted by climate change. Economic benefits related to oil and gas production are a countervailing positive impact. Based on all accumulated evidence and local testimony, it is reasonable to anticipate that other oil and gas projects will result in cumulative environmental justice impacts.

Mitigation Actions that Could Address Impacts

This section lists mitigation actions that could be taken to address unavoidable impacts caused by oil and gas development in the Northeastern NPR-A that are not currently covered by existing IAP BMPs. The majority of actions listed were recommended by stakeholders during RMS development workshops and during comment periods. While some of the actions propose specific projects in specific locations (such as the Colville River access road, or the cultural center in Nuiqsut), others (such as the proposal to restore water quantity and quality) do not. The identification and selection of specific actions and locations where they will be implemented will be driven by the impacts identified for a particular project. Therefore, the selection of specific

actions, mechanisms, and sites will occur on a project-by-project basis, as was the case with GMT1 mitigation actions (see Section 4.2: Implementation).

Table 1 lists potential optional mitigation actions, projects, and project locations organized by the primary mitigation objective that the action would address.

TABLE 1. Potential Mitigation Projects and Project Locations

Residual Impacts	Mitigation Actions	Potential Mitigation Projects	Potential Project Locations
1. Mitigation Objective: Sustain and enhance access to and use of traditional <u>subsistence</u> use areas.			
Subsistence Socio-cultural Systems Environmental Justice Public Health Cultural Resources Land Use & Ownership	Construct new access routes to subsistence use areas	Build (complete) a road to provide access from Nuiqsut to the Colville River	Colville River Delta/Special Area, Colville River Watershed, Fish Creek, and vicinity of Nuiqsut
	Restore access to traditional subsistence use areas	Build ramps on already constructed roads	
		Reclaim roads, pipelines, and other disturbed areas in areas formerly used for subsistence that are currently avoided	
		Dredge channels that have silted-in due to changes in flow resulting from development	Nigliq Channel
	Reimburse hunters for additional costs for having to travel further	(No specific project recommended.)	Impacted communities
	Develop and implement programs to share food among North Slope communities	(No specific project recommended.)	North Slope communities
	Reduce competition for subsistence resources	Manage/control sport-hunting	Colville River Delta/Special Area, Colville River Watershed, Teshekpuk Lake caribou herd migration corridors, river crossings and insect relief areas, Teshekpuk Lake Special Area and vicinity.
	Develop and implement programs to enhance production of local food sources	Build community greenhouses Reindeer herding program Establish harvesting cooperatives Offer food preparation and preservation courses Start-up assistance/office space for local Native food-oriented consultant	Impacted communities
2. Mitigation Objective: Sustain and enhance opportunities and rights for Native peoples to live, practice, and pass-on <u>Iñupiat</u> culture and lifestyle.			
Subsistence Socio-cultural Systems <i>Continued</i>	Build and maintain facilities that support the cultural education and activities	Build cultural centers	Impacted communities

Residual Impacts	Mitigation Actions	Potential Mitigation Projects	Potential Project Locations
Environmental Justice Air Quality Water Quality Public Health Birds #2 <i>Continued</i> Fish Terrestrial Mammals T&E Species Cultural Resources Visual Resources Land Use and Ownership	Support cultural education programs	Support cultural camps for youth and a whaling apprentice program. Support projects that document, teach, and protect culture, history, and language. Support projects could include: Updating the Nuiqsut Paisangich; establishing (ideally in new cultural center) a library with a focus on Iñupiat culture that is open year-round; establishing a community-based photojournalism/ media institute	
3. Mitigation Objective: Sustain and enhance the functionality of the <u>ecological system</u> .			
Subsistence Socio-cultural Systems Air Quality Water Quality Public Health Birds Fish Terrestrial Mammals T&E Species: Spectacled Eider	Preserve and protect areas with important environmental, subsistence, or cultural resource values, including high-value wetlands (for example, important waterfowl molting areas)	Establish conservation easements and voluntary limits on use and occupancy of existing leases	Fish Creek, Judy Creek, Tiñmiaqsigvik (Ublutuoeh) River, Colville River Delta/Special Area, Colville River Watershed, and Teshekpuk Lake Special Area and vicinity
		Create/expand/ enforce special management areas/buffers	Colville River Delta/Special Area, Colville River Watershed, Fish Creek, Teshekpuk Lake caribou herd migration corridors, river crossings and insect relief areas, Teshekpuk Lake Special Area and vicinity, and Ikpiqpu River area
		Construct erosion control projects (such as breakwaters or causeways)	Colville River Delta/Special Area
		Protect against the introduction and proliferation of invasive species	Colville River Watershed, and vicinity of Nuiqsut
		Develop conservation and managements plans	Colville River Delta/Special Area, Colville River Watershed, Teshekpuk Lake caribou herd migration corridors, river crossings and insect relief areas, Teshekpuk Lake Special Area and vicinity
		Conduct research and monitoring using community-based monitoring programs	
	Better understand the effects of development infrastructure and activities on subsistence species	Conduct baseline data collection and ongoing monitoring of ecosystem health and functionality	Colville River Watershed, Fish Creek, and Teshekpuk Lake Special Area and vicinity.

Residual Impacts	Mitigation Actions	Potential Mitigation Projects	Potential Project Locations
#3 <i>continued</i>	Support the recovery and survival of the Spectacled Eider	a. Conduct monitoring of annual survival and lead in blood levels regionwide, but focus on areas lacking data b. Evaluate and model the effects of environmental change in breeding areas. Support education programs to eliminate the use of lead shot	North Slope region
	Restore/maintain water flow volume, protect surface water quality	[No specific project recommended.]	Colville River Delta/Special Area, Colville River Watershed, and Fish Creek.
4. Mitigation Objective: Sustain and enhance the <u>health and safety</u> of the residents			
Subsistence Socio-cultural Systems Environmental Justice Air Quality Water Quality Public Health	Improve air quality monitoring	Install additional stations, upgrading stations to best available technology and upgrade stations to monitor for a broader suite of pollutants; improve public education and outreach on AQ	Impacted communities
	Develop and implement programs to safely store food	Build community freezers and/or ice cellars	
	Advance the understanding of the impacts of development on public health	Develop and implement research and monitoring projects focused on improving the understanding of the effects of development infrastructure and activities on human health	Nuiqsut and Anaktuvuk Pass
	Support health programs	Include drug/alcohol programs	Impacted communities
5. Mitigation Objective: Sustain and enhance economic and <u>community</u> development.			
Subsistence Socio-cultural Systems Environmental Justice Public Health	Support community cohesiveness.	a. Build recreation centers, teen centers, playgrounds, and/or picnic areas b. Build parking area in Deadhorse to facilitate North Slope residents' use of Dalton Highway for transportation. c. Assist communities in communicating with levels of government to get issues of concern addressed, such as: hiring permanent grant writers to submit proposals for impacts mitigation and other grants and to produce grant requests; assist local entities with obtaining technical and legal expertise to advise them on the permitting process. <i>continued</i>	In and around impacted communities.

Residual Impacts	Mitigation Actions	Potential Mitigation Projects	Potential Project Locations
<i>#5 continued</i>	<i>#5 continued</i>	d. Support the implementation/ expansion of STEM (Science Technology Engineering Math) programs, such as the Alaska Native Science and Engineering Program in impacted communities e. Support the development and implementation of job training programs in North Slope communities. f. Develop and implement programs that support local entrepreneurial and economic development in impacted communities. g. Fund increased local oversight/monitoring of development activities (e.g., staff, training, funding to contract for technical and scientific expertise). h. Support development of engineering and architectural plans to secure sources of construction funding for facilities and infrastructure improvements in impacted communities. i. Fund the development of long-term community development plans for impacted communities. j. Build new housing to meet growing demand in impacted communities.	<i>#5 continued</i>

The potential mitigation actions identified in Table 1 are examples of actions and projects that have some level of stakeholder support; other effective means for mitigation may emerge during the NEPA analysis for individual projects. Additional mitigation actions may be identified in the future based on:

- Government-to-government consultations;
- Additional nominations from stakeholders such as the NPR-A Working Group or the Subsistence Advisory Panel;
- BLM subject matter expert recommendations; and
- Other Federal, state, and local government recommendations.

4. IMPLEMENTATION

How the RMS will be used by BLM

This RMS is an effort by the BLM to describe in one place current and potential future mitigation actions or opportunities that should be considered when approving an application for development. The RMS also contains detailed information regarding ecological and social resources, conditions and trends found in Appendices C and D, as well as information regarding impacts to resources from oil and gas development based on past research, environmental analysis, and stakeholder input found in Appendix E. The BLM, other state and Federal agencies, and industry will use the RMS as an aid in the NEPA process in a variety of ways:

- It is a document that can be shared with cooperating agencies to explain mitigation, anticipated impacts from development, and potential mitigation measures that will assist in preparing the EIS;
- It will educate stakeholders about mitigation, and provide examples of currently applicable mitigation plus mitigation that has been suggested, in order to assist stakeholders in providing additional and robust input as part of the public commenting process associated with an EIS;
- It will assist BLM in all phases of writing the EIS or Environmental Assessment (EA), including alternatives development; resources affected; the direct, indirect and cumulative impact analysis; and in identifying potential additional mitigation to address adverse effects.

In addition, the RMS is a repository of potential mitigation actions that other agencies with regulatory authority, such as the U.S. Army Corps of Engineers, can use in conjunction with their permitting processes. This document is a source of information regarding efforts that could be undertaken that stakeholders believe could assist in addressing impacts that result from development on the North Slope.

The mitigation actions described in Table 1 have been obtained and vetted through a series of multi-stakeholder workshops. These actions could be adopted and carried out as proposed, or could serve as the starting point for negotiating similar but modified actions with key stakeholders identified as part of the regulatory process.

Finally, the document could be used by industry prior to submitting an application to understand the impacts of development, as well as the ways in which mitigation is applied to address those impacts. This will allow them to potentially craft their development proposals to incorporate design features that would reduce or eliminate adverse effects. Applicants could also use the RMS to work with local stakeholders to identify mitigation actions that are carried out independent of the NEPA or regulatory process, as an application of the good neighbor philosophy.

5. REFERENCES

- BLM (Bureau of Land Management), 2004. *Alpine Satellite Development Plan, Final Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Sept. Available at: <http://www.blm.gov/eis/AK/alpine/dspfeisd.html>.
- BLM, 2012. *National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Nov. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=14702>.
- BLM, 2013. *National Petroleum Reserve – Alaska Integrated Activity Plan Record of Decision*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Feb. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=14702>.
- BLM, 2014. *Supplemental Environmental Impact Statement for the Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth One Development Project*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Oct. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=50912>.
- BLM, 2015. *Supplemental Environmental Impact Statement for the Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth One Development Project, Record of Decision*. U.S. Department of the Interior, Bureau of Land Management. Feb. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=50912>.
- BLM, 2016. H-1794-1 Mitigation (P). U.S. Department of the Interior, Bureau of Land Management Release 1-1783, Dec 22.
- Council on Environmental Quality (CEQ), 1997. *Environmental Justice: Guidance Under the National Environmental Policy Act*. Available at: <http://energy.gov/nepa/downloads/environmental-justice-guidance-under-nepa-ceq-1997>. Accessed July 1, 2016.
- Federal Register, 1994. *Federal Register*, Volume 59, page 7629, February 16.

6. GLOSSARY

Adaptive management: a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated. Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain.

Avoidance: avoiding the impact altogether by not taking a certain action or parts of an action (40 CFR 1508.20(a)).

Baseline: the pre-existing condition of a resource, at all relevant scales, which can be quantified by an appropriate attribute(s). During environmental reviews, the baseline is considered the affected environment that exists absent the project's implementation, and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.

Best management practices (BMPs): state-of-the-art, efficient, effective, and practicable mitigation measures for avoiding, minimizing, rectifying, and reducing or eliminating impacts over time. BMPs for oil and gas development in Alaska are identified in BLM's Western Oil and Gas Plan and Restoration Design Energy Project.

Change agents: an environmental phenomena or human activity that can alter or influence the future condition and/or trend of a resource. Some change agents (e.g., roads) are the result of direct human actions or influence; others (e.g., climate change, wildland fire, and invasive species) may involve natural phenomena or be partially or indirectly related to human activities.

Coarse filter: elements such as vegetation communities, ecosystems, or land classes for planning and management across landscape- and regional-level management units.

Compensation: compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20(e)).

Cumulative Effects: the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7)

Design features: required measures or procedures incorporated into the proposed action or alternatives that could avoid, minimize, mitigate, or otherwise reduce adverse impacts of a project proposal. Design features for oil and gas development in Alaska are identified in BLM's Western Oil and Gas Plan and Restoration Design Energy Project.

Effective: produces the desired outcome.

Effects: the adverse direct, indirect, and cumulative impacts from a land use activity; the words "effects" and "impacts" are synonymous as used in this document.

Enhancement: the manipulation of resources to heighten, intensify, or improve a specific resource.

Environmental Justice: Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Fine filter: meant to complement the coarse filter by targeting species with requirements that will not be met through the broad brush of dominant vegetation communities — rare, threatened, or endangered species; wildlife species of management interest; or those species that consistently use ecotones or multiple habitats on a diurnal or seasonal basis.

Goal (regional goal or land use plan goal): a broad statement of a desired outcome. Goals are usually not quantifiable and may not have established time frames for achievement.

Impacts: the adverse direct, indirect, and cumulative effects from a land use activity; the words “effects” and “impacts” are synonymous as used in this document.

Landscape: a geographic area encompassing an interacting mosaic of ecosystems and human systems that is characterized by a set of common management concerns. The landscape is not defined by the size of the area, but rather by the interacting elements that are relevant and meaningful in a management context.

Minimization: minimizing impacts by limiting the degree or magnitude of the action and its implementation (40 CFR 1508.20(b)).

Mitigation: includes avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

Mitigation hierarchy: see *Mitigation*, the process and order of preference for the application of mitigation, i.e., avoidance, minimization, remediation, reduction over time, and/or compensation, in that order.

Mitigation strategy: a document that identifies, evaluates, and communicates potential mitigation needs and mitigation measures in a geographic area, at relevant scales, in advance of anticipated land use activities.

NEPA process/analysis: analysis prepared pursuant to the National Environmental Policy Act, such as a planning- or project-level Environmental Assessment (EA) or Environmental Impact Statement (EIS).

Objective (regional objective or land use plan objective): a description of a desired outcome for a resource in a land use plan. Objectives can be quantified and measured and, where possible, have established time frames for achievement.

Onsite mitigation: mitigation implemented in the project area.

Preservation: the removal of a threat to, or preventing the decline of, resources. Preservation may include the application of new protective designations on previously unprotected land or the relinquishment or restraint of a lawful use that adversely impacts resources.

Resources (and their values, services, and/or functions): *resources* are natural, social, or cultural objects or qualities; *resource values* are the importance, worth, or usefulness of resources; *resource services* are the benefits people derive from resources; and *resource functions* are the physical, chemical, and/or biological processes that involve resources.

Restoration: the manipulation of degraded resources in order to return the resources to an un-degraded condition.

Setback: a distance measured from a named ground feature, such as a river or lake, in which certain activities or structures would not be allowed. All setback distances are to be measured at the time of the application for a permit for a development. In addition, facility development along the coast would be required to be designated to maintain the prescribed setback distance for the anticipated life of the facility.

Socio-Cultural Impacts: Effects relating to or including a combination of social and cultural impacts. As described in NEPA, "social impacts" are the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society. The term "cultural impacts" involves changes to the norms, values, and beliefs that guide traditions and customs.

Subsistence: A way of life that involves the harvest, preparation, distribution, and consumption of wild resources for food and other cultural purposes

Residual impacts: any adverse reasonably foreseeable effects that remain after the application of the first four steps in the mitigation hierarchy; also referred to as residual impacts.

APPENDIX A:

IAP LEASE STIPULATIONS AND BEST MANAGEMENT PRACTICES

(Complete Text from the Record of Decision for the NPR-A Integrated Activity Plan [BLM 2013], Appendix A)

Definitions

The following definitions apply to the stipulations and best management practices listed in this appendix. The Glossary of the Final IAP/EIS has additional definitions.

Active Floodplain: The lowland and relatively flat areas adjoining inland and coastal waters, including the flood-prone areas of offshore islands, composing, at a minimum, that area subject to a 1 percent or greater chance of flooding in any given year (also referred to as the 100-year or base floodplain).

Authorized Officer: A position of authority for approval of various activities through delegation from the Secretary of the Interior. Currently, the designated authorized officers in Alaska for leasing, surface use, and permitting are 1) State Director, 2) Manager of the Arctic Field Office in Fairbanks, and 3) Deputy State Director, Division of Resources.

Best Management Practice: Mitigation developed through the BLM planning process/NEPA process that is not attached to the oil and gas lease but is required, implemented, and enforced at the operational level for all authorized (not just oil and gas) activities in the planning area. Best management practices were developed with various mechanisms in place to ensure compliance. These mechanisms include the following:

1. Some best management practices are pre-application requirements; therefore compliance will precede approval of the proposed activity. For example, Best Management Practice H-1(a) requires consultation with affected communities prior to submission of an application for relevant activities within the NPR-A. If consultation has not taken place, the application will be rejected or will be considered incomplete until such time that the consultation has occurred.
2. Other best management practices are required design features, and will have to be incorporated into the applicant's proposal. As an integral part of the proposal and the authorization, the requirement does not need to be stipulated to be enforceable. For example, a minimum pipeline height of 7 feet for above ground pipelines is a required design of any approved above ground pipeline (Best Management Practice E-7). Since the authorization (a ROW in this case) authorizes a pipeline with a minimum height of 7 feet, anything less (unless specifically approved through additional NEPA analysis and the permit) is not in compliance and enforcement actions may be taken even if the permit does not specify a minimum of 7 feet.
3. Other best management practices will become conditions of approval on post lease land use authorizations. For example, Best Management Practice C-1 prohibits heavy equipment used for cross-country moves within ½ mile of occupied grizzly bear dens.

Body of Water or Water body: A lake, river, stream, creek, or pond that holds water throughout the summer and supports a minimum of aquatic life.

Buffer: A zone extending outward or inward from the periphery of a “protected” feature for a specified distance. Activities and development may be prohibited or limited by type or time within the buffer dependent on the goal associated with applying the buffer.

Class I air quality area: One of 156 protected areas such as national parks (over 6,000 acres), wilderness areas (over 5,000 acres), national memorial parks (over 5,000 acres), and international parks that were in existence as of August 1977, where air quality should be given special protection. Federal Class I areas are subject to maximum limits on air quality degradation called air quality increments (often referred to as Prevention of Significant Deterioration [PSD] increments). All areas of the United States not designated as Class I are Class II areas. The air quality standards in Class I areas are more stringent than national ambient air quality standards.

Consultation: Consultation, as it is referenced in the lease stipulations, does not infer formal consultation as required under other legal mandates such as “Section 7 Consultation” under the Endangered Species Act (ESA). Rather, consultation implies that the BLM or the Lessee/Permittee will contact other agencies or entities to inform them of potential actions and to seek input on noted topics. This includes informal contacts, and written, electronic, and/or verbal communication.

Criteria Air Pollutants: Those pollutants subject to the National Air Quality Standards (<http://www.epa.gov/air/criteria.html>). They currently include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (both PM₁₀ and PM_{2.5} – inhalable and respirable particulates), and sulfur dioxide (SO₂).

Development Activities: Any activity associated with construction and operation of facilities or equipment post exploration.

Field: The term used to describe the area containing surface infrastructure above one or more subsurface reservoirs. In this sense, “field” is analogous to “a Unit participating area or collection of participating areas.” The infrastructure in the field includes, but is not limited to, drilling and production pads, service roads, perhaps an airstrip, and processing and support facilities. Field infrastructure may be used in the development and production of several oil/gas accumulations in different subsurface reservoirs. Fields typically have a primary reservoir that supports initial development in addition to satellite reservoirs that are developed later and tie into the main facilities. Although oil and gas reservoirs may vary greatly in subsurface depth and other geologic characteristics, because they are located in the same geographic area it is more efficient to coordinate and share the necessary surface infrastructure. Fields may or may not be connected by permanent roads to adjacent fields or transportation facilities outside the field area.

Greenhouse gas (GHG): A gas that absorbs and emits thermal radiation within the lowest layers of the atmosphere. This process is the fundamental cause of the greenhouse effect. The primary

greenhouse gases that are considered air pollutants are carbon dioxide, (CO₂), methane (CH₄), nitrous oxide (N₂O), and chlorofluorocarbons (CFCs).

Hazardous air pollutants (HAPs), (also known as *toxic air pollutants*): Those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. The Environmental Protection Agency (EPA) is required to control 187 hazardous air pollutants. Examples of HAPs include benzene (found in gasoline), perchlorethylene (emitted from dry cleaning facilities), and methylene chloride (used as a solvent).

Lease Stipulation: Mitigation developed through BLM planning process/NEPA process that is specifically attached to a lease.

NO_x: Mono-nitrogen oxides, including nitric oxide (NO) and nitrogen dioxide (NO₂). It is formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuels in automobiles, power plants, industrial processes, and home and office heating units.

Permanent Oil and Gas Facilities: Permanent Facilities include production facilities, pipelines, roads, airstrips, production pads, docks and other bottom-founded structures, seawater-treatment plants, and other structures associated with an oil and gas operation that occupy land for more than one winter season; also included are material sites such as sand and gravel, and “temporary platforms” if those platforms are used for production rather than exploration. Exploration wellheads and seasonal facilities such as ice roads and ice pads are excluded, even when the pads are designed for use in successive winters. This definition does not include over-summering ice pads for exploration purposes.

Setback: A distance measured from a named ground feature, such as a river or lake, in which certain activities or structures would not be allowed. All setback distances are to be measured as of the time of the application for a permit for a development. In addition, facility development along the coast would be required to be designed to maintain the prescribed setback distance for the anticipated life of the facility.

SO_x: Sulfur oxides, including sulfur dioxide (SO₂). A product of vehicle tailpipe emissions.

Stipulation: A requirement or condition placed by the BLM on the leaseholder for operations the leaseholder might carry out within that lease. The BLM develops stipulations that apply to all future leases within the NPR-A.

Temporary Platform: A facility that does not require the use of an ice or gravel pad to support oil and gas and related exploration activities. An example of a temporary platform recently used on the North Slope is Anadarko Petroleum's Arctic Drilling Platform used for the company's Hot Ice Project during the winters of 2003-2004. The facility consisted of a series of platform modules joined together and supported above the tundra surface on steel legs. Once the project was completed the platform was disassembled and the support legs were removed, leaving the tundra surface undisturbed. Note: A temporary platform that is used for production, as opposed

to exploration, would be considered a permanent oil and gas facility and be subject to the restrictions on placement of such structures.

Valid existing: in the context of exceptions for the development of “valid existing NPR-A oil and gas leases,” “valid existing” leases refers to oil and gas leases issued by the BLM prior to the signing of this record of decision and valid at the time of the application for approval of an action for which the “valid existing NPR-A oil and gas lease” exception is requested.

Volatile Organic Compounds (VOCs): A group of chemicals that react in the atmosphere with nitrogen oxides in the presence of sunlight and heat to form ozone. VOCs contribute significantly to photochemical smog production and certain health problems. Examples of VOCs are gasoline fumes and oil-based paints.

Applicability of Requirements/Standards

All surface disturbing activities such as exploratory drilling, road/pipeline construction, seismic acquisition, and overland moves require additional authorization(s) issued subsequent to leasing. The stipulations and best management practices require that certain protections of resources and uses be achieved. Requirements and standards listed with the stipulations and best management practices represent BLM’s current understanding of how lessees/permittees would achieve the objectives of the stipulation or best management practice.

A lessee/permittee may propose a deviation from the requirements/standards of stipulations and best management practices as part of an authorization application. Prior to approving an alternative procedure as part of the authorization, the BLM would analyze the proposal and determine if the proposal incorporating the alternative procedure would achieve the objectives of the stipulations and best management practices. If the BLM determines that the alternative procedure proposed by the applicant would meet the stipulation’s or best management practice’s objective, it could approve the alternative procedure. If BLM determines that the alternative procedure proposed by the applicant is unlikely to meet the objectives of a stipulation or best management practice, the requirements/standards would still be required. However, the authorized officer may allow a deviation from the objectives and requirement/standard in a new decision document supported by additional NEPA analysis.

The BLM could independently require different actions than those listed under requirements/standards. If, after experience or additional study, BLM concludes that a requirement/standard is not achieving or is unlikely to achieve the protective objective when applied to a specific future on-the ground action or would not do so as well as the use of recently proven technology or techniques, BLM could at the permitting stage and under the terms of the stipulation or best management practice, impose other restrictions to meet the objective.

STIPULATIONS AND BEST MANAGEMENT PRACTICES

Waste Prevention, Handling, Disposal, Spills, Air Quality, and Public Health and Safety

A-1 Best Management Practice

Objective: Protect the health and safety of oil and gas field workers and the general public by disposing of solid waste and garbage in accordance with applicable Federal, state, and local law and regulations.

Requirement/Standard: Areas of operation shall be left clean of all debris.

A-2 Best Management Practice

Objective: Minimize impacts on the environment from non-hazardous and hazardous waste generation. Encourage continuous environmental improvement. Protect the health and safety of oil field workers and the general public. Avoid human-caused changes in predator populations.

Requirement/Standard: Lessees/permittees shall prepare and implement a comprehensive waste management plan for all phases of exploration and development, including seismic activities. The plan shall be submitted to the authorized officer for approval, in consultation with Federal, state, and North Slope Borough regulatory and resource agencies, as appropriate (based on agency legal authority and jurisdictional responsibility), as part of a plan of operations or other similar permit application.

Management decisions affecting waste generation shall be addressed in the following order of priority: 1) prevention and reduction, 2) recycling, 3) treatment, and 4) disposal. The plan shall consider and take into account the following requirements:

- a. Methods to avoid attracting wildlife to food and garbage. The plan shall identify precautions that are to be taken to avoid attracting wildlife to food and garbage.
- b. Disposal of putrescible waste. Requirements prohibit the burial of garbage. Lessees and permitted users shall have a written procedure to ensure that the handling and disposal of putrescible waste will be accomplished in a manner that prevents the attraction of wildlife. All putrescible waste shall be incinerated, backhauled, or composted in a manner approved by the authorized officer. All solid waste, including incinerator ash, shall be disposed of in an approved waste-disposal facility in accordance with EPA and Alaska Department of Environmental Conservation regulations and procedures. The burial of human waste is prohibited except as authorized by the authorized officer.
- c. Disposal of pumpable waste products. Except as specifically provided, the BLM requires that all pumpable solid, liquid, and sludge waste be disposed of by injection in accordance with EPA, Alaska Department of Environmental Conservation, and the Alaska Oil and Gas Conservation Commission regulations and procedures. On-pad temporary muds and cuttings storage, as approved by Alaska Department of Environmental Conservation (DEC), will be allowed as necessary to facilitate annular injection and/or backhaul operations.
- d. Disposal of wastewater and domestic wastewater. The BLM prohibits wastewater discharges or disposal of domestic wastewater into bodies of fresh, estuarine, and marine water, including wetlands, unless authorized by a National Pollutant Discharge Elimination System or state permit.

A-3 Best Management Practice

Objective: Minimize pollution through effective hazardous-materials contingency planning.

Requirement/Standard: For oil- and gas-related activities, a hazardous materials emergency contingency plan shall be prepared and implemented before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. Procedures in the plan applicable to fuel and hazardous substances handling (associated with transportation vehicles) shall consist of best management practices if approved by the authorized officer. The plan shall include a list of resources available for response (e.g., heavy-equipment operators, spill-cleanup materials or companies), and names and phone numbers of Federal, state, and North Slope Borough contacts. Other Federal and state regulations may apply and require additional planning requirements. All appropriate staff shall be instructed regarding these procedures. In addition, contingency plans related to facilities developed for oil production shall include requirements to:

- a. Provide refresher spill-response training to North Slope Borough and local community spill-response teams on a yearly basis.
- b. Plan and conduct a major spill-response field-deployment drill annually.
- c. Prior to production and as required by law, develop spill prevention and response contingency plans and participate in development and maintenance of the North Slope Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases for the National Petroleum Reserve-Alaska operating area. Planning shall include development and funding of detailed (e.g., 1:26,000 scale) environmental sensitivity index maps for the lessee's/permittee's operating area and areas outside the lessee's/permittee's operating area that could be affected by their activities. (The specific area to be mapped shall be defined in the lease agreement and approved by the authorized officer in consultation with appropriate resource agencies.) Maps shall be completed in paper copy and geographic information system format in conformance with the latest version of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration's Environmental Sensitivity Index Guidelines. Draft and final products shall be peer reviewed and approved by the authorized officer in consultation with appropriate Federal, state, and North Slope Borough resource and regulatory agencies.

A-4 Best Management Practice

Objective: Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.

Requirement/Standard: Before initiating any oil and gas or related activity or operation, including field research/surveys and/or seismic operations, lessees/permittees shall develop a comprehensive spill prevention and response contingency plan per 40 CFR § 112 (Oil Pollution Act). The plan shall consider and take into account the following requirements:

- a. On-site Clean-up Materials. Sufficient oil-spill-cleanup materials (absorbents, containment devices, etc.) shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by field crews on all overland moves, seismic work trains, and similar overland moves by heavy equipment.

- b. Storage Containers. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Except during overland moves and seismic operations, fuel, other petroleum products, and other liquid chemicals designated by the authorized officer that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers, such as over packs, capable of containing 110% of the stored volume. In areas within 500 feet of water bodies, fuel containers are to be stored within appropriate containment.
- c. Liner Materials. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period.
- d. Permanent Fueling Stations. Permanent fueling stations shall be lined or have impermeable protection to prevent fuel migration to the environment from overfills and spills.
- e. Proper Identification of Containers. All fuel containers, including barrels and propane tanks, shall be marked with the responsible party's name, product type, and year filled or purchased.
- f. Notice of Reportable Spills. Notice of any reportable spill (as required by 40 CFR § 300.125 and 18 AAC § 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence.
- g. Identification of Oil Pans (“duck ponds”). All oil pans shall be marked with the responsible party’s name.

A-5 Best Management Practice

Objective: Minimize the impact of contaminants from refueling operations on fish, wildlife and the environment.

Requirement/Standard: Refueling of equipment within 500 feet of the active floodplain of any water body is prohibited. Fuel storage stations shall be located at least 500 feet from any water body with the exception that small caches (up to 210 gallons) for motor boats, float planes, ski planes, and small equipment, e.g. portable generators and water pumps, are permitted. The authorized officer may allow storage and operations at areas closer than the stated distances if properly designed to account for local hydrologic conditions.

A-6 Best Management Practice

Objective: Minimize the impact on fish, wildlife, and the environment from contaminants associated with the exploratory drilling process.

Requirement/Standard: Surface discharge of reserve-pit fluids is prohibited.

A-7 Best Management Practice

Objective: Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.

Requirement/Standard: Discharge of produced water in upland areas and marine waters is prohibited.

A-8 Best Management Practice

Objective: Minimize conflicts resulting from interaction between humans and bears during oil and gas activities.

Requirement/Standard: Oil and gas lessees and their contractors and subcontractors will, as a part of preparation of lease operation planning, prepare and implement bear-interaction plans to minimize conflicts between bears and humans. These plans shall include measures to:

- a. Minimize attraction of bears to the drill sites.
- b. Organize layout of buildings and work sites to minimize human/bear interactions.
- c. Warn personnel of bears near or on work sites and identify proper procedures to be followed.
- d. Establish procedures, if authorized, to discourage bears from approaching the work site.
- e. Provide contingencies in the event bears do not leave the site or cannot be discouraged by authorized personnel.
- f. Discuss proper storage and disposal of materials that may be toxic to bears.
- g. Provide a systematic record of bears on the work site and in the immediate area.

A-9 Best Management Practice

Objective: Reduce air quality impacts.

Requirement/Standard: All oil and gas operations (vehicles and equipment) that burn diesel fuels must use “ultra-low sulfur” diesel as defined by the Alaska Department of Environmental Conservation-Division of Air Quality.

A-10 Best Management Practice

Objective: Prevent unnecessary or undue degradation of the lands and protect health.

Requirement/Standard: This measure includes the following elements:

- a. Prior to initiation of a NEPA analysis for an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source (hereafter project), the authorizing officer (BLM) may require the project proponent to provide a minimum of one year of baseline ambient air monitoring data for any pollutant(s) of concern as determined by the BLM if no representative air monitoring data are available for the project area, or existing representative ambient air monitoring data are insufficient, incomplete, or do not meet minimum air monitoring standards set by the Alaska DEC or the EPA. If the BLM determines that baseline monitoring is required, this pre-analysis data must meet Alaska DEC and EPA air monitoring standards, and cover the year immediately prior to the submittal. Pre-project monitoring may not be appropriate where the life of the project is less than one year.
- b. The BLM may require monitoring for the life of the project depending on the magnitude of potential air emissions from the project, proximity to a Federally mandated Class I area, sensitive Class II area (as identified on a case-by-case basis by Alaska DEC or a Federal land management agency), or population center, location within or proximity to a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during NEPA undertaken for the project.
- c. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the project proponent shall prepare (and submit for BLM approval) an emissions inventory that includes quantified emissions of regulated air pollutants from all direct and indirect sources related to the proposed project, including

- reasonably foreseeable air pollutant emissions of criteria air pollutants, volatile organic compounds, hazardous air pollutants, and greenhouse gases estimated for each year for the life of the project.
- d. The BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project.
 - e. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the BLM may require the proponent to provide an emissions reduction plan that includes a detailed description of operator committed measures to reduce project related air pollutant emissions including, but not limited to, greenhouse gases and fugitive dust.
 - f. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the authorized officer may require air quality modeling for purposes of analyzing project direct, indirect or cumulative impacts to air quality. The BLM may require air quality modeling depending on the magnitude of potential air emissions from the project or activity, duration of the proposed action, proximity to a Federally mandated Class I area, sensitive Class II area (as identified on a case-by-case basis by Alaska DEC or a Federal land management agency), or population center, location within a nonattainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during the NEPA analysis undertaken for the project. The BLM will determine the information required for a project specific modeling analysis through the development of a modeling protocol for each analysis. The authorized officer will consult with appropriate Federal, state, and/or local agencies regarding modeling to inform his/her modeling decision and avoid duplication of effort. The modeling shall compare predicted impacts to all applicable local, state, and Federal air quality standards and increments, as well as other scientifically defensible significance thresholds (such as impacts to air quality related values, incremental cancer risks, etc.).
 - g. The BLM may require air quality mitigation measures and strategies within its authority (and in consultation with local, state, Federal, and tribal agencies with responsibility for managing air resources) in addition to regulatory requirements and proponent committed emission reduction measures, and for emission sources not otherwise regulated by Alaska DEC or EPA, if the air quality analysis shows potential future impacts to National Ambient Air Quality Standards (NAAQS) or Alaska Ambient Air Quality Standards (AAAQS) or impacts above specific levels of concern for air quality related values (AQRVs).
 - h. If ambient air monitoring indicates that project-related emissions are causing or contributing to impacts that would cause unnecessary or undue degradation of the lands, cause exceedances of NAAQS, or fail to protect health (either directly or through use of subsistence resources), the authorized officer may require changes in activities at any time to reduce these emissions to comply with the NAAQS and/or minimize impacts to AQRVs. Within the scope of BLM's authority, the BLM may

require additional emission control strategies to minimize or reduce impacts to air quality.

- i. Publicly available reports on air quality baseline monitoring, emissions inventory, and modeling results developed in conformance with this best management procedure shall be provided by the project proponent to the North Slope Borough and to local communities and tribes in a timely manner.

A-11 Best Management Practice

Objective: Ensure that permitted activities do not create human health risks through contamination of subsistence foods.

Requirement/Standard: A lessee proposing a permanent oil and gas development shall design and implement a monitoring study of contaminants in locally-used subsistence foods. The monitoring study shall examine subsistence foods for all contaminants that could be associated with the proposed development. The study shall identify the level of contaminants in subsistence foods prior to the proposed permanent oil and gas development and monitor the level of these contaminants throughout the operation and abandonment phases of the development. If ongoing monitoring detects a measurable and persistent increase in a contaminant in subsistence foods, the lessee shall design and implement a study to determine how much, if any, of the increase in the contaminant in subsistence foods originates from the lessee's activities. If the study determines that a portion of the increase in contamination in subsistence foods is caused by the lessee's activities, the authorized officer may require changes in the lessee's processes to reduce or eliminate emissions of the contaminant. The design of the study/studies must meet the approval of the authorized officer. The authorized officer may consult with appropriate Federal, state, and North Slope Borough agencies prior to approving the study/studies design. The authorized officer may require/authorize changes in the design of the studies throughout the operations and abandonment period, or terminate or suspend studies if results warrant.

A-12 Best Management Practice

Objective: To minimize negative health impacts associated with oil spills.

Requirement/Standard: If an oil spill with potential impacts to public health occurs, the BLM, in undertaking its oil spill responsibilities, will consider:

- a. Immediate health impacts and responses for affected communities and individuals.
- b. Long-term monitoring for contamination of subsistence food sources.
- c. Long-term monitoring of potential human health impacts.
- d. Perceptions of contamination and subsequent changes in consumption patterns.
- e. Health promotion activities and communication strategies to maintain the consumption of traditional food.

Water Use for Permitted Activities

B-1 Best Management Practice

Objective: Maintain populations of, and adequate habitat for, fish and invertebrates.

Requirement/Standard: Withdrawal of unfrozen water from rivers and streams during winter is prohibited. The removal of ice aggregate from grounded areas ≤ 4 -feet deep may be authorized from rivers on a site-specific basis.

B-2 Best Management Practice

Objective: Maintain natural hydrologic regimes in soils surrounding lakes and ponds, and maintain populations of, and adequate habitat for, fish, invertebrates, and waterfowl.

Requirement/Standard: Withdrawal of unfrozen water from lakes and the removal of ice

aggregate from grounded areas ≤ 4 -feet deep may be authorized on a site-specific basis

depending on water volume and depth and the waterbody's fish community. Current water use requirements are:

- a. Lakes with sensitive fish (i.e., any fish except ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 15% of calculated volume deeper than 7 feet; only ice aggregate may be removed from lakes that are ≤ 7 -feet deep.
- b. Lakes with only non-sensitive fish (i.e., ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 30% of calculated volume deeper than 5 feet; only ice aggregate may be removed from lakes that are ≤ 5 .
- c. Lakes with no fish present, regardless of depth: water available for use is limited to 35% of total lake volume.
- d. In lakes where unfrozen water and ice aggregate are both removed, the total use shall not exceed the respective 15%, 30%, or 35% volume calculations.
- e. Additional modeling or monitoring may be required to assess water level and water quality conditions before, during, and after water use from any fish-bearing lake or lake of special concern.
- f. Any water intake structures in fish bearing or non-fish bearing waters shall be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. Note: All water withdrawal equipment must be equipped and must utilize fish screening devices approved by the Alaska Department of Fish and Game, Division of Habitat.
- g. Compaction of snow cover or snow removal from fish-bearing waterbodies shall be prohibited except at approved ice road crossings, water pumping stations on lakes, or areas of grounded ice.

Winter Overland Moves and Seismic Work

The following best management practices apply to overland moves, seismic work, and any similar cross-country vehicle use of heavy equipment on nonroaded surfaces during the winter season. These restrictions do not apply to the use of such equipment on ice roads after they are constructed.

C-1 Best Management Practice

Objective: Protect grizzly bear, polar bear, and marine mammal denning and/or birthing locations.

Requirement/Standard:

- a. Cross-country use of heavy equipment and seismic activities is prohibited within $\frac{1}{2}$ mile of occupied grizzly bear dens identified by the Alaska Department of Fish and Game unless alternative protective measures are approved by the authorized officer in consultation with the Alaska Department of Fish and Game.

- b. Cross-country use of heavy equipment and seismic activity is prohibited within 1 mile of known or observed polar bear dens or seal birthing lairs. Operators near coastal areas shall conduct a survey for potential polar bear dens and seal birthing lairs and consult with the USFWS and/or NOAA-Fisheries, as appropriate, before initiating activities in coastal habitat between October 30 and April 15.

C-2 Best Management Practice

Objective: Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.

Requirement/Standard:

- a. Ground operations shall be allowed only when frost and snow cover are at sufficient depths to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 5 in the foothills area where elevations reach or exceed 500 feet and approximately May 15 in the northern coastal areas). The exact dates will be determined by the authorized officer.
- b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. Low-ground-pressure vehicles shall be selected and operated in a manner that eliminates direct impacts to the tundra by shearing, scraping, or excessively compacting the tundra mat. Note: This provision does not include the use of heavy equipment such as front-end loaders and similar equipment required during ice road construction.
- c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited; however, on existing trails, seismic lines or camps, clearing of drifted snow is allowed to the extent that the tundra mat is not disturbed.
- d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. This provision does not apply to hardened snow trails for use by low-ground-pressure vehicles such as Rolligons.
- e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year.
- f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River, and 2 miles on either side of the Kogosukruk and Kikiakrorak rivers and tributaries of the Kogosukruk River from April 15 through August 5, with the exception that use will be minimized in the vicinity of gyrfalcon nests beginning March 15. Such use will remain 1/2 mile away from known raptor nesting sites, unless authorized by the authorized officer.

C-3 Best Management Practice

Objective: Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.

Requirement/Standard: Crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice (“bridges”) shall be removed, breached, or slotted before spring breakup. Ramps and bridges shall be substantially free of soil and debris.

C-4 Best Management Practice

Objective: Avoid additional freeze-down of deep-water pools harboring over-wintering fish and invertebrates used by fish.

Requirement/Standard: Travel up and down streambeds is prohibited unless it can be demonstrated that there will be no additional impacts from such travel to over-wintering fish or the invertebrates they rely on. Rivers, streams, and lakes shall be crossed at areas of grounded ice whenever possible.

C-5 Best Management Practice

Objective: Minimize the effects of high-intensity acoustic energy from seismic surveys on fish.

Requirement/Standard:

- a. When conducting vibroseis-based surveys above potential fish overwintering areas (water 6 feet deep or greater, ice plus liquid depth), operators shall follow recommendations by Morris and Winters (2005): only a single set of vibroseis shots should be conducted if possible; if multiple shot locations are required, these should be conducted with minimal delay; multiple days of vibroseis activity above the same overwintering area should be avoided if possible.
- b. When conducting air gun-based surveys in freshwater, operators shall follow standard marine mitigation measures that are applicable to fish (e.g., Minerals Management Service 2006): operators will use the lowest sound levels feasible to accomplish their data-collection needs; ramp-up techniques will be utilized (ramp-up involves the gradual increase in emitted sound levels beginning with firing a single air gun and gradually adding air guns until the desired operating level of the full array is obtained).
- c. When conducting explosive-based surveys, operators shall follow setback distances from fish-bearing waterbodies based on requirements outlined by Alaska Department of Fish and Game (1991).

Oil and Gas Exploratory Drilling

D-1 Lease Stipulation

Objectives: Protect fish-bearing rivers, streams, and lakes from blowouts and minimize alteration of riparian habitat.

Requirement/Standard: Exploratory drilling is prohibited in rivers and streams, as determined by the active floodplain, and fish-bearing lakes.

D-2 Lease Stipulation

Objective: Minimize surface impacts from exploratory drilling.

Requirement/Standard: Construction of permanent or gravel oil and gas facilities shall be prohibited for exploratory drilling. Use of a previously constructed road or pad may be permitted if it is environmentally preferred.

Facility Design and Construction

E-1 Best Management Practice

Objective: 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.

Requirement/Standard: All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence hunting and fishing areas. The authorized officer will consult with appropriate Federal, state, and North Slope Borough regulatory and resources agencies prior to approving construction of roads. Subject to approval by the authorized officer, the construction, operation, and maintenance of oil and gas field roads is the responsibility of the lessee unless the construction, operation, and maintenance of roads are assumed by the appropriate governing entity.

E-2 Lease Stipulation

Objective: Protect fish-bearing water bodies, water quality, and aquatic habitats.

Requirement/Standard: Permanent oil and gas facilities, including roads, airstrips, and pipelines, are prohibited upon or within 500 feet as measured from the ordinary high water mark of fish-bearing waterbodies. Essential pipeline and road crossings will be permitted on a case-by-case basis. Note: Also refer to Stipulations/Best Management Practices K-1 and K-2. Construction camps are prohibited on frozen lakes and river ice. Siting of construction camps on river sand and gravel bars is allowed and encouraged. Where leveling of trailers or modules is required and the surface has a vegetative mat, leveling shall be accomplished through blocking rather than use of a bulldozer.

E-3 Lease Stipulation

Objective: Maintain free passage of marine and anadromous fish and protect subsistence use and access to subsistence hunting and fishing.

Requirement/Standard: Causeways and docks are prohibited in river mouths or deltas. Artificial gravel islands and bottom-founded structures are prohibited in river mouths or active stream channels on river deltas. Causeways, docks, artificial islands, and bottom-founded drilling structures shall be designed to ensure free passage of marine and anadromous fish and to prevent significant changes to nearshore oceanographic circulation patterns and water quality characteristics. A monitoring program, developed in consultation with appropriate Federal, state, and North Slope Borough regulatory and resource agencies, shall be required to address the objectives of water quality and free passage of fish.

E-4 Best Management Practice

Objective: Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.

Requirement/Standard: All pipelines shall be designed, constructed, and operated under an authorized officer-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.

E-5 Best Management Practice

Objective: Minimize impacts of the development footprint.

Requirement/Standard: Facilities shall be designed and located to minimize the development footprint. Issues and methods that are to be considered include:

- a. use of maximum extended-reach drilling for production drilling to minimize the number of pads and the network of roads between pads;
- b. sharing facilities with existing development;
- c. collocation of all oil and gas facilities, except airstrips, docks, and seawater-treatment plants, with drill pads;
- d. integration of airstrips with roads;
- e. use of gravel-reduction technologies, e.g., insulated or pile-supported pads,
- f. coordination of facilities with infrastructure in support of offshore development.

Note: Where aircraft traffic is a concern, consideration shall be given to balancing gravel pad size and available supply storage capacity with potential reductions in the use of aircraft to support oil and gas operations.

E-6 Best Management Practice

Objective: Reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, alteration of natural drainage patterns, and restriction of fish passage.

Requirement/Standard: Stream and marsh crossings shall be designed and constructed to ensure free passage of fish, reduce erosion, maintain natural drainage, and minimize adverse effects to natural stream flow. Note: Bridges, rather than culverts, are the preferred method for crossing rivers. When necessary, culverts can be constructed on smaller streams, if they are large enough to avoid restricting fish passage or adversely affecting natural stream flow.

E-7 Best Management Practice

Objective: Minimize disruption of caribou movement and subsistence use.

Requirement/Standard: Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. Listed below are the accepted design practices:

- a. Above ground pipelines shall be elevated a minimum of 7 feet as measured from the ground to the bottom of the pipeline at vertical support members.
- b. In areas where facilities or terrain may funnel caribou movement, ramps over pipelines, buried pipelines, or pipelines buried under roads may be required by the authorized officer after consultation with Federal, state, and North Slope Borough regulatory and resource agencies (as appropriate, based on agency legal authority and jurisdictional responsibility).
- c. A minimum distance of 500 feet between pipelines and roads shall be maintained. Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, alternative pipeline routes, designs and possible burial within the road will be considered by the authorized officer.

E-8 Best Management Practice

Objective: Minimize the impact of mineral materials mining activities on air, land, water, fish, and wildlife resources.

Requirement/Standard: Gravel mine site design and reclamation will be in accordance with a plan approved by the authorized officer. The plan shall be developed in consultation with appropriate Federal, State, and North Slope Borough regulatory and resource agencies and consider:

- a. Locations outside the active flood plain.
- b. Design and construction of gravel mine sites within active flood plains to serve as water reservoirs for future use.
- c. Potential use of the site for enhancing fish and wildlife habitat.
- d. Potential storage and reuse of sod/overburden for the mine site or at other disturbed sites on the North Slope.

E-9 Best Management Practice

Objective: Avoidance of human-caused increases in populations of predators of ground nesting birds.

Requirement/Standard:

- a. Lessee shall utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. The lessee shall provide the authorized officer with an annual report on the use of oil and gas facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites.
- b. Feeding of wildlife is prohibited and will be subject to noncompliance regulations.

E-10 Best Management Practice

Objective: Prevention of migrating waterfowl, including species listed under the Endangered Species Act, from striking oil and gas and related facilities during low light conditions.

Requirement/Standard: Illumination of all structures between August 1 and October 31 shall be designed to direct artificial exterior lighting inward and downward, rather than upward and outward, unless otherwise required by the Federal Aviation Administration.

E-11 Best Management Practice

Objective: Minimize the take of species, particularly those listed under the ESA and BLM Special Status Species, from direct or indirect interaction with oil and gas facilities.

Requirement/Standard: In accordance with the guidance below, before the approval of facility construction, aerial surveys of the following species shall be conducted within any area proposed for development.

Special Conditions in Spectacled and/or Steller's Eiders Habitats:

- a. Surveys shall be conducted by the lessee for at least 3 years before authorization of construction, if such construction is within the USFWS North Slope eider survey area and at least 1 year outside that area.
- a. Results of aerial surveys and habitat mapping may require additional ground nest surveys. Spectacled and/or Steller's eider surveys shall be conducted following accepted BLM-protocol. Information gained from these surveys shall be used to make infrastructure siting decisions as discussed in subparagraph b, below.

- b. If spectacled and/or Steller's eiders are determined to be present within the proposed development area, the applicant shall work with the USFWS and BLM early in the design process to site roads and facilities in order to minimize impacts to nesting and brood-rearing eiders and their preferred habitats. Such consultation shall address timing restrictions and other temporary mitigating measures, location of permanent facilities, placement of fill, alteration of eider habitat, aircraft operations, and management of high noise levels.
- c. To reduce the possibility of spectacled and/or Steller's eiders or other birds colliding with above-ground utility lines (power and communication), such lines shall either be buried in access roads or suspended on vertical support members except in rare cases which are to be few in number and limited in extent. Exceptions are limited to the following situations, and must be reported to the USFWS when exceptions are authorized:
 - 1. Overhead power or communication lines may be allowed when located entirely within the boundaries of a facility pad;
 - 2. Overhead power or communication lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a vertical support member; or
 - 3. Overhead power or communication lines may be allowed in situations when human safety would be compromised by other methods.
- d. To reduce the likelihood of spectacled and/or Steller's eiders or other birds colliding with communication towers, towers should be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures, and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers, radio antennas, and other similar facilities, should be avoided to the extent practicable. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low flying birds. Such markings shall be developed through consultation with the USFWS.

Special Conditions in Yellow-billed Loon Habitats:

- e. Aerial surveys shall be conducted by the lessee for at least 3 years before authorization of construction of facilities proposed for development which are within 1 mile of a lake 25 acres or larger in size. These surveys along shorelines of large lakes shall be conducted following accepted BLM protocol during nesting in late June and during brood rearing in late August.
- f. Should yellow-billed loons be present, the design and location of facilities must be such that disturbance is minimized. The default standard mitigation is a 1-mile buffer around all recorded nest sites and a minimum 1,625-foot (500-meter) buffer around the remainder of the shoreline. Development will generally be prohibited within buffers unless no other option exists.

Protections for Birds

- g. To reduce the possibility of birds colliding with above-ground utility lines (power and communication), such lines shall either be buried in access roads or suspended on vertical support members except in rare cases, which are to be few in number and limited in extent. Exceptions are limited to the following situations:
 - 1. Overhead power or communication lines may be allowed when located entirely within the boundaries of a facility pad;

2. Overhead power or communication lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a vertical support member; or
 3. Overhead power or communication lines may be allowed in situations when human safety would be compromised by other methods.
- h. To reduce the likelihood of birds colliding with communication towers, towers should be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures, and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers, radio antennas, and other similar facilities, should be avoided to the extent practicable. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low-flying birds. Such markings shall be developed through consultation with the USFWS.

E-12 Best Management Practice

Objective: Use ecological mapping as a tool to assess wildlife habitat before development of permanent facilities to conserve important habitat types during development.

Requirement/Standard: An ecological land classification map of the development area shall be developed before approval of facility construction. The map will integrate geomorphology, surface form, and vegetation at a scale, level of resolution, and level of positional accuracy adequate for detailed analysis of development alternatives. The map shall be prepared in time to plan one season of ground-based wildlife surveys, if deemed necessary by the authorized officer, before approval of the exact facility location and facility construction.

E-13 Best Management Practice

Objective: Protect cultural and paleontological resources.

Requirement/Standard: Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee or their designated representative shall notify the authorized officer and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer.

E-14 Best Management Practice

Objective: Ensure the passage of fish at stream crossings.

Requirement/Standard: To ensure that crossings provide for fish passage, all proposed crossing designs shall adhere to the best management practices outlined in “Stream Crossing Design Procedure for Fish Streams on the North Slope Coastal Plain” by McDonald et al. (1994), “Fundamentals of Culvert Design for Passage of Weak-Swimming Fish” by Behlke et al. (1991), and other generally accepted best management procedures prescribed by the authorized officer. To adhere to these best management practices, at least 3 years of hydrologic and fish data shall be collected by the lessee for any proposed crossing of a stream whose structure is designed to occur, wholly or partially, below the stream’s ordinary high watermark. These data shall include, but are not limited to, the range of water levels (highest and lowest) at the location of the planned crossing, and the seasonal distribution and composition of fish populations using the stream.

E-15 Best Management Practice

Objective: Prevent or minimize the loss of nesting habitat for cliff nesting raptors.

Requirement/Standard:

- a. Removal of greater than 100 cubic yards of bedrock outcrops, sand, and/or gravel from cliffs shall be prohibited.
- b. Any extraction of sand and/or gravel from an active river or stream channel shall be prohibited unless preceded by a hydrological study that indicates no potential impact by the action to the integrity of the river bluffs.

E-16 Best Management Practice

Objective: Prevent or minimize the loss of raptors due to electrocution by power lines.

Requirement/Standard: Comply with the most up-to-date industry-accepted suggested practices for raptor protection on power lines. Current accepted standards were published in *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* by the Avian Power Line Interaction Committee and are updated as needed.

E-17 Best Management Practice

Objective: Manage permitted activities to meet Visual Resource Management class objectives described below.

- a. Class I: Natural ecological changes and very limited management activity are allowed. The level of change to the characteristic landscape should be very low and must not attract attention.
- b. Class II: The level of change to the characteristic landscape should be low. Management activities may be seen, but should not dominate the view of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- c. Class III: The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- d. Class IV: The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize impacts through location and design by repeating form, line, color, and texture.

Requirement/Standard: At the time of application for construction of permanent facilities, the lessee/permittee shall, after consultation with the authorized officer, submit a plan to best minimize visual impacts, consistent with the Visual Resource Management class for the lands on which facilities would be located. A photo simulation of the proposed facilities may be a necessary element of the plan.

E-18 Best Management Practice

Objective: Avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests.

Requirement/Standard: Ground-level activity (by vehicle or on foot) within 200 meters of occupied Steller's and/or spectacled eider nests, from June 1 through August 15, will be

restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied Steller's and/or spectacled eider nests will be prohibited. In instances where summer (June 1 through August 15) support/construction activity must occur off existing thoroughfares, USFWS-approved nest surveys must be conducted during mid-June prior to the approval of the activity. Collected data will be used to evaluate whether the action could occur based on employment of a 200-meter buffer around nests or if the activity would be delayed until after mid-August once ducklings are mobile and have left the nest site. Also, in cases in which oil spill response training is proposed to be conducted within 200 meters of shore in riverine, marine, or inter-tidal areas, the BLM will work with the USFWS to schedule the training at a time that is not a sensitive nesting/brood-rearing period or require that nest surveys be conducted in the training area prior to the rendering a decision on approving the training. The protocol and timing of nest surveys for Steller's and/or spectacled eiders will be determined in cooperation with the USFWS, and must be approved by the USFWS. Surveys should be supervised by biologists who have previous experience with Steller's and/or spectacled eider nest surveys.

E-19 Best Management Practice

Objective: Provide information to be used in monitoring and assessing wildlife movements during and after construction.

Requirement/Standard: A representation, in the form of ArcGIS-compatible shape-files, of all new infrastructure construction shall be provided to the authorized officer. During the planning and permitting phase, shape-files representing proposed locations shall be provided. Within 6 months of construction completion, shape-files (within GPS accuracy) of all new infrastructure shall be provided. Infrastructure includes all gravel roads and pads, facilities built on pads, pipelines and independently constructed powerlines (as opposed to those incorporated in pipeline design). Gravel pads shall be included as polygon feature. Roads, pipelines, and powerlines may be represented as line features but must include ancillary data to denote width, number pipes, etc. Poles for power lines may be represented as point features. Ancillary data shall include construction beginning and ending dates.

Use of Aircraft for Permitted Activities

F-1 Best Management Practice

Objective: Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.

Requirement/Standard: The lessee shall ensure that aircraft used for permitted activities maintain altitudes according to the following guidelines. (Note: This best management practice is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objectives of the stipulations and best management practices. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.):

- a. Aircraft shall maintain an altitude of at least 1,500 feet above ground level when within ½ mile of cliffs identified as raptor nesting sites from April 15 through August 15 and an altitude of at least 1,500 feet above ground level when within ½ mile of known gyrfalcon nest sites from March 15 to August 15, unless doing so would endanger human life or violate safe flying practices. Permittees shall obtain information from the BLM necessary to plan flight routes when routes may go near falcon nests.

- b. Aircraft shall maintain an altitude of at least 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, unless doing so would endanger human life or violate safe flying practices. Caribou wintering areas will be defined annually by the authorized officer. The BLM will consult directly with the Alaska Department of Fish and Game in annually defining caribou winter ranges.
- c. Land user shall submit an aircraft use plan as part of an oil and gas exploration or development proposal. The plan shall address strategies to minimize impacts to subsistence hunting and associated activities, including but not limited to the number of flights, type of aircraft, and flight altitudes and routes, and shall also include a plan to monitor flights. Proposed aircraft use plans should be reviewed by appropriate Federal, state, and borough agencies. Consultations with these same agencies will be required if unacceptable disturbance is identified by subsistence users. Adjustments, including possible suspension of all flights, may be required by the authorized officer if resulting disturbance is determined to be unacceptable. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies should be limited to the maximum extent possible. During the design of proposed oil and gas facilities, larger landing strips and storage areas should be considered to allow larger aircraft to be employed, resulting in fewer flights to the facility.
- d. Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou and moose hunting) should be kept to a minimum.
- e. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level (except for takeoffs and landings) over the Teshekpuk Lake Caribou Habitat Area (Map 2) from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices. Aircraft use (including fixed wing and February 2013 helicopter) by oil and gas lessees in the Goose Molting Area (Map 2) should be minimized from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices.
- f. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level (except for takeoffs and landings) over the Utukok River Uplands Special Area (Map 2) from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices.
- g. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. If wildlife begins to run as an aircraft approaches, the aircraft is too close and must break away.
- h. Fixed wing aircraft used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 2,000 feet when within a ½-mile of walrus haulouts, unless doing so would endanger human life or violate safe flying practices. Helicopters used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 3,000 feet and a 1-mile buffer from walrus haulouts, unless doing so would endanger human life or violate safe flying practices.
- i. Aircraft used as part of a BLM-authorized activity along the coast and shore fast ice zone shall maintain minimum altitude of 3,000 feet when within 1 mile from aggregations of seals, unless doing so would endanger human life or violate safe flying practices.

Oil Field Abandonment

G-1 Lease Stipulation

Objective: Ensure long-term reclamation of land to its previous condition and use.

Requirement/Standard: Prior to final abandonment, land used for oil and gas infrastructure—including but not limited to well pads, production facilities, access roads, and airstrips—shall be reclaimed to ensure eventual restoration of ecosystem function. The leaseholder shall develop and implement an abandonment and reclamation plan approved by the BLM. The plan shall 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, vegetative, and habitat condition. The BLM may grant exceptions to satisfy stated environmental or public purposes.

Subsistence Consultation for Permitted Activities

H-1 Best Management Practice

Objective: Provide opportunities for participation in planning and decision making to prevent unreasonable conflicts between subsistence uses and other activities.

Requirement/Standard: Lessee/permittee shall consult directly with affected communities using the following guidelines:

- a. Before submitting an application to the BLM, the applicant shall consult with directly affected subsistence communities, the North Slope Borough, and the NPR-A Subsistence Advisory Panel to discuss the siting, timing, and methods of their proposed operations to help discover local traditional and scientific knowledge, resulting in measures that minimize impacts to subsistence uses. Through this consultation, the applicant shall make every reasonable effort, including such mechanisms as conflict avoidance agreements and mitigating measures, to ensure that proposed activities will not result in unreasonable interference with subsistence activities.
- b. In the event that no agreement is reached between the parties, the authorized officer shall consult with the directly involved parties and determine which activities will occur, including the timeframes. The applicant shall submit documentation of consultation efforts as part of its operations plan.
- c. Applicants should submit the proposed plan of operations to the NPR-A Subsistence Advisory Panel for review and comment. The applicant must allow time for the BLM to conduct formal government-to-government consultation with Native Tribal governments if the proposed action requires it.
- d. A plan shall be developed that shows how the activity, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The plan will also describe the methods used to monitor the effects of the activity on subsistence use. The plan shall be submitted to the BLM as part of the plan of operations and should address the following items:
 1. A detailed description of the activity(ies) to take place (including the use of aircraft).
 2. A description of how the lessee/permittee will minimize and/or deal with any potential impacts identified by the authorized officer during the consultation process.

3. A detailed description of the monitoring effort to take place, including process, procedures, personnel involved and points of contact both at the work site and in the local community.
 4. Communication elements to provide information on how the applicant will keep potentially affected individuals and communities up-to-date on the progress of the activities and locations of possible, short-term conflicts (if any) with subsistence activities. Communication methods could include holding community meetings, open house meetings, workshops, newsletters, radio and television announcements, etc.
 5. Procedures necessary to facilitate access by subsistence users to the permittees' area of activity or facilities during the course of conducting subsistence activities.
- e. During development, monitoring plans must be established for new permanent facilities, including pipelines, to assess an appropriate range of potential effects on resources and subsistence as determined on a case-by-case basis given the nature and location of the facilities.
 - f. The scope, intensity, and duration of such plans will be established in consultation with the authorized officer and NPR-A Subsistence Advisory Panel.
 - g. Permittees that propose barging facilities, equipment, supplies, or other materials to NPR-A in support of oil and gas activities in the NPR-A shall notify, confer, and coordinate with the Alaska Eskimo Whaling Commission, the appropriate local community whaling captains' associations, and the North Slope Borough to minimize impacts from the proposed barging on subsistence whaling activities.
 - h. Barge operators requiring a BLM permit are required to demonstrate that barging activities will not have unmitigable adverse impacts on the availability of marine mammals to subsistence hunters.
 - i. All vessels over 50 ft. in length engaged in operations requiring a BLM permit must have an Automatic Identification System (AIS) transponder system on the vessel.

H-2 Best Management Practice

Objective: Prevent unreasonable conflicts between subsistence activities and geophysical (seismic) exploration.

Requirement/Standard: In addition to the consultation process described in Best Management Practice H-1 for permitted activities, before activity to conduct geophysical (seismic) exploration commences, applicants shall notify the local search and rescue organizations of proposed seismic survey locations for that operational season. For the purpose of this standard, a potentially affected cabin/campsite is defined as any camp or campsite used for subsistence purposes and located within the boundary of the area subject to proposed geophysical exploration and/or within 1 mile of actual or planned travel routes used to supply the seismic operations while it is in operation.

- a. Because of the large land area covered by typical geophysical operations and the potential to impact a large number of subsistence users during the exploration season, the permittee/operator will notify all potentially affected subsistence-use cabin and campsite users.
- b. The official recognized list of subsistence-use cabin and campsite users is the North Slope Borough's most current inventory of cabins and campsites, which have been identified by the subsistence users' names.

- c. A copy of the notification, a map of the proposed exploration area, and the list of potentially affected users shall also be provided to the office of the appropriate Native Tribal government.
- d. The authorized officer will prohibit seismic work within 1 mile of any known subsistence-use cabin or campsite unless an alternate agreement between the cabin/campsite owner/user is reached through the consultation process and presented to the authorized officer. (Regardless of the consultation outcome, the authorized officer will prohibit seismic work within 300 feet of a known subsistence-use cabin or campsite.)
- e. The permittee shall notify the appropriate local search and rescue (e.g., Nuiqsut Search and Rescue, Atqasuk Search and Rescue) of their current operational location within the NPR-A on a weekly basis. This notification should include a map indicating the current extent of surface use and occupation, as well as areas previously used/occupied during the course of the operation in progress. The purpose of this notification is to allow hunters up-to-date information regarding where seismic exploration is occurring, and has occurred, so that they can plan their hunting trips and access routes accordingly. Identification of the appropriate search and rescue offices to be contacted can be obtained from the coordinator of the NPR-A Subsistence Advisory Panel in the BLM's Arctic Field Office.

H-3 Best Management Practice

Objective: Minimize impacts to sport hunting and trapping species and to subsistence harvest of those animals.

Requirement/Standard: Hunting and trapping by lessee's/permittee's employees, agents, and contractors are prohibited when persons are on "work status." Work status is defined as the period during which an individual is under the control and supervision of an employer. Work status is terminated when the individual's shift ends and he/she returns to a public airport or community (e.g., Fairbanks, Barrow, Nuiqsut, or Deadhorse). Use of lessee/permittee facilities, equipment, or transport for personal access or aid in hunting and trapping is prohibited.

Orientation Programs Associated with Permitted Activities

I-1 Best Management Practice

Objective: Minimize cultural and resource conflicts.

Requirement/Standard: All personnel involved in oil and gas and related activities shall be provided information concerning applicable stipulations, best management practices, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. The lessee/permittee shall ensure that all personnel involved in permitted activities shall attend an orientation program at least once a year. The proposed orientation program shall be submitted to the authorized officer for review and approval and should:

- a. Provide sufficient detail to notify personnel of applicable stipulations and best management practices as well as inform individuals working on the project of specific types of environmental, social, traditional and cultural concerns that relate to the region.
- b. Address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals, and provide guidance on how to avoid disturbance.

- c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species.
- d. Be designed to increase sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which personnel will be operating.
- e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.
- f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. Of special concern is aircraft use near traditional subsistence cabins and campsites, flights during spring goose hunting and fall caribou and moose hunting seasons, and flights near North Slope communities.
- g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site.
- h. Include on-site records of all personnel who attend the program for so long as the site is active, though not to exceed the 5 most recent years of operations. This record shall include the name and dates(s) of attendance of each attendee.
- i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans.
- j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel.
- k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. This training should be offered to the North Slope Borough Health Department for review and comment.
- l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities. This training should be offered to the North Slope Borough Health Department for review and comment.

Endangered Species Act—Section 7 Consultation Process

J. The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or to have some other special status. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that will contribute to the need to list such a species or their habitat. The BLM may require modifications to or disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. The BLM will not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, including completion of any required procedure for conference or consultation.

Additional Protections that Apply in Select Biologically Sensitive Areas

K-1 Lease Stipulation/Best Management Practice – Rivers

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing in the respective alternatives, K-1 would be a best management practice. The decision indicated below in subparagraphs (a) and (d) modify Protection 1 of the Colville River Special Area Management Plan by widening its applicability to 2 miles.

Objective: Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.

Requirement/Standard: Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below at the distances identified. (Gravel mines may be located within the active floodplain consistent with Best Management Practice E-8). On a case-by case basis, and in consultation with Federal, state, and North Slope Borough regulatory and resource agencies (as appropriate, based on agency legal authority and jurisdictional responsibility), essential pipeline and road crossings to the main channel will be permitted through setback areas. The below setbacks may not be practical within river deltas; in such deltas, permanent facilities shall be designed to withstand a 200-year flood event. In the below list, if no upper limit for the setback is indicated, the setback extends to the head of the stream as identified in the National Hydrography Dataset.

- a. **Colville River:** A 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville River as determined by cadastral survey to be the highest high watermark on the left (western or northern) bank and from both banks' ordinary high watermark where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to its source at the juncture of Thunder and Storm creeks the setback will be ½ mile. Note: The planning area excludes conveyed Native lands along the lower reaches of the Colville River. Development of road crossings intended to support oil and gas activities shall be consolidated with other similar projects and uses to the maximum extent possible. Note: This provision does not apply to intercommunity or other permanent roads constructed with public funds for general transportation purposes, though the BLM would encourage minimal use of the setback area. This preserves the opportunity to plan, design, and construct public transportation systems to meet the economic, transportation, and public health and safety needs of the State of Alaska and/or communities within NPR-A.
- b. **Ikpikpuk River:** A 2-mile setback from of the ordinary high watermark of the Ikpiuk River extending from the mouth upstream through T7 N, R11W, U.M.; above that the setback would be for 1 mile to the confluence of the Kigalik River and Maybe Creek.
- c. **Miguakiak River:** A ½-mile setback from the ordinary high watermark.
- d. **Kikiakrorak and Kogosukruk Rivers:** A 2-mile setback from the top of the bluff (or ordinary high watermark if there is no bluff) on the Kikiakrorak River downstream from T2N., R4W, U.M. and on the Kogosukruk River (including Branch of Kogosukruk River, Henry Creek, and two unnamed tributaries off the southern bank) downstream from T2N, R3W, U.M. The setback from these streams in the named townships and further upstream as applicable will be a ½-mile from the top of the bluff or bank if there is no bluff.
- e. **Fish Creek:** A 3-mile setback from the highest high watermark of the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a ½-mile setback from the bank's highest high watermark farther upstream.
- f. **Judy Creek:** A ½-mile setback from the ordinary high watermark.

- g. **Ublutuoch (Tiḡmiaqsiugvik) River:** A ½-mile setback from the ordinary high water mark.
- h. **Alaktak River:** A 1-mile setback from the ordinary high water mark.
- i. **Chipp River:** A 1-mile setback from the ordinary high water mark.
- j. **Oumalik River:** A ½-mile setback from the Oumalik River ordinary high water mark from the mouth upstream to section 5, T8N, R14W, U.M., and a ½ mile setback in and above section 5, T8N, R14W, U.M.
- k. **Titaluk River:** A 2-mile setback from the ordinary high water mark from its confluence with the Ikpiḡpuk River upstream through T7N, R12W, U.M.; above that point the setback would be ½-mile from the ordinary high water mark.
- l. **Kigalik River:** A ½-mile setback from the ordinary high water mark.
- m. **Maybe Creek:** A ½-mile setback from the ordinary high water mark.
- n. **Topagoruk River:** A 1-mile setback from the ordinary high water mark.
- o. **Ishuktak Creek:** A ½-mile setback from the ordinary high water mark.
- p. **Meade River:** A 1-mile setback from the ordinary high water mark on BLM-managed lands.
- q. **Usuktuk River:** A 1-mile setback from the ordinary high water mark on BLM-managed lands.
- r. **Pikroka Creek:** A ½-mile setback from the ordinary high water mark.
- s. **Nigisaktuvik River:** A 1-mile setback from the ordinary high water mark.
- t. **Inaru River:** A 1-mile setback from the ordinary high water mark.
- u. **Kucheak Creek:** A ½-mile setback from the ordinary high water mark.
- v. **Avalik River:** A 1-mile setback from the ordinary high water mark.
- w. **Niklavik Creek:** A ½-mile setback from the ordinary high water mark.
- x. **Kugrua River:** A ½-mile setback from the ordinary high water mark.
- y. **Kungok River:** A 1-mile setback from the ordinary high water mark on BLM-managed lands.
- z. **Kolipsun Creek:** A ½-mile setback from the ordinary high water mark upstream through T13N, R28W, U.M.
- aa. **Maguriak Creek:** A ½-mile setback from the ordinary high water mark upstream through T12N, R29W, U.M.
- ab. **Mikigealiak River:** A ½-mile setback from the ordinary high water mark upstream through T12N, R30W, U.M.
- ac. **Kuk River:** A 1-mile setback from the ordinary high water mark on BLM-managed lands.
- ad. **Ketik River:** A 1-mile setback from the ordinary high water mark.
- ae. **Kaolak River:** A 1-mile setback from the ordinary high water mark.
- af. **Ivisaruk River:** A 1-mile setback from the ordinary high water mark.
- ag. **Nokotlek River:** A ½-mile setback from the ordinary high water mark.
- ah. **Ongorakvik River:** A ½-mile setback from the ordinary high water mark.
- Ai. **Tunalik River:** A ½-mile setback from the ordinary high water mark.
- Aj. **Avak River:** A ½-mile setback from the ordinary high water mark within the NPR-A.
- ak. **Nigu River:** A ½-mile setback from the ordinary high water mark from the confluence with the Etivluk River upstream to the boundary of NPR-A.
- al. **Etivluk River:** A ½-mile setback from the ordinary high water mark.
- am. **Iḡnavik River:** A ½-mile setback from the ordinary high water mark.

- an. **Kuna River:** A ½-mile setback from the ordinary high water mark.
- ao. **Kiligwa River:** A ½-mile setback from the ordinary high water mark.
- ap. **Nuka River:** A ½-mile setback from the ordinary high water mark.
- aq. **Driftwood Creek:** A ½-mile setback from the ordinary high water mark.
- ar. **Utukok River:** A 1-mile setback from the ordinary high water mark within the NPR-A.
- as. **Awuna River:** A ½-mile setback from the ordinary high water mark.
- at. **Carbon Creek:** A ½-mile setback from the ordinary high water mark.
- au. **Kokolik River:** A 1-mile setback from the ordinary high water mark within the NPR-A.
- av. **Keolok Creek:** A ½-mile setback from the ordinary high water mark.

The decisions in subparagraphs K-1(a) and K-1(d) modify Colville River Management Plan Protection 1 by widening the setback in that measure to 2 miles. Protection 1 thus is modified to the following:

Colville River Special Area Management Plan-Protection 1

Objective: Minimize the loss of arctic peregrine falcon nesting habitat in the Colville River Special Area.

Requirement/Standard: To minimize the direct loss of arctic peregrine falcon nesting habitat and to protect nest sites in the Colville River Special Area the following protective measures apply: Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited in the stream bed and adjacent to the rivers listed below at the distances identified. On a case-by-case basis, and in consultation with Federal, state, and North Slope Borough regulatory and resource agencies (as appropriate; based on agency legal authority and jurisdictional responsibility), essential pipeline and road crossings perpendicular to the main channel will be permitted through setback areas.

- a. Colville River: Downstream of the Etivluk River a continuous 2-mile setback measured from the highest high watermark on the left bank (facing downstream); upstream of the Etivluk River a 2-mile setback measured from the ordinary high watermark of the bank on both sides of the river. Development of road crossings intended to support oil and gas activities shall be consolidated with other similar projects and uses to the maximum extent possible. This provision does not apply to intercommunity or other permanent roads constructed with public funds for general transportation purposes.
- b. Kikiakrorak River: Downstream from T2N, R4W, U.M., a continuous 2-mile setback as measured from the top of the bluff (or bank if there is no bluff) of both sides of the river.
- c. Kogosukruk River: Downstream from T2N, R3W, U.M., a continuous 2-mile setback as measured from the top of the bluff (or bank if there is no bluff) of both sides of the river and several of its tributaries.

K-2 Lease Stipulation/Best Management Practice – Deep Water Lakes

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-2 would be a best management practice.

Objective: Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deep water lakes; the loss of spawning, rearing or over wintering habitat for fish; the loss of cultural and paleontological resources; impacts to subsistence cabin and campsites; and the disruption of subsistence activities.

Requirement/Standard: Generally, permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited on the lake or lakebed and within ¼ mile of the ordinary high water mark of any deep lake as determined to be in lake zone III (i.e., depth greater than 13 feet [4 meters]; Mellor 1985). On a case-by-case basis in consultation with federal, State and North Slope Borough regulatory and resource agencies (as appropriate based on agency legal authority and jurisdictional responsibility), essential pipeline(s), road crossings, and other permanent facilities may be considered through the permitting process in these areas where the lessee can demonstrate on a site-specific basis that impacts will be minimal.

K-3 Best Management Practice – Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon, and their associated Islands

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-3 will apply as a best management practice.

Objective: Protect fish and wildlife habitat (including, but not limited to, that for waterfowl and shorebirds, caribou insect-relief, and marine mammals), preserve air and water quality, and minimize impacts to subsistence activities and historic travel routes on the major coastal waterbodies.

Requirement/Standard (Development): With the exception of linear features such as pipelines, no permanent oil and gas facilities are permitted on or under the water within ¾ mile seaward of the shoreline (as measured from mean high tide) of the major coastal waterbodies or the natural coastal islands (to the extent that the seaward subsurface is within NPR-A).

Elsewhere, permanent facilities within the major coastal waterbodies will only be permitted on or under the water if they can meet all the following criteria:

- a. Design and construction of facilities shall minimize impacts to subsistence uses, travel corridors, seasonally concentrated fish and wildlife resources.
- b. Daily operational activities, including use of support vehicles, watercraft, and aircraft traffic, alone or in combination with other past, present, and reasonably foreseeable activities, shall be conducted to minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources.
- c. The location of oil and gas facilities, including artificial islands, platforms, associated pipelines, ice or other roads, bridges or causeways, shall be sited and constructed so as to not pose a hazard to navigation by the public using traditional high-use subsistence-related travel routes into and through the major coastal waterbodies as identified by the North Slope Borough.
- d. Demonstrated year-round oil spill response capability, including the capability of adequate response during periods of broken ice or open water, or the availability of alternative methods to prevent well blowouts during periods when adequate response capability cannot be demonstrated. Such alternative methods may include seasonal drilling restrictions, improvements in blowout prevention technology, equipment and/or changes in operational procedures, and “top-setting” of hydrocarbon-bearing zones.
- e. Reasonable efforts will be made to avoid or minimize impacts related to oil spill response activities, including vessel, aircraft, and pedestrian traffic that add to impacts or further compound “direct spill” related impacts on area resources and subsistence uses.
- f. Before conducting open water activities, the permittee shall consult with the Alaska Eskimo Whaling Commission and the North Slope Borough to minimize impacts to the fall and spring subsistence whaling activities of the communities of the North Slope.

K-4a Best Management Practice – Goose Molting Area

Note: Except for less than 10,000 acres east of the mouth of the Ikpikpuk River, new non-subsistence infrastructure would be prohibited in the goose molting area. None of the area is available for oil and gas leasing or exploratory drilling.

Objective: Minimize disturbance to molting geese and loss of goose molting habitat in and around lakes in the Goose Molting Area.

Requirement/Standard (General): Within the Goose Molting Area no permanent oil and gas facilities, except for pipelines, will be allowed within 1 mile of the shoreline of goose molting lakes. No waiver, exception, or modification will be considered. Prior to the permitting of a pipeline in the Goose Molting Area, a workshop will be convened to determine the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to Federal, state, and North Slope Borough representatives. In addition, only “in field” roads will be authorized as part of oil and gas field development.

Requirement/Standard (Development): In the Goose Molting Area, the following standards will be followed for permitted activities:

- a. Within the Goose Molting Area from June 15 through August 20, all off-pad activities and major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended (see also Best Management Practice K-5(d)), unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb molting geese during the period when geese are present.
- b. Water extraction from any lakes used by molting geese shall not alter hydrological conditions that could adversely affect identified goosefeeding habitat along lakeshore margins. Considerations will be given to seasonal use by operators (generally in winter) and geese (generally in summer), as well as recharge to lakes from the spring snowmelt.
- c. Oil and gas activities will avoid altering (i.e., damage or disturbance of soils, vegetation, or surface hydrology) critical goose-feeding habitat types along lakeshore margins (grass/sedge/moss) and salt marsh habitats.
- d. Permanent oil and gas facilities (including gravel roads, pads, and airstrips, but excluding pipelines) and material sites will be sited outside the identified buffers and restricted surface occupancy areas.
- e. Additional limits on development footprint apply.
- f. Between June 15 and August 20, within the Goose Molting Area, oil and gas facilities shall incorporate features (e.g., temporary fences, siting/orientation) that screen/shield human activity from view of any Goose Molting Area lake, as identified by the authorized officer in consultation with appropriate Federal, state, and North Slope Borough regulatory and resource agencies.
- g. Strategies to minimize ground traffic shall be implemented from June 15 through August 20. These strategies may include limiting trips, use of convoys, different vehicle types, etc. to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan.

- h. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
- i. Within the Goose Molting Area aircraft use (including fixed wing and helicopter) shall be restricted from June 15 through August 20 unless doing so endangers human life or violates safe flying practices. Restrictions may include: (1) limiting flights to two round-trips/week, and (2) limiting flights to corridors established by the BLM after discussions with appropriate Federal, state, and North Slope Borough regulatory and resource agencies. The permittee shall submit with the development proposal an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. Adjustments, including perhaps suspension of all aircraft use, will be required by the authorized officer if resulting disturbance is determined to be unacceptable. Note: This site-specific best management practice is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and best management practices. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.
- j. Any permit for development issued under this IAP/EIS will include a requirement for the permittee to conduct monitoring studies necessary to adequately determine consequences of development and any need for change to mitigations. Monitoring studies will be site- and development-specific within a set of over-arching guidelines developed by the BLM after conferring with appropriate Federal, state, North Slope Borough agencies. The study(ies) will include the construction period and will continue for a minimum of 3 years after construction has been completed and production has begun. The monitoring studies will be a continuation of evaluating the effectiveness of Best Management Practice K-4a's requirements in meeting the objective of K-4a and determine if any changes to the best management practice or any project specific mitigation(s) are necessary. If changes are determined to be necessary, the BLM, with the permittee and/or their representative, will conduct an assessment of the feasibility of altering development operation (e.g., reduced human activity, visibility barriers, noise abatement). Any changes determined necessary will be implemented prior to authorization of any new construction.

K-4b Best Management Practice – Brant Survey Area

Objective: Minimize the loss or alteration of habitat for, or disturbance of, nesting and brood rearing brant in the Brant Survey Area. None of the area is available for oil and gas leasing or exploratory drilling.

Requirement/Standard:

- a. Aerial surveys for brant nesting colonies and brood-rearing areas shall be conducted for a minimum of 2 years before authorization of construction of permanent facilities. At a minimum, the survey area shall include the proposed development site(s) (i.e., the footprint) and the surrounding ½-mile area. These surveys shall be conducted following accepted BLM protocol.
- b. Development may be prohibited or activities curtailed within ½-mile of all identified brant nesting colonies and brood-rearing areas identified during the 2-year survey.

K-5 Best Management Practice – Teshekpuk Lake Caribou Habitat Area

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-5 will apply as a best management practice. Portions of K-5 that apply to permanent infrastructure are only relevant to the portion of the Teshekpuk Lake Caribou Habitat Area available to application for such infrastructure, i.e., to those areas outside of the approximately 1.1 million acres near the lake where no new non-subsistence permanent infrastructure will be permitted.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements through portions the Teshekpuk Lake Caribou Habitat Area that are essential for all season use, including calving and rearing, insect-relief, and migration.

Requirement/Standard: In the Teshekpuk Lake Caribou Habitat Area the following standards will be applied to permitted activities:

- a. Before authorization of construction of permanent facilities (limited as they may be by surface occupancy restrictions established in this decision), the permittee shall design and implement and report a study of caribou movement unless an acceptable study(s) specific to the Teshekpuk Caribou Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Teshekpuk Caribou Herd movements and the study design shall be approved by the authorized officer in consultation with the appropriate Federal, state, and North Slope Borough wildlife and resource agencies. The study should provide information necessary to determine facility (including pipeline) design and location. Permittee may submit individual study proposals or they may combine with other permittees in the area to do a single, joint study for the entire Teshekpuk Lake Caribou Habitat Area. Study data may be gathered concurrently with other activities as approved by the authorized officer and in consultation with the appropriate Federal, State, and North Slope Borough wildlife and resource agencies. A final report of the study results will be prepared and submitted. Prior to the permitting of a pipeline in the Teshekpuk Lake Caribou Habitat Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife (specifically the Teshekpuk Caribou Herd) and subsistence resources. The workshop participants will include but will not be limited to Federal, state, and North Slope Borough representatives. All of these modifications will increase protection for caribou and other wildlife that utilize the Teshekpuk Lake Caribou Habitat Area during all seasons.
- b. Within the Teshekpuk Lake Caribou Habitat Area, permittee shall orient linear corridors when laying out oil and gas field developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities.
- c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required by the authorized officer, after consultation with appropriate Federal, state, and North Slope Borough regulatory and resource agencies, in the Teshekpuk Lake Caribou Habitat Area where pipelines potentially impede caribou movement.
- d. Major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended within Teshekpuk Lake Caribou Habitat Area from May 20 through August 20, unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb caribou during calving and insect-relief periods. If caribou arrive on the calving grounds prior to May 20, major construction activities will be suspended. The permittee shall submit with the

development proposal a “stop work” plan that considers this and any other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur during the life of fields in the region.

- e. The following ground and air traffic restrictions shall apply in the areas and time periods indicated. Ground traffic restrictions apply to permanent oil and gas-related roads:

1. Within the Teshekpuk Lake Caribou Habitat Area, from May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within ½ mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc., to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
2. The permittee or a contractor shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped:
 - a. temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation.
 - b. by direction of the authorized officer throughout a defined area for up to four weeks to prevent displacement of calving caribou.

The vehicle use plan shall also include a vehicle-use monitoring plan.

Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.

3. Major equipment, materials, and supplies to be used at oil and gas work sites in the Teshekpuk Lake Caribou Habitat Area shall be stockpiled prior to or after the period of May 20 through August 20 to minimize road traffic during that period.
4. Within the Teshekpuk Lake Caribou Habitat Area aircraft use (including fixed wing and helicopter) shall be restricted from May 20 through August 20 unless doing so endangers human life or violates safe flying practices. Authorized users of the NPR-A may be restricted from using aircraft larger than a Twin Otter, and limited to an average of one fixed-wing aircraft takeoff and landing per day per airstrip, except for emergency purposes. Restrictions may include prohibiting the use of aircraft larger than a Twin Otter by authorized users of the NPR-A, including oil and gas permittee, from May 20 through August 20 within the Teshekpuk Lake Caribou Habitat Area, except for emergency purposes. The permittee shall submit with the development proposal an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. Adjustments, including perhaps suspension of all aircraft use, will be required by the authorized officer if resulting disturbance is determined to be unacceptable. This best management practice is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and best management practices. However,

flights necessary to gain this information will be restricted to the minimum necessary to collect such data.

5. Aircraft shall maintain a minimum height of 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, and 2,000 feet above ground level over the Teshekpuk Lake Caribou Habitat Area from May 20 through August 20, unless doing so endangers human life or violates safe flying practices. Caribou wintering ranges will be defined annually by the authorized officer in consultation with the Alaska Department of Fish and Game. This best management practice is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and best management practices. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.

K-6 Lease Stipulation/Best Management Practice – Coastal Area

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing in the respective alternatives, K-6 would be a best management practice.

Objective: Protect coastal waters and their value as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals), minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears, and the summer shoreline habitat for walrus and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts to subsistence resources and activities.

Requirement/Standard:

- a. Exploratory well drill pads, production well drill pads, or a central processing facility for oil or gas would not be allowed in coastal waters or on islands between the northern boundary of the Reserve and the mainland, or in inland areas within one mile of the coast. (Note: This would include the entirety of the Kasegaluk Lagoon and Peard Bay Special Areas.) Other facilities necessary for oil and gas production within NPR-A that necessarily must be within this area (e.g., barge landing, seawater treatment plant, or spill response staging and storage areas) would not be precluded. Nor would this stipulation preclude infrastructure associated with offshore oil and gas exploration and production or construction, renovation, or replacement of facilities on existing gravel sites. Lessees/permittees shall consider the practicality of locating facilities that necessarily must be within this area at previously occupied sites such as various Husky/USGS drill sites and Distant Early Warning-Line sites. All lessees/permittees involved in activities in the immediate area must coordinate use of these new or existing sites with all other prospective users. Before conducting open water activities, the lessee shall consult with the Alaska Eskimo Whaling Commission, the North Slope Borough, and local whaling captains associations to minimize impacts to the fall and spring subsistence whaling activities of the communities of the North Slope. In a case in which the BLM authorizes a permanent oil and gas facility within the Coastal Area, the lessee/permittee shall develop and implement a monitoring plan to assess the effects of the facility and its use on coastal habitat and use.
- b. Marine vessels used as part of a BLM-authorized activity shall maintain a 1-mile buffer from the shore when transiting past an aggregation of seals (primarily spotted seals) using

a terrestrial haulout unless doing so would endanger human life or violate safe boating practices. Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast except when necessary for the safe operation of the vessel.

- c. Marine vessels used as part of a BLM-authorized activity shall maintain a ½-mile buffer from shore when transiting past an aggregation of walrus using a terrestrial haulout.

K-7 Lease Stipulation/Best Management Practice - Colville River Special Area

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-7 would be a best management practice.

Objective: Prevent or minimize loss of raptor foraging habitat (also see Lease Stipulation K-1).

Requirement/Standard: If necessary to construct permanent facilities within the Colville River Special Area, all reasonable and practicable efforts shall be made to locate permanent facilities as far from raptor nests as feasible. Additionally, within 15 miles of raptor nest sites, significant alteration of high quality foraging habitat shall be prohibited unless the lessee can demonstrate on a site-specific basis that impacts would be minimal. Of particular concern are ponds, lakes, wetlands, and riparian habitats. Note: On a case-by-case basis, and in consultation with appropriate federal and State regulatory and resource agencies, essential pipeline and road crossings will be permitted through the Colville River Special Area where no other feasible or prudent options are available.

K-8 Best Management Practice - Pik Dunes

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-8 will apply as a best management practice.

Objective: Retain unique qualities of the Pik Dunes, including geologic and scenic uniqueness, insect-relief habitat for caribou, and habitat for several uncommon plant species.

Requirement/Standard: Surface structures, except approximately perpendicular pipeline crossings and ice pads, are prohibited within the Pik Dunes.

K-9 Best Management Practice – Teshekpuk Lake Caribou Movement Corridor

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-9 will apply as a best management practice. All of the former movement corridor northwest of Teshekpuk Lake and all but the eastern-most part of the other corridor that lies north of the Kogru River are within an area prohibiting new non-subsistence infrastructure. Therefore, this best management practice only applies to the lands in the former corridor north of the Kogru River in Ts. 14-15 N., R. 2 W., U.M.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and rearing, insect-relief, and migration) in the area extending from the eastern shore of Teshekpuk Lake eastward to the Kogru River.

Requirement/Standard: Within the Teshekpuk Lake Caribou Movement Corridor, no permanent oil and gas facilities, except for pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed. Prior to the permitting of permanent oil and gas infrastructure in the Caribou Movement Corridor, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to Federal, state, and North Slope Borough representatives.

K-10 Best Management Practice – Southern Caribou Calving Area

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-10 will apply as a best management practice. All but the eastern-most part of the former Southern Caribou Calving Area lies within an area prohibiting new non-subsistence infrastructure. Therefore, this best management practice only applies to the lands in the former area T. 14 N., Rs. 1-2 W., U.M.; T. 14 N., R. 1 E., U.M; and T. 15 N., R. 2 W., U.M.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and post calving, and insect-relief) in the area south/southeast of Teshekpuk Lake.

Requirement/Standard: Within the Southern Caribou Calving Area, no permanent oil and gas facilities, except pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed. Prior to the permitting of permanent oil and gas infrastructure in the Southern Caribou Calving Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to Federal, state, and North Slope Borough representatives.

K-11 Lease Stipulation/Best Management Practice – Western Arctic Herd Habitat Area

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-11 would be a best management practice. Portions of K-11 that apply to permanent infrastructure are only relevant to the northern portion of the Utukok River Uplands Special Area available to application for such infrastructure.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements through the Utukok River Uplands Special Area that are essential for all season use, including calving and rearing, insect-relief, and migration.

Requirement/Standard: In the Utukok River Uplands Special Area the following standards will be applied to permitted activities:

- a. Before authorization of construction of permanent facilities, the lessee shall design and implement and report a study of caribou movement unless an acceptable study(s) specific to the Western Arctic Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Western Arctic Herd's movements and the study design shall be approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies and the Western Arctic Caribou Herd Working Group. The study should provide information necessary to determine facility (including pipeline) design and location. Lessees may submit individual study proposals or they may combine with other lessees in the area to do a single, joint study for the entire Utukok River Uplands Special Area. Study data may be gathered concurrently with other activities as approved by the authorized officer and in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies. A final report of the study results will be prepared and submitted. Prior to the permitting of a pipeline in the Utukok River Uplands Special Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife (specifically the Western Arctic Herd) and subsistence resources. The workshop participants will include but will not be limited to Federal, state, and North Slope Borough representatives. All of these

modifications will increase protection for caribou and other wildlife that utilize the Utukok River Uplands Special Area during all seasons.

- b. Within the Utukok River Uplands Special Area, lessees shall orient linear corridors when laying out oil and gas field developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities.
- c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required by the authorized officer, after consultation with appropriate federal, State, and North Slope Borough regulatory and resource agencies, in the Utukok River Uplands Special Area where pipelines potentially impede caribou movement.
- d. Major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended within Utukok River Uplands Special Area from May 20 through August 20, unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb caribou during calving and insect-relief periods. If caribou arrive on the calving grounds prior to May 20, major construction activities will be suspended. The lessee shall submit with the development proposal a “stop work” plan that considers this and any other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur during the life of fields in the region.
- e. The following ground and air traffic restrictions shall apply to permanent oil and gas-related roads in the areas and time periods indicated:
 1. Within the Utukok River Uplands Special Area, from May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within ½ mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc., to the extent practicable. The lessee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
 2. The lessee or a contractor shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped:
 - a) Temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. The lessee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation.
 - b) By direction of the authorized officer throughout a defined area for up to four weeks to prevent displacement of calving caribou.The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
 3. Major equipment, materials, and supplies to be used at oil and gas work sites in the Utukok River Uplands Special Area shall be stockpiled prior to or after the period of May 20 through August 20 to minimize road traffic during that period.

4. Within the Utukok River Uplands Special Area aircraft use (including fixed wing and helicopter) shall be restricted from May 20 through August 20 unless doing so endangers human life or violates safe flying practices. Authorized users of the NPR-A may be restricted from using aircraft larger than a Twin Otter, and limited to an average of one fixed-wing aircraft takeoff and landing per day per airstrip, except for emergency purposes. Restrictions may include prohibiting the use of aircraft larger than a Twin Otter by authorized users of the NPR-A, including oil and gas lessees, from May 20 through August 20 within the Utukok River Uplands Special Area, except for emergency purposes. The lessee shall submit with the development proposal an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. Adjustments, including perhaps suspension of all aircraft use, will be required by the authorized officer if resulting disturbance is determined to be unacceptable. This lease stipulation is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and best management practices. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.
5. Aircraft shall maintain a minimum height of 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, and 2,000 feet above ground level over the Utukok River Uplands Special Area from May 20 through August 20, unless doing so endangers human life or violates safe flying practices. Caribou wintering ranges will be defined annually by the authorized officer in consultation with the Alaska Department of Fish and Game. This lease stipulation is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and best management practices. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.

Summer Vehicle Tundra Access

L-1 Best Management Practice

Objective: Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.

Requirement/Standard: On a case-by-case basis, BLM may permit lowground-pressure vehicles to travel off of gravel pads and roads during times other than those identified in Best Management Practice C-2a. Permission for such use would only be granted after an applicant has:

- a. Submitted studies satisfactory to the authorized officer of the impacts on soils and vegetation of the specific low-ground-pressure vehicles to be used. These studies should reflect use of such vehicles under conditions similar to those of the route proposed for use and should demonstrate that the proposed use would have no more than minimal impacts to soils and vegetation.
- b. Submitted surveys satisfactory to the authorized officer of subsistence uses of the area as well as of the soils, vegetation, hydrology, wildlife and fish (and their habitats),

paleontological and archaeological resources, and other resources as required by the authorized officer.

- c. Designed and/or modified the use proposal to minimize impacts to the authorized officer's satisfaction. Design steps to achieve the objectives and based upon the studies and surveys may include, but not be limited to, timing restrictions (generally it is considered inadvisable to conduct tundra travel prior to August 1 to protect ground-nesting birds), shifting of work to winter, rerouting, and not proceeding when certain wildlife are present or subsistence activities are occurring. At the discretion of the authorized officer, the plan for summer tundra vehicle access may be included as part of the spill prevention and response contingency plan required by 40 CFR 112 (Oil Pollution Act) and Best Management Practice A-4.

General Wildlife and Habitat Protection

M-1 Best Management Practice

Objective: Minimize disturbance and hindrance of wildlife, or alteration of wildlife movements through the NPR-A.

Requirement/Standard: Chasing wildlife with ground vehicles is prohibited. Particular attention will be given to avoid disturbing caribou.

M-2 Best Management Practice

Objective: Prevent the introduction, or spread, of non-native, invasive plant species in the NPR-A.

Requirement/Standard: Certify that all equipment and vehicles (intended for use either off or on roads) are weed-free prior to transporting them into the NPR-A. Monitor annually along roads for non-native invasive species, and initiate effective weed control measures upon evidence of their introduction. Prior to operations in the NPR-A, submit a plan for the BLM's approval, detailing the methods for cleaning equipment and vehicles, monitoring for weeds and weed control.

M-3 Best Management Practice

Objective: Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.

Requirement/Standard: If a development is proposed in an area that provides potential habitat for a BLM Sensitive Plant Species, the development proponent would conduct surveys at appropriate times of the summer season and in appropriate habitats for the Sensitive Plant Species that might occur there. The results of these surveys will be submitted to the BLM with the application for development.

M-4 Best Management Practice

Objective: Minimize loss of individuals of, and habitat for, mammalian species designated as Sensitive by the BLM in Alaska.

Requirement/Standard: If a development is proposed in an area that provides potential habitat for the Alaska tiny shrew, the development proponent would conduct surveys at appropriate times of the year and in appropriate habitats in an effort to detect the presence of the shrew. The results of these surveys will be submitted to BLM with the application for development.

APPENDIX B:

MITIGATION PROGRAMS ADMINISTERED BY ENTITIES OTHER THAN THE BLM AND POTENTIALLY APPLICABLE IN THE NPR-A

TABLE B-1. Mitigation Programs Administered by Entities other than the BLM and Potentially Applicable in the NPR-A

Program	Program Purpose/Benefit	Funding Flow	Funding Use	Pros	Cons	Comments
NPR-A Grant Fund <i>Federal Revenue Sharing (50% to State of Alaska)</i>	<i>Priority: Provide impacted municipalities with grants to help plan for and mitigate adverse impacts related to oil and gas development in the NPR-A. (per 42 U.S.C. Chapter 78, Section 6506a and AS 37.05.530)</i>	<i>Developer to the BLM to State of Alaska to impacted NPR-A communities submitting grant applications (Nuiqsut, Barrow, Atkasuk, Wainwright, Anaktuvuk Pass, NSB)</i>	The State of Alaska provides funds to municipalities under (d) of this section, only for the following activities and services to alleviate the impact of the oil and gas development under 42 U.S.C. 6506a or former 42 U.S.C. 6508 within the NPR-A: 1) Planning; 2) Construction, maintenance, and operation of essential public facilities by the municipality; and, 3) Other necessary public services provided by the municipality. Examples of past Mitigation Grant Projects: City operations for NPR-A communities, Nuiqsut Natural Gas system, Youth Programs, NSB Police Officers, Wildlife Studies, Gravel for Coville River Access Road, Barrow Rec Center addition, Search and Rescue equipment	Designed to offset impacts to municipalities: infrastructure, services, and equipment	Funding may not be going to communities most acutely experiencing the impacts ^b (see footnote 'b') Favors entities with grant writing capabilities	Where the 'left-over' funds go ^a (see footnote 'a')
<i>Kuukpik Subsistence Mitigation Payments</i>	<i>Offset potential impacts to Nuiqsut subsistence hunters related to CPAI operations</i>	<i>CPAI to City of Nuiqsut; Local committee determines how it will be distributed</i>	<i>Payments to date have been used to provide fuel vouchers to hunters and payments to households and elders</i>	Stated purpose is to offset impacts to hunters. Local control over how distributed.	--	Non-public agreement between only CPAI and Kuukpik Corp.
<i>USACE 404 Permit Compensatory Mitigation</i>	<i>Offset impacts to wetlands as determined by USACE</i>	<i>Developer to approved mitigation bank or project directed by USACE</i>	<i>Conservation easements, land purchases, or remediation projects directed by USACE</i>	Can address multiple impacts: habitat for wildlife, birds, and fish; water quality; sedimentation & erosion	--	--
<i>Endangered Species Act Section 7 Funds</i>	Recover species listed under the ESA	Developer to entity identified in a Habitat Conservation Plan	Habitat protection and restoration, monitoring, research.	Actions may benefit other species	Only applies to endangered species	--

Program	Program Purpose/Benefit	Funding Flow	Funding Use	Pros	Cons	Comments
<i>Monitoring, Studies, and Stipulations</i>	<i>Baseline studies, required monitoring studies, and BLM oversight</i>	<i>CPAI to contractors conducting studies and annual funding to BLM</i>	<i>Labor equipment, and travel to support study work for compliance with permits; oversight monitoring by the BLM</i>	Supports effective implementation of minimizing impacts on-site	Not compensatory mitigation	--
<i>NSB Property Taxes/ City of Nuiqsut Taxes</i>	<i>Tax payments fund municipal government services to North Slope Borough and Nuiqsut</i>	<i>CPAI to NSB. Nuiqsut: Bed taxes to City of Nuiqsut.</i>	<i>NSB: Schools, health clinics, village public works (water, sewer, waste, roads), wildlife, planning, emergency response, etc.) City of Nuiqsut: local operations</i>	Increased revenue for NSB, and municipalities: operations, infrastructure, services, equipment	Not a compensatory mitigation program	--
<i>ANCSA Corporation Royalties</i>	<i>Revenue to ASRC and Kuukpik Corporation; 7i/7j^e sharing.</i>	<i>CPAI payments to ASRC and Kuukpik. ASRC revenue sharing per 7i/7j to other ANCSA Corporations.</i>	<i>Dividends to ANCSA corporation stakeholders, corporation operations, shareholder benefits, scholarships, etc.</i>	Economic benefits of oil and gas development	Not a compensatory mitigation program	--
<i>Project Spending and Economic Impact Multiplier</i>	<i>Statewide direct and indirect benefits: Jobs for Alaskans, work for Alaska businesses, severance taxes, TAPS benefits, etc.</i>	<i>CPAI contracts and subcontracts to Alaska businesses. Severance taxes: CPAI to State of Alaska</i>	<i>Supports State of Alaska Economy and State Government</i>	Economic benefits of oil and gas development	Not a compensatory mitigation program	--
<i>NSB Property Taxes/ City of Nuiqsut Taxes</i>	<i>Tax payments fund municipal government services to North Slope Borough and Nuiqsut</i>	<i>CPAI to NSB. Nuiqsut: Bed taxes to City of Nuiqsut.</i>	<i>NSB: Schools, health clinics, village public works (water, sewer, waste, roads), wildlife, planning, emergency response, etc.) City of Nuiqsut: local operations</i>	Increased revenue for NSB, and municipalities: operations, infrastructure, services, equipment	Not a compensatory mitigation program	--
<i>ANCSA Corporation Royalties</i>	<i>Revenue to ASRC and Kuukpik Corporation; 7i/7j^e sharing.</i>	<i>CPAI payments to ASRC and Kuukpik. ASRC revenue sharing per 7i/7j to other ANCSA Corporations.</i>	<i>Dividends to ANCSA corporation stakeholders, corporation operations, shareholder benefits, scholarships, etc.</i>	Economic benefits of oil and gas development	Not a compensatory mitigation program	--
<i>Project Spending and Economic Impact Multiplier</i>	<i>Statewide direct and indirect benefits: Jobs for Alaskans, work for Alaska businesses, severance taxes, TAPS benefits, etc.</i>	<i>CPAI contracts and subcontracts to Alaska businesses. Severance taxes: CPAI to State of Alaska</i>	<i>Supports State of Alaska economy and state government</i>	Economic benefits of oil and gas development	Not a compensatory mitigation program	--

^a **Regarding the disposition of funds if not granted** (from NPR-A Impact Grant Program (Federal Statutes (42 USC Chapter 78); Alaska Statutes (AS 37.05.530); Alaska Regulations (03 AAC 150)):

The provisions of this subsection apply to amounts received by the state under 42 U.S.C. 6506a(l) or former 42 U.S.C. 6508, as follows:

(1) amounts received and not appropriated for grants to municipalities under (d) of this section shall be deposited at the end of each fiscal year as follows:

- (A) 25 percent of amounts received by the state during that fiscal year under 42 U.S.C. 6506a(l) or former 42 U.S.C. 6508 to the principal of the Alaska permanent fund; and*
- (B) .5 percent of amounts received by the state during that fiscal year under 42 U.S.C. 6506a(l) or former 42 U.S.C. 6508 to the public school trust fund (AS 37.14.110);*
- (2) if, after making the grants under (d) of this section, the amounts remaining are insufficient to make payment in full of the deposits required by (1) (A) and (B) of this subsection, the deposits shall be allocated pro rata between the fund deposits;*
- (3) the amounts remaining after the making of payment of the deposits in full to the Alaska permanent fund and the public school trust fund under (2) of this subsection may be appropriated*
 - (A) first, to each of the funds described in (1)(A) and (B) of this subsection to recover amounts not paid to those funds on or after the effective date of this Act because of deficiencies in making the payments required by (2) of this subsection; and*
 - (B) after appropriations authorized by (A) of this paragraph, to the power cost equalization and rural electric capitalization fund (AS 42.45.100);*
- (4) the amounts remaining after any appropriation to the power cost equalization and rural electric capitalization fund shall lapse into the general fund for use by the state for the following facilities and services: planning; construction, maintenance, and operation of essential public facilities; and other necessary public services.*

^b **Regarding the BLM Niche** (from NPR-A Impact Grant Program (Federal Statutes (42 USC Chapter 78, 6506(a)(b))):
Activities undertaken pursuant to this Act shall include or provide for such conditions, restrictions, and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable and significantly adverse effects on the surface resources of the National Petroleum Reserve in Alaska.

APPENDIX C:

ECOLOGICAL RESOURCES, CONDITIONS, AND TRENDS

The NPR-A is located on the North Slope of Alaska. The total area of the NPR-A is 36,300 mi² (94,000 km²). The Northeastern region of the NPR-A consists of two ecoregions as defined by Omernik (1987): the Arctic Coastal Plain and the Arctic Foothills (Figure C-1). The Arctic Coastal Plain represents about 60% of the northeastern region, whereas the Arctic Foothills represents about 40% of the northeastern region. A summary of these ecoregions, as described in the North Slope Rapid Ecoregional Assessment (REA; Trammell et al. 2015), is provided in Table C-1.

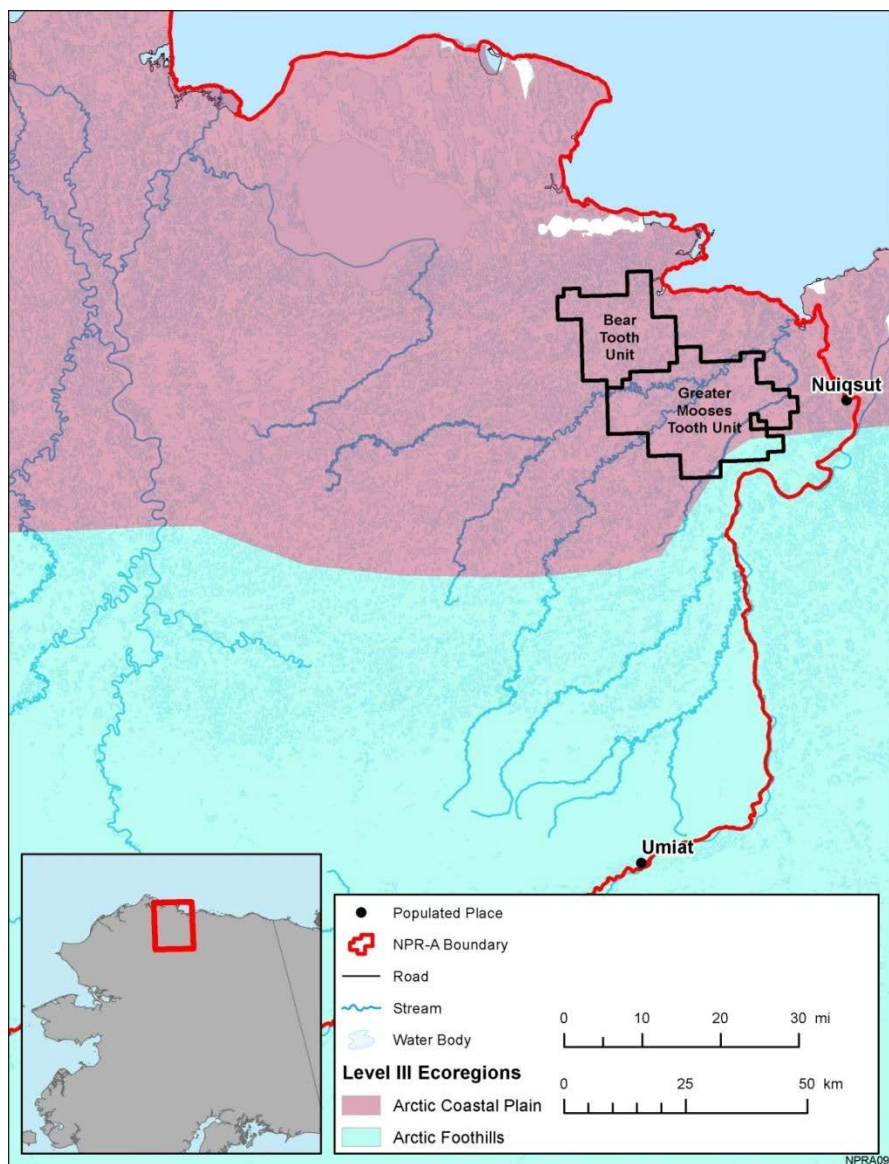


FIGURE C-1. Ecoregions of the Northeastern NPR-A

TABLE C-1. Summary of Level III Ecoregions in the NPR-A^a

Ecoregion Name	Description	Approximate Percentage in the NPR-A (%)	Approximate Percentage in the Northeastern NPR-A (%)
Arctic Coastal Plain	A low, gradually rising plain characterized by poor drainage, wetlands, and many lakes that cover up to 50% of the surface. The region has Arctic climate conditions and is underlain by thick, continuous permafrost.	41.3	60.5
Arctic Foothills	A transition between the flat, low-lying Arctic Coastal Plain to the north and the steep mountainous Brooks Range to the south. The region consists of rounded hills and plateaus. Drainage is better and more defined than the Arctic Coastal Plain, with less saturated soils and fewer lakes. Thick permafrost underlies the region.	49.3	39.5
Brooks Range	Gently rolling hills and broad exposed ridges that extend along the northern flank of the Brooks Range. Narrow valleys and glacial moraines and outwashes are interspersed among long, straight ridges and buttes composed of tightly folded sedimentary rock. A dry, polar climate dominates the region, although it is slightly warmer and wetter than the Coastal Plain. Permafrost is thick and continuous.	9.4	0 ^b

^a Distribution data source: Omerik (1987). Description source: North Slope REA (Trammell et al 2015).

^b The Brooks Range Ecoregion does not occur in the Northeastern NPR-A.

Previous NEPA evaluations have described the presence of ecological resources in the Northeastern NPR-A (e.g., BLM 2008, 2012, 2014). The presence and distribution of ecological resources in the NPR-A are largely related to the physical environment, such as climate, hydrology, and soils. As discussed in the IAP EIS for the Northeastern Planning Area of the NPR-A (BLM 2008), water resources in the region consist mainly of rivers, shallow discontinuous streams, lakes, and ponds (Figure C-2). Wetlands comprise more than 95% of the northeastern region and range from seasonally saturated to permanently flooded wetlands. Patterned oriented thaw lakes occur throughout much of the project area and Arctic Coastal Plain (BLM 2008, 2012). Wetland functions identified in the Alpine Satellite Development Plan Area include fish and wildlife habitat, production and export of organic matter, nutrient removal, sediment/toxicant retention, flood moderation, and sediment/shoreline stabilization (BLM 2008, 2012).

TABLE C-2. Vegetation Communities of the Northeastern NPR-A

Landcover Class	Characteristics	Percent of NPR-A^a	Percent of Northeastern NPR-A^b
Water	>80% water	9.4	21.4
Ice	≥60% ice	0.6	2.2
Clear water	Depth >3.3 ft (1 m) and no turbidity	5.0	10.8
Turbid water	Depth ≤3.3 ft (1 m) or turbid	3.8	8.4
Aquatic	>50% but <80% water and >4 in. (10 cm) deep	1.9	4.2
Water sedge	>15% water sedge	1.6	3.8
Pendent grass	>15% pendent grass	0.3	0.4
Flooded tundra	>25% but <50% water and <4 in. (10 cm) deep	6.0	9.2
Low centered polygons	≥5% sedge/grass	3.7	6.5
Non-patterned	<5% sedge/grass	2.3	2.7
Wet tundra	>10% but <25% water	4.4	5.0
Moist tundra	<10% water, <40% shrub (mostly sedges, grasses, rushes, and moss/peat/lichen)	31.2	40.8
Sedge/grass meadow	≥50% sedge/grass and <40% tussock cottongrass	5.2	10.1
Tussock tundra	≥40% tussock cottongrass	25.0	29.1
Moss/lichen	≥50% moss and/or lichen	1.0	1.6
Shrub	<5% water and >40% shrub	44.1	17.3
Dwarf	≤12 in. (30 cm) in height	40.4	15.5
Low	>12 in. (30 cm) but <4.9 ft (1.5 m) in height	3.7	1.7
Tall	≥4.9 ft (1.5 m) in height	0.01	0.1
Barren ground	0–30% vegetation	2.7	2.2
Sparsely vegetated	10–30% vegetated	1.3	0.5
Dunes/dry sand	<10% vegetation and <10% wet sand, mud, or rock	0.3	0.7
Other	<10% vegetation and ≥10% wet sand, mud, or rock	1.1	1.0

^a Source: BLM 2012.

^b Source: BLM 2008.

There are many species of fish, birds, and mammals that reside in the Northeastern NPR-A throughout all or parts of the year. Many of these species are important for their subsistence uses. A summary of fish and wildlife species that could occur in areas available for oil and gas leasing or that may be affected by oil and gas operations enabled or assisted by the development of GMT1 (based on the reasonably foreseeable development scenario presented in Section 2.2) is provided in Table C-3. This table includes species important for their subsistence uses and sensitive or rare species (e.g., those listed under the Endangered Species Act).

TABLE C-3. Summary of Fish and Wildlife Resources in the RMS Region^a

Fish and Wildlife Species	Status	Potential for Residual Impacts from the Reasonably Foreseeable Development Scenario?^b
Arctic cisco (<i>Coregonus autumnalis</i>)	Key subsistence species in the region	Maybe – Minor impacts may occur, including injury at water use intakes, physical habitat changes, pollution, and barriers to fish movement.
Arctic grayling (<i>Thymallus arcticus</i>)	Key subsistence species in the region	Maybe – Minor impacts may occur, including injury at water use intakes, physical habitat changes, pollution, and barriers to fish movement.
Broad whitefish (<i>Coregonus nasus</i>)	Key subsistence species in the region	Maybe – Minor impacts may occur, including injury at water use intakes, physical habitat changes, pollution, and barriers to fish movement.
Greater white-fronted goose (<i>Anser albifrons</i>)	Regionally important species identified by stakeholders	Maybe – Minor impacts may occur, including impacts to bird behavior, nesting, brood-rearing, foraging, and molting, noise disturbance, and displacement from habitats.
Spectacled eider (<i>Somateria fischeri</i>)	Rare species (ESA threatened)	No.
Caribou (<i>Rangifer tarandus</i>)	Key subsistence species in the region	Negligible to minor impacts may occur, including physical habitat changes, collision-related mortality, noise disturbance, and obstruction of movements by roads, pipelines, and spills.
Polar bear (<i>Ursus maritimus</i>)	Rare species (ESA threatened)	Maybe – Minor impacts may occur, including habitat loss/alteration, disturbance or displacement of denning females and cubs, incidental harassment of individuals, and mortality due to collisions or self-defense.

^a Sources: BLM 2008, 2012, 2014.

^b See Section 2.2.

As reported in previous planning documents (e.g., BLM 2008, 2012, 2014), subsistence fish or wildlife species include the Arctic cisco (*Coregonus autumnalis*), Arctic grayling (*Thymallus arcticus*), broad whitefish (*Coregonus nasus*), greater white-fronted goose (*Anser albifrons*), and caribou (*Rangifer tarandus*). Along with subsistence species, there are two species listed as Federally Threatened or Endangered under the ESA that could occur in areas available for oil and gas leasing or may be affected by oil and gas operations enabled or assisted by the development of GMT1. These species include the spectacled eider (*Somateria fischeri*), a bird species listed as threatened under the ESA, and the polar bear (*Ursus maritimus*), a marine mammal listed as threatened under the ESA.

Regional-Level Ecological Conditions and Trends

The North Slope REA (Trammell et al. 2015) presents a framework for determining the condition and trends of various resource values and conservation elements in the ecoregion. Studies on fish and wildlife populations in the RMS region also provide information on the status and trends for some species listed in Table C-3. The North Slope REA defines conservation elements as resources of conservation concern within an ecoregion. These elements could include habitat or populations for plant and animal taxa, such as threatened and endangered species, or ecological systems and plant communities of regional importance. A list of conservation elements could also include other resource values, such as soils; scenic viewsheds; or designated sites of natural, historical, or cultural significance. A full list of conservation elements evaluated in the North Slope REA can be found in Section 2.2 of the REA.

The North Slope REA forecasted trends in the ecoregion by modeling current and future distributions of change agents. The four change agents modeled for the ecoregion included: (1) abiotic, anthropogenic, and biotic factors such as climate change, fire, soil thermal dynamics (permafrost); (2) human development; (3) subsistence use; and (4) invasive species. In addition, the REA evaluated trends in landscape integrity across the ecoregion through the development of a Landscape Condition Model. This model was built from spatial datasets on human development, and the results provided a quantitative measure of the human footprint on the landscape. Landscape Condition Models are often used as general indicators of ecological integrity over broad spatial scales. Trends in subsistence, modeled change agents, and landscape condition for the North Slope ecoregion are summarized in Table C-4 and in Figures C-3 through C-7.

TABLE C-4. Trends in Change Agents and Landscape and Ecological Integrity across the North Slope Ecoregion^a

Modeled Attribute	Summary of Future Trends	Figure
Subsistence	Forecast not provided in the REA. However, increased population may increase total harvest but lower per capita harvest amount. Currently subsistence food consumption makes up between half- and three-quarters of all food consumed by Alaska Native households.	Figure C-4
Change Agents		
Climate Change (cliomes)	Cliomes are projected to shift northward and become warmer over time. The colder Arctic cliome (Cliome 3) is expected to decline substantially in area by 2060. Reductions of some cliomes suggest that Arctic climates may become milder and wetter in interior regions.	Figure C-5
Fire	Most of the North Slope is expected to remain relatively free of fire in the future (e.g., through 2100). However, fire frequency may increase in some portions of the Brooks Range.	No Figure
Permafrost	Permafrost is expected to warm with some thawing of discontinuous portions of permafrost. Mean annual ground temperatures are expected to warm across the region.	Figure C-6
Human Development	The resident population is expected to increase by more than 50% (from 2013 estimate) by 2060. Oil and gas infrastructure includes development at the Greater Mooses Tooth region and a pipeline connecting offshore activities to Point Thomson by 2040.	No Figure
Invasive Species	The RMS region is currently resistant to invasion by nonnative plant species. By the 2060s, however, the region may become vulnerable to invasions of extremely cold-tolerant species.	Figure C-7
Landscape and Ecological Integrity		
Landscape Condition	Overall landscape condition expected to remain very high throughout most of the North Slope (by 2040). Landscape condition expected to lower in areas of current and future oil and gas developments, roads, and pipelines.	Figure C-8

^a Source: North Slope Rapid Ecoregional Assessment (Trammell et al. 2015).

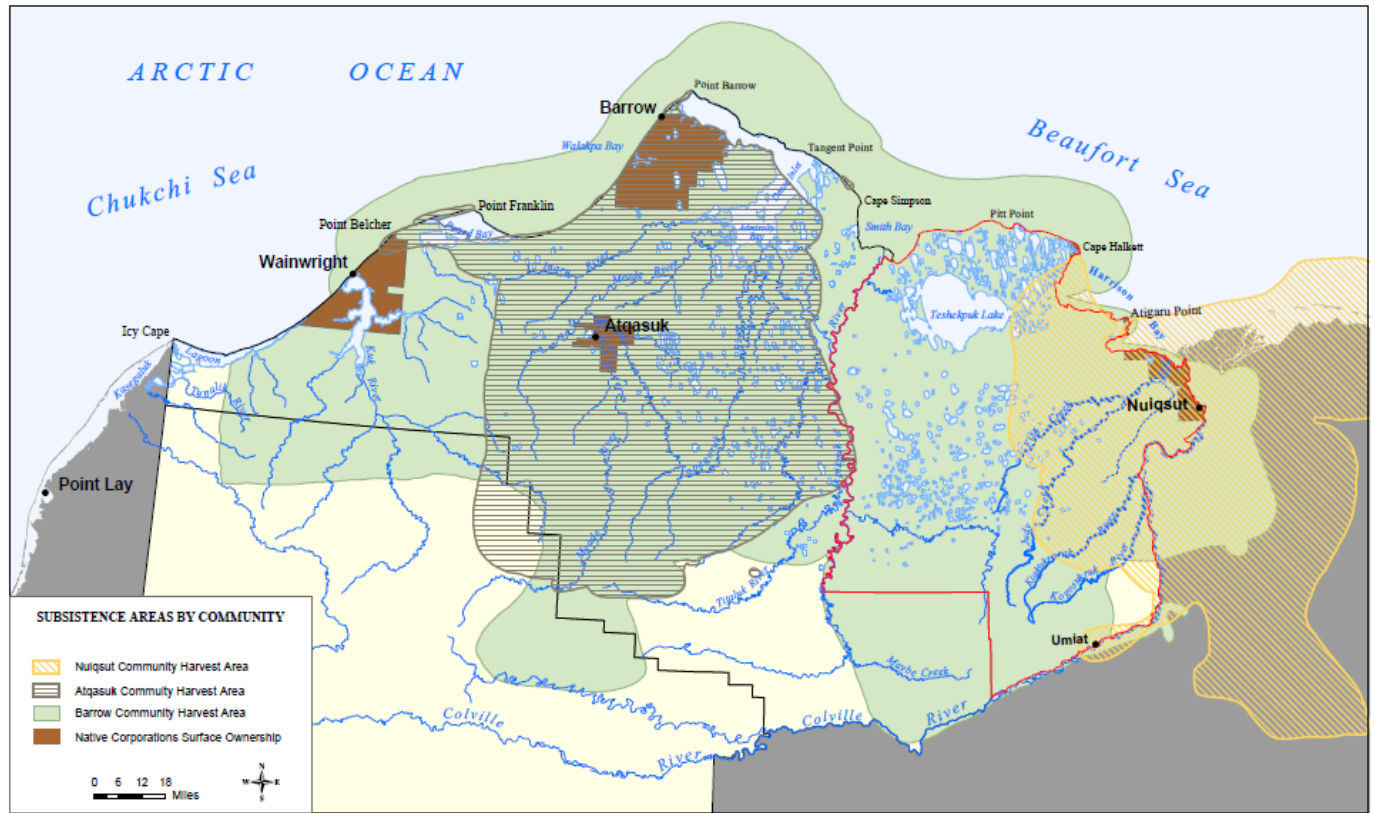


FIGURE C-3. Example Map of Subsistence Use Areas in the Region (Source: BLM 2008)

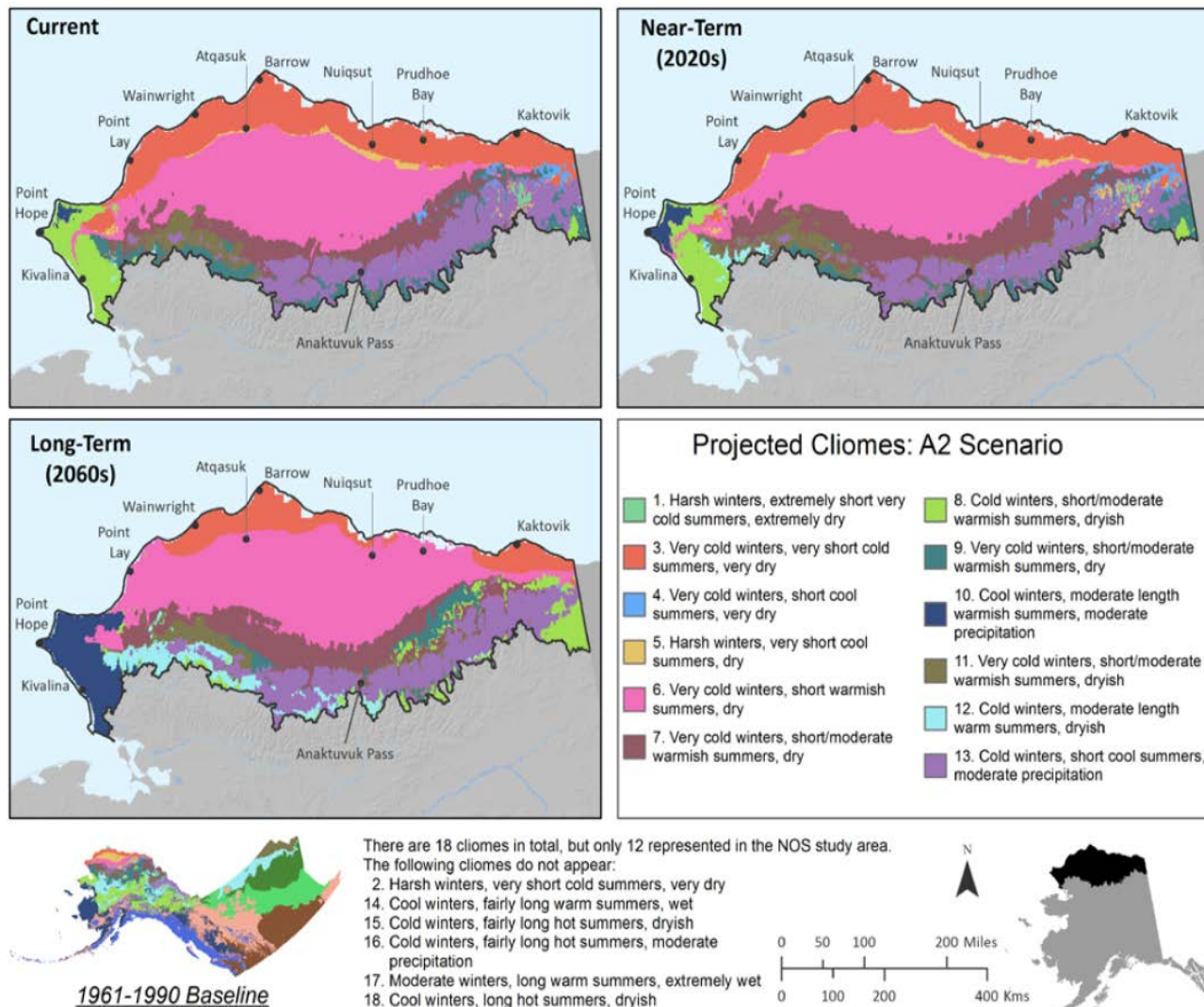


FIGURE C-4. Projected Cliome Shifts over Time in the North Slope (Source: Trammell et al. 2015)

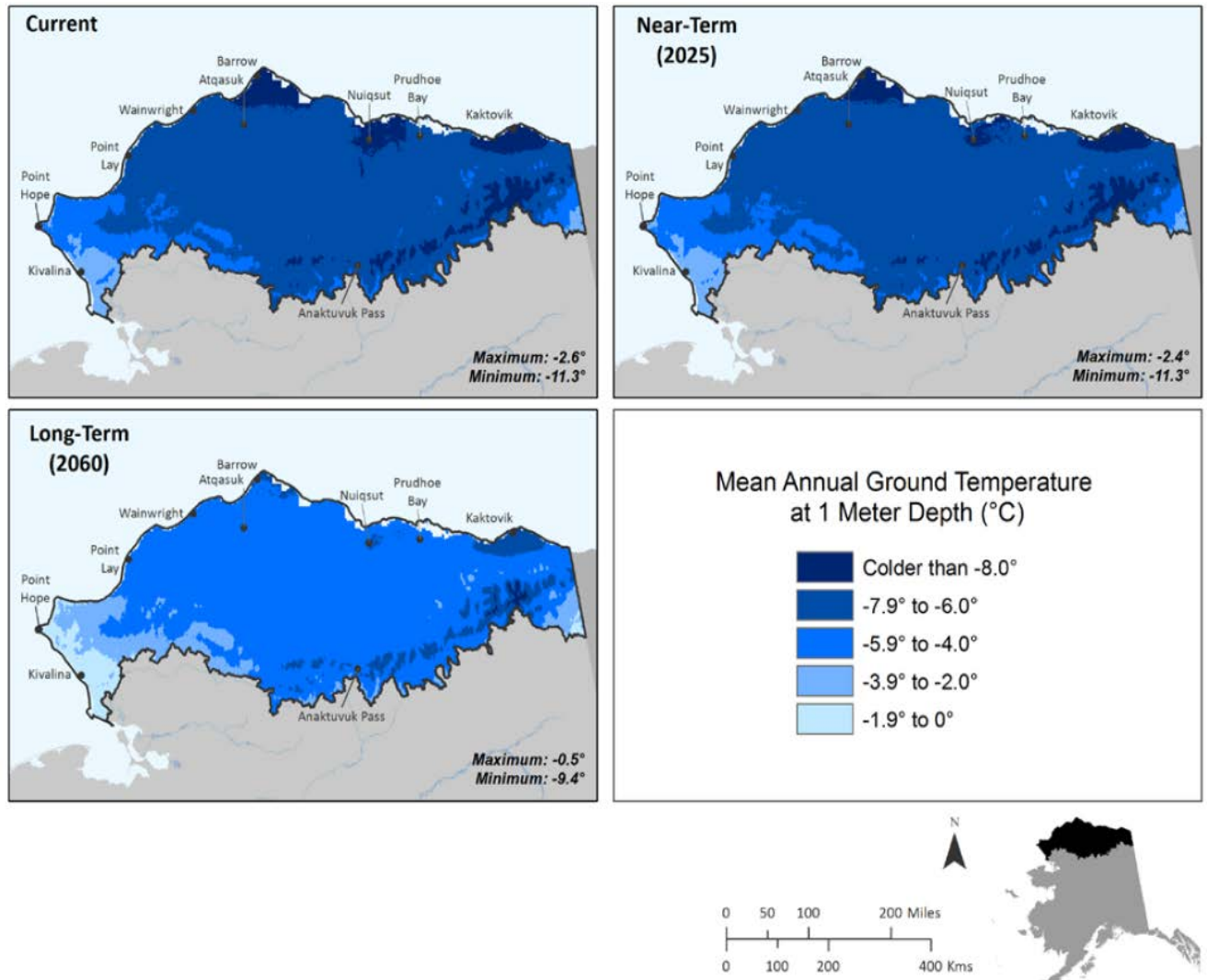


FIGURE C-5. Mean Annual Ground Temperature Projections in the North Slope (Source: North Slope REA; Trammell et al. 2015)

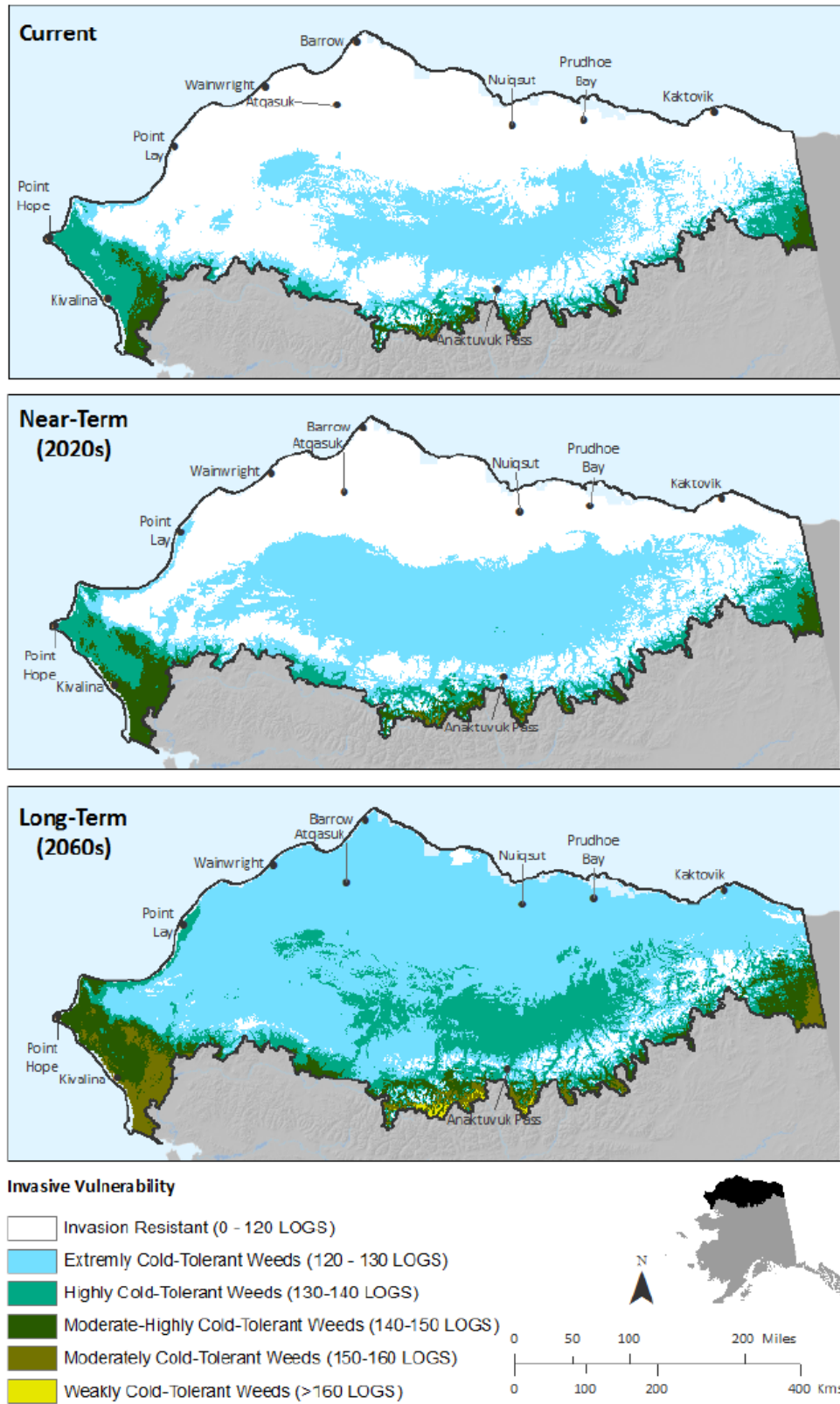


FIGURE C-6. General Plant Invasion Vulnerability across the North Slope
 (Source: North Slope REA; Trammell et al. 2015)

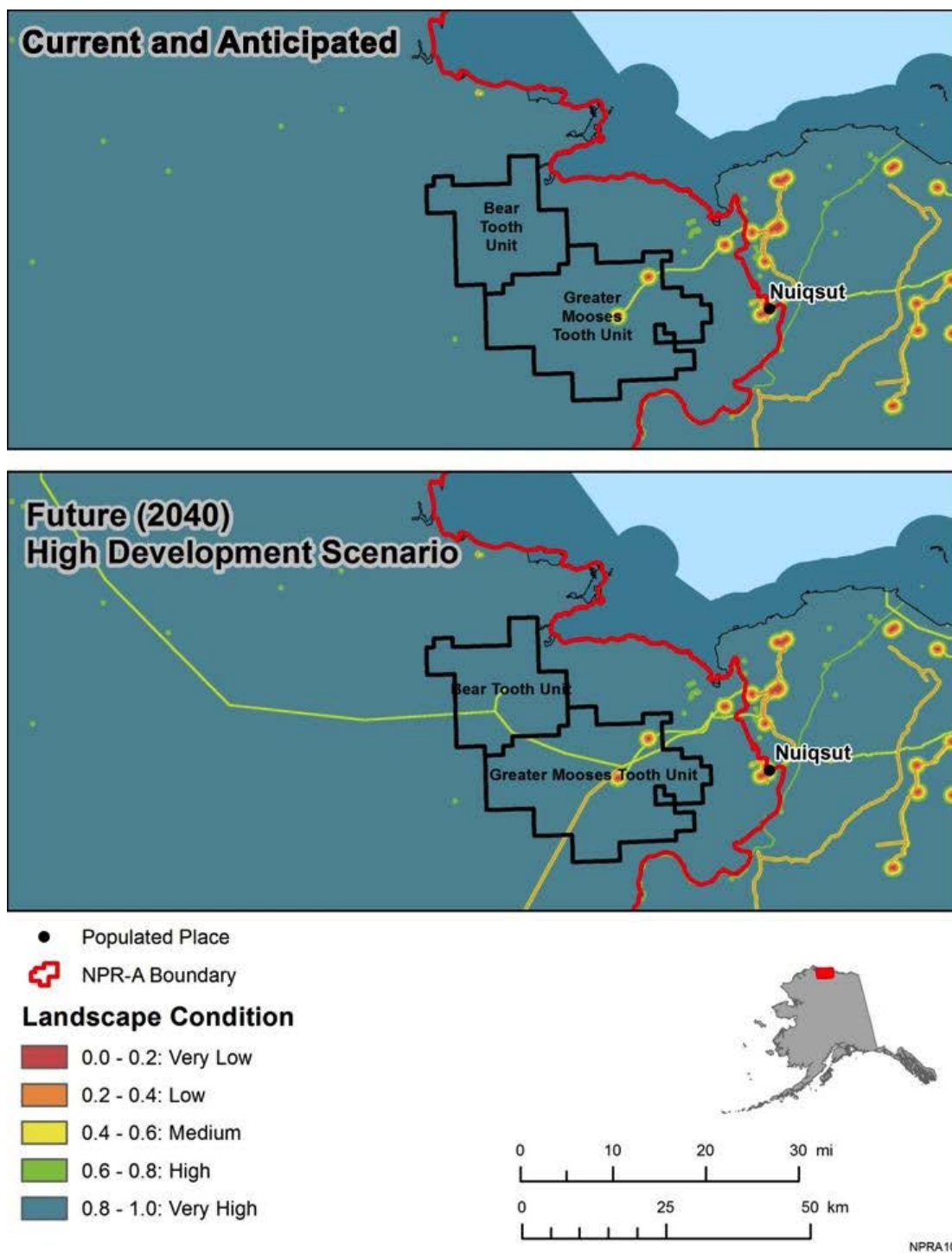


FIGURE C-7. Current (2015) and Future (2040) Landscape Condition in the RMS Region (Source: North Slope REA; Trammell et al. 2015)

Resource-Specific Ecological Conditions and Trends

This section includes information on the condition and trends for the following ecological resources: wetlands and the seven fish and wildlife species identified in Table C-3 (Arctic cisco, Arctic grayling, broad whitefish, greater white-fronted goose, spectacled eider, caribou, and polar bear). Information on condition and trends was obtained from various sources, including the North Slope REA (Trammell et al. 2015), past NEPA assessments, and population studies.

Wetlands

Baseline Conditions. Wetlands comprise upwards of 75% of the Northeastern NPR-A, with major vegetation types being wet sedge meadow tundra, tussock tundra, and moist sedge-shrub tundra. Water bodies (lakes, ponds, streams, and rivers, including associated river gravels and beaches) comprise another 20% of the area (BLM 2014). Over 94% of the wetland habitats within the Northeastern NPR-A are considered to be in the “very high” landscape condition class (Trammell et al. 2015).

Trends. Climate change will be the major factor that could potentially affect wetland habitats within the Northeastern NPR-A. Nevertheless, by 2040 it is concluded that 93% or more of the wetland types will remain in a “very high” landscape condition class (Trammell et al. 2015). Some wetlands may dry out under a warming climate due to loss of permafrost and from evaporation due to an increase in the ice-free season. Vegetation may also shift toward more shrub species at the expense of grass and sedge species (BLM 2012). Impacts to wetlands from oil and gas development, operation, and accidental spills would include long-term destruction and alteration of wetlands. Subsequent recovery of wetlands could take up to two decades (BLM 2012).

Arctic Cisco (*Coregonus autumnalis*)

Baseline Conditions. The Arctic cisco (Qaaktaq) is an anadromous fish species that has a nearly circumpolar distribution in Arctic waters. During summer, they are one of the most abundant species in nearshore waters of the Beaufort Sea (USFWS 2015a). The Arctic cisco is a pelagic feeder on crustaceans and small fishes. Within the Northeastern NPR-A, the Arctic cisco is limited to coastal waters during summer and the lower Colville River Delta during winter (BLM 2012). Most of the Colville River watershed and the lakes, ponds, and stream systems in Northeastern NPR-A are not important habitats for the species. The Colville River is the only drainage west of the Mackenzie River, Canada, which is large and deep enough to support substantial overwintering populations of Arctic cisco subadults and adults. Most, if not all, individuals in Alaska originate from spawning grounds in the Mackenzie River system (BLM 2008). They return to the Mackenzie River system when they reach sexual maturity at about age seven (BLM 2012). It is the principal species targeted in the fall subsistence and commercial fisheries that operate in the Colville River Delta (BLM 2008).

Trends. Potential effects on fishes (including the Arctic cisco) from oil and gas exploration, development, and production include acoustic disturbance, injury at water-use intakes, altered water quality, physical habitat changes, point and non-point discharges, increased turbidity and sedimentation, and barriers to fish movement (BLM 2012). Subsistence activities for fish (in the vicinity of Barrow) occur from June through November with highest levels occurring from July through October (Trammell et al. 2015). Climate change may affect fish species in several ways: a reduction in age at maturity and shift in spawning season, potential increase in susceptibility to diseases and parasites, increased availability and effects of contaminants, and reduced quality of spawning habitats and aquatic food base from increased erosion and sedimentation. However, permafrost thaw may increase nutrient inputs which may directly or indirectly increase food base abundance. Increased winter precipitation could potentially increase overwinter habitat, but also increase run-off and sedimentation. Thus, the long-term effect of climate change on fishes (including the Arctic cisco) remains unclear (Trammel et al. 2015).

Arctic Grayling (*Thymallus arcticus*)

Baseline Conditions. The Arctic grayling (Sulukpaugaq) is the most widespread fish species in the NPR-A; occurring throughout all of the major river drainages, including many small tributaries and lakes (BLM 2012). It spawns in small rivers and lake tributaries over areas of sandy gravel and, when stream habitat is not available, in larger substrates in rivers and lakes (USFWS 2015a). Adults feed primarily on invertebrates and may undertake extensive inter- and intra-drainage movements between overwintering sites (deep pools, lakes, spring-fed areas) and summer feeding habitats following reproduction (USFWS 2015a). The Arctic grayling tolerates low dissolved oxygen levels which allow it to survive long winters in areas where many other fish would die (ADFG 2016).

Trends. Throughout Alaska, most Arctic grayling stocks are healthy and isolated from most anthropogenic threats (ADFG 2016). The two biggest threats to the Arctic grayling are climate change and oil and gas development (ADFG 2016). Potential effects from oil and gas exploration, development, and production include acoustic disturbance, injury at water-use intakes, altered water quality, physical habitat changes, point and non-point discharges, increased turbidity and sedimentation, and barriers to fish movement (BLM 2012). Subsistence activities for fish (in the vicinity of Barrow) occur from June through November with highest levels occurring from July through October (Trammell et al. 2015). Climate change may affect fish species in several ways: a reduction in age at maturity and shift in spawning season, potential increase in susceptibility to diseases and parasites, increased availability and effects of contaminants, and reduced quality of spawning habitats and aquatic food base from increased erosion and sedimentation. However, permafrost thaw may increase nutrient inputs which may directly or indirectly increase food base abundance. Increased winter precipitation could potentially increase overwinter habitat, but also increase run-off and sedimentation. Thus, the long-term effect of climate change on fish (including the Arctic grayling) remains unclear (Trammel et al. 2015).

Broad Whitefish (*Coregonus nasus*)

Baseline Conditions. The broad whitefish (Aanakliq) is common in all NPR-A watersheds that drain into the Beaufort Sea, and it is the most abundant anadromous fish species in adjacent coastal waters (BLM 2012). Populations may exhibit either anadromous or freshwater life histories (USFWS 2015a). Most individuals stay within a river system where they target small streams and lakes for summer feeding while overwintering in deep pools or brackish water (ADFG 2016). Spawning occurs from fall to early winter. Broad whitefish are primarily benthic feeders. In some locations, feeding may cease between fall spawning and the following spring (ADFG 2016).

Trends. Subsistence activities for fish (in the vicinity of Barrow) occur from June through November with highest levels occurring from July through October (Trammell et al. 2015). Potential effects from oil and gas exploration, development, and production include acoustic disturbance, injury at water-use intakes, altered water quality, physical habitat changes, point and non-point discharges, increased turbidity and sedimentation, and barriers to fish movement (BLM 2012). Climate change may affect fish species in several ways: a reduction in age at maturity and shift in spawning season, potential increase in susceptibility to diseases and parasites, increased availability and effects of contaminants, and reduced quality of spawning habitats and aquatic food base from increased erosion and sedimentation. However, permafrost thaw may increase nutrient inputs which may directly or indirectly increase food base abundance. Increased winter precipitation could potentially increase overwinter habitat, but also increase run-off and sedimentation. Thus, the long-term effect of climate change on fishes (including the broad whitefish) remains unclear (Trammel et al. 2015).

Greater White-fronted Goose (*Anser albifrons*)

Baseline Conditions. The Greater White-fronted Goose (Nigliq) is a common species along the Arctic coast and is an important subsistence species. It arrives in the Northeastern NPR-A from mid-May to early June, egg laying occurs early June to late June, brood rearing occurs late June to early September, adult molt occurs mid-July to mid-August, and fall migration occurs from mid-August to early September (BLM 2008). One of the largest Greater White-fronted Goose concentrations in the NPR-A occurs to the north, east, and west of Teshekpuk Lake (BLM 2012). Densities across the Arctic Coastal Plain range as high as 41 birds/mi² (BLM 2014). The long-term population for the Greater White-fronted Goose (1986-2013) averaged 63,098 breeding birds (population growth rate 1.079) and 133,056 total birds (population growth rate 1.043), while its short-term population (2004-2013) averaged 112,550 breeding birds (population growth rate 1.134) and 200,764 total birds (population growth rate 1.101) (Stehn 2014). The Teshekpuk Lake Traditional Survey Area is an important area for molting geese including the Greater White-fronted Goose. In the 2014 survey, 34,199 adult Greater White-fronted Goose adults and 15,112 goslings were observed. These geese are believed to nest on the Arctic Coastal Plain of Alaska (Wilson 2015). Post-breeding birds favor deep, open lakes during the molt (BLM 2012).

Trends. The annual population estimates for the Greater White-fronted Goose in the Arctic Coastal Plain (Stehn 2014) indicate a positive trend in population growth. Within the Teshekpuk

Lake Traditional Survey Area, the Greater White-fronted Goose population has increased by 10% between 1982 and 2014 (Wilson 2015). The importance of this area to molting geese is one of the primary reasons that the area is protected from oil development (BLM 2008, 2014). Threats to the Greater White-fronted Goose include loss of wetlands at migratory stopovers, change in breeding habitat due to climate change effects, potential negative effects from oil and gas exploration and drilling, and potential increases in predation if industrial and community development provide opportunities for increases in predator populations near nesting grounds (BLM 2012). Activities related to oil and gas exploration, development, and production could cause potential disturbance, habitat loss, and mortality. Such impacts would be additive to impacts caused by non-oil and gas activities (BLM 2012). Subsistence activities for birds (in the vicinity of Barrow) occur from May through October with highest levels occurring from June through August (Trammell et al. 2015). Currently, 81.8% of Greater White-fronted Goose habitat is in “very high” condition, dropping to 77.88% by 2040 under the “high development” scenario. As they are loyal to breeding and molting sites, they may not be able to readily relocate if development or disturbance effects impact existing sites (Trammel et al. 2015).

Generally, increased summer temperatures associated with climate change could lead to conversion of aquatic and wetland habitats to drier habitats, resulting in a loss of habitat quantity and quality (BLM 2012). However, the Greater White-fronted Goose may also benefit from climate change. Warmer summers may increase juvenile survival rates, and an increase in the number of ice-free days may lengthen the breeding season and decrease juvenile mortality. Permafrost thaw may increase general use of thermokarst terrain, and increased primary production may lead to an increase in the food supply. However, changes in seasonal vegetation may reduce high-nutrient forage availability, while spring storm events and precipitation levels may affect juvenile mortality and reproductive success (Trammel et al. 2015).

Spectacled Eider (*Somateria fischeri*)

Baseline Conditions. The Spectacled Eider (Qavaasuk) was listed as threatened in May 1993 due to a 94 to 98% decline of its principal breeding range in Alaska and a continuing decline in the number of breeding birds in Alaska by about 14% per year (USFWS 1993). Critical habitat does not occur on the North Slope (USFWS 2001). From November through March or April, the Spectacled Eider inhabits the central Bering Sea (USFWS 2010a). The Spectacled Eider breeds primarily along coastal areas of western and northern Alaska and eastern Russia (BLM 2012). The estimated population on the Arctic Coastal Plain for 1992 through 2012 was 7,158 birds with a slightly negative average annual population growth rate (Stehn et al. 2013). The long-term population for the Spectacled Eider (1992–2013) averaged 6,951 breeding birds (population growth rate 0.998) and 7,201 total birds (population growth rate 0.997), while its short-term population (2004–2013) averaged 6,698 breeding birds (population growth rate 1.0) and 7,091 total birds (population growth rate 0.984) (Stehn 2014). Highest concentrations occur within about 40 mi of the coast between Barrow and Wainwright, and north and northeast of Teshekpuk Lake (BLM 2014). In Alaska, nests occur discontinuously from the Nushagak Peninsula north to Barrow, and east nearly to Canada (USFWS 2010a). Preferred nesting habitat is large shallow productive thaw lakes, often with convoluted shorelines and/or small islands (BLM 2012). Most nests occur within 10 ft of shallow ponds or lakes (USFWS 2010a). Highest

breeding season densities occur northeast of Teshekpuk Lake at 0.82 birds/mi² (BLM 2008). Hens and broods feed in freshwater ponds and wetlands, while males return to the sea. Non-breeding females move to molting areas in July while successful nesters do so in August/September. Molting areas do not occur in the Beaufort Sea (USFWS 2010a).

Trends. The Spectacled Eider population declined significantly between the 1960s and 1990s, but the cause of the decline remains unknown. Lead poisoning from ingestion of spent shot has been a significant source of mortality in Alaska. Since the 1990s, the population appears to have stabilized (ADFG 2016). The annual population estimates for the Spectacled Eider in the Arctic Coastal Plain indicate a slightly declining population trend (Stehn 2014). Development on the Arctic Coastal Plain is not expected to be a significant threat to the Spectacled Eider, as only a small proportion of its range is within or near proposed development areas. Activities related to oil and gas exploration, development, and production could cause potential disturbance, habitat loss, and mortality. Such impacts would be additive to impacts caused by non-oil and gas activities (BLM 2012). All future developments in Alaska will require Section 7 consultation under the ESA, which will evaluate effects to the species and its habitat and allow for mitigation and reduction of potential adverse effects (USFWS 2010a).

Generally, increased summer temperatures associated with climate change could lead to conversion of aquatic and wetland habitats to drier habitats, resulting in a loss of habitat quantity and quality (BLM 2012). Climate change is also likely to increase ocean acidification, affecting marine food webs in Spectacled Eider habitats (USFWS 2010a). Increased vessel traffic in Arctic waters may increase the likelihood of fuel spills, disturbance, and collisions. Increasing coastal erosion rates pose a risk of direct loss of nesting habitat. Terrestrial warming may also affect breeding habitats (USFWS 2010a). Climate change and anthropogenic influences on predator populations may increase predation in the areas where Spectacled Eiders breed. Harvests may be a threat, particularly along the Arctic Coastal Plain where population surveys indicate a slightly decreasing trend (USFWS 2010a); at a minimum, subsistence harvests may hinder species recovery (ADFG 2016). Subsistence activities for birds (in the vicinity of Barrow) occur from May through October, with highest levels occurring from June through August (Trammell et al. 2015). A catastrophic event (e.g., large oil spill) during the winter or molting periods when Spectacled Eiders congregate in large flocks could have a major impact on the entire population (ADFG 2016). As mentioned, the Beaufort Sea in the area of the Northeastern NPR-A is not used by Spectacled Eiders during molting or winter.

Caribou (*Rangifer tarandus*)

Baseline Conditions. Most caribou (Tuttut) occurring within the Northeastern NPR-A belong to the Teshekpuk Herd which has great importance for subsistence use (BLM 2014). Most individuals migrate from their winter range across northern Alaska to the Teshekpuk Lake area during May. Calving grounds are primarily in the northern portion of the Northeastern NPR-A near Teshekpuk Lake (BLM 2008). The Teshekpuk Lake area is also important as summer range because of prevailing winds and proximity to the coast, river deltas, and lake edge that provide insect-relief habitat and adjacent forage. Overall, the summer range extends from Barrow to the Colville River (BLM 2008). Some individuals are present year-round in the Teshekpuk Lake

area, but most winter on the coastal plain of the NPR-A (BLM 2008). Caribou densities in the area are low in spring, moderately high during calving, high in late June, and low in August (BLM 2014).

Caribou move in response to changing weather conditions, biting and parasitic insect harassment, and predators (USFWS 2015a). In Arctic areas, caribou reproduction is highly synchronous and most calving occurs in a two- to three-week period (USFWS 2015a). Post-calving summer aggregations harassed by insects move towards the Arctic coast or to higher elevations in the mountains to find relief. By August, the large aggregations break into widely dispersed small groups that move slowly toward winter ranges. Breeding takes place during this time, and by mid-November the caribou arrive at winter ranges (USFWS 2015a).

Trends. Caribou throughout the circumpolar Arctic were experiencing population declines, but many herds in North America are now increasing or are stable (USFWS 2015a). The Teshekpuk Herd population size appears to be in decline due to low and declining calf production, poor calf survival, and high adult mortality rates likely related to poor summer and winter nutrition and difficult winters, and high levels of predation of calves in winter (BLM 2014). However, caribou are somewhat cyclic in number and the timings of increases and declines are not very predictable. Climate, population density, predation, and disease outbreaks determine whether most herds increase or decrease (ADFG 2016). Subsistence activities for caribou (in the vicinity of Barrow) occur throughout the year, except for May, with high levels of subsistence activity occurring from July through October (Trammell et al. 2015).

Oil and gas exploration, development, and production may impact caribou through habitat loss and alteration, disturbance, habitat fragmentation, mortality, and altered survival or productivity (BLM 2014). Disturbance of maternal groups on calving grounds may interfere with bond formation (first 24 hours following birth) and can increase calf mortality (USFWS 2015a). The Alpine Satellite Development Plan area is not a concentrated calving area for the Teshekpuk Herd (BLM 2014).

Climate change will impact caribou herds of the North Slope, but not uniformly because weather patterns and the variety of terrain occupied across the region are complex. Deep snow or icing events in winter may affect spring migration. Warmer temperatures and longer growing seasons could increase the availability of summer forage, but mismatches between emergence of nutritious forage and arrival of caribou on calving grounds could occur. Increasing temperatures may lead to shrub encroachment that may reduce lichen cover for caribou, although earlier spring thaws may increase plant biomass during calving. Warming climate and increased precipitation may alter insect abundance and timing, possibly affecting caribou body condition (Trammell et al. 2015; USFWS 2015a). Currently, 90.9% of the Central Arctic herd's range is in "very high" condition, dropping to 90.2% by 2040 under the "high development" scenario (Trammell et al. 2015).

Polar Bear (*Ursus maritimus*)

Baseline Conditions. The polar bear (Nanuq) was designated as a threatened species under the ESA in May 2008 due to loss of sea ice habitat caused by climate change (USFWS 2008). The primary constituent elements of critical habitat are sea ice habitat, terrestrial denning habitat, and barrier island habitat (USFWS 2010b). The Beaufort Sea coastline, creek and river drainages, and bluffs along the lakes throughout NPR-A provide important areas for polar bear resting, feeding, denning, and seasonal movements (BLM 2012). Polar bears typically occur on broken sea ice in areas with abundant ring or bearded seals (USFWS 2015b). Sea ice, the primary habitat for polar bears, function as a platform on which to hunt and feed, seek mates and breed, travel to terrestrial maternity denning areas, den, and make long-distance movements (USFWS 2015b). Winter dens are excavated by pregnant females in stable pack ice or onshore in large drifts along drainages; while males and non-pregnant females remain active throughout winter on the ice pack (USFWS 2015b). Polar bears in the Northeastern NPR-A are part of the Southern Beaufort Sea subpopulation that ranges from Icy Cape (west of Point Barrow, Alaska) to Pearce Point (east of Paulatuk, Canada). They spend most of their time in shallow waters over the continental shelf, on areas with greater than 50% ice cover (USFWS 2015b).

Trends. The current global polar bear population is estimated at 20,000 to 25,000 (USFWS 2015b) with the population of the Southern Beaufort Sea subpopulation estimated at about 900 animals in 2015 (ADFG 2016). This is down from the valid population estimate of 1,526 provided by Regehr et al. (2006). Overhunting in the early 1960s resulted in population declines in the Southern Beaufort Sea subpopulation. Following passage of the Marine Mammal Protection Act in 1972, the population increased and likely stabilized in the 1990s. From 2001 to 2006, there was a negative rate of population growth and declining recruitment, survival, body condition, and size, suggesting that the population is declining (USFWS 2015b). Conservation concerns for the Southern Beaufort Sea subpopulation include loss of sea ice habitat due to climate change, potential overharvest, and current and proposed human activities including industrial activities in the nearshore and offshore environment (USFWS 2015b). Overharvest could hasten the decline or prevent and/or slow population recovery (Allen and Angliss 2015). Subsistence activities for polar bears (in the vicinity of Barrow) occur January through March and in May and June, with high levels of subsistence activity occurring in May (Trammell et al. 2015).

Lethal takes of individuals from the South Beaufort Sea subpopulation related to the oil and gas industry are rare (Allen and Angliss 2015). Authorized nonlethal, incidental unintentional take of polar bears (e.g., disturbance) during year-round oil and gas exploration, development, and production in the Beaufort Sea and the adjacent north coast of Alaska has been approved from August 3, 2011, to August 3, 2016. The analysis found that oil and gas activities would have a negligible impact on polar bears during this period. Only a small number of bears are likely to be affected by a large oil spill in Arctic waters with only a negligible impact (USFWS 2011).

The decline of sea ice habitat due to climate change is the primary threat to polar bears. The population may face severe declines if sea ice loss continues (USFWS 2015b). Sea ice normally provides a platform for hunting and feeding, seeking mates and breeding, movement to terrestrial maternity denning areas and occasionally for maternity denning, for resting, and for long-

distance movements (BLM 2012). Thinning ice has apparently led to a shift from denning on sea ice to denning on land in eastern Alaska (USFWS 2015b). Continuing sea ice loss will also exacerbate other current or potential sources of polar bear mortality particularly declines in marine prey base; but also subsistence harvesting, defense-of-life removals, disease, take from oil and gas activities, loss of denning habitat, contamination from spills, and disturbance due to increased shipping in the Arctic (USFWS 2015b). Survival rates >93% for adult females are essential to sustain polar bear subpopulations (Regehr et al. 2015).

APPENDIX C REFERENCES

ADFG (Alaska Department of Fish and Game), 2016. *Animals*. Available at: <http://www.adfg.alaska.gov/index.cfm?adfg=animals.main>.

Allen, B.M. and R.P. Angliss, 2015. *Alaska Marine Mammal Stock Assessments. 2014*, U.S. Department of Commerce, NOAA Technical Memo, NMFS-AFSC-301.

BLM (Bureau of Land Management), 2008. *Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. May. Available at: http://www.blm.gov/ak/st/en/prog/planning/NPR-A_general/ne_NPR-A/northeast_npr-a_final.html.

BLM, 2012. *National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Nov. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=14702>.

BLM, 2014. *Supplemental Environmental Impact Statement for the Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth One Development Project*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Oct. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=50912>.

National Research Council, 2003. *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope*. Committee on Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope, Board of Environmental Studies and Toxicology, Polar Research Board, Division of Earth and Life Studies. The National Academies Press, Washington, D.C.

Omernik, J.M., 1987. "Ecoregions of the Conterminous United States, Map (scale 1:7,500,000)," *Annals of the Association of American Geographers* 77:118-125.

- Regehr, E.V., S.C. Amstrup, and I. Stirling, 2006. *Polar Bear Population Status in the Southern Beaufort Sea*. U.S. Geological Survey Open-File Report 2006-1337.
- Regehr, E.V., R.R. Wilson, K.D. Rode, and M.C. Runge, 2015. *Resilience and Risk – A Demographic Model to Inform Conservation Planning for Polar Bears*. U.S. Geological Survey Open-File Report 2015-1029.
- Stehn, R.A., W.W. Larned, and R.M. Platte, 2013. *Analysis of Aerial Survey Indices Monitoring Waterbird Populations of the Arctic Coastal Plain, Alaska, 1986-2012*. Unpublished Report by the U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage and Soldotna, Alaska.
- Stehn, R.A., 2014. *Analysis of Aerial Survey Indices Monitoring Waterbird Populations of the Arctic Coastal Plain, Alaska, 1986-2013*. Unpublished Report by the U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage and Soldotna, Alaska.
- Trammell, E.J., M.L. Carlson, N. Fresco, T. Gotthardt, M.L. McTeague, and D. Vadapalli, (eds.), 2015. *North Slope Rapid Ecoregional Assessment*. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. July.
- USFWS (U.S. Fish and Wildlife Service), 1993. “Endangered and Threatened Wildlife and Plants; Final Rule to List Spectacled Eider as Threatened,” *Federal Register* 58(88):27474-27480.
- USFWS, 2001. “Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Spectacled Eider,” *Federal Register* 66(25):9146-9185.
- USFWS, 2008. “Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Polar bear (*Ursus maritimus*) throughout Its Range,” *Federal Register* 73(95):28212-28303.
- USFWS, 2010a. *Spectacled Eider (Somateria fischeri) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. August 23.
- USFWS, 2010b. “Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Polar bear (*Ursus maritimus*) in the United States.” *Federal Register* 75(234):76086-76137.
- USFWS, 2011. “Marine Mammals; Incidental Take during Specified Activities.” *Federal Register* 76(149):47010-47054.
- USFWS, 2015a. *Arctic National Wildlife Refuge Revised Comprehensive Conservation Plan – Final Environmental Impact Statement*. U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge, Fairbanks, Alaska and Alaska Regional Office, Division of Conservation Planning and Policy, Anchorage, AK. January.

USFWS, 2015b. *Polar Bear (Ursus maritimus) Conservation Management Plan, Draft*.
U.S. Fish and Wildlife Service, Region 7, Anchorage, Alaska.

Wilson, H.M., 2015. *Teshkepuk Lake Area Molting Goose Survey, 2014*. Available at:
http://www.fws.gov/alaska/mbsp/mbm/waterfowl/surveys/pdf/Tesh_report_2014.pdf.

APPENDIX D:

SUBSISTENCE AND SOCIO-CULTURAL RESOURCES, CONDITIONS, AND TRENDS

Other NEPA documents describe in detail the existing cultural and socio-cultural resources and values present within the Northeastern (NE) NPR-A in their Affected Environment sections (e.g., BLM 2004 [Alpine FEIS, Sept. 2004], BLM 2005 [Amended NE NPR-A IAP EIS, Jan. 2005], BLM 2008 [Supplemental IAP-EIS, May 2008], BLM 2012 [Final IAP EIS, Nov. 2012], and BLM 2014 [Alpine GMT1 FSEIS, Oct. 2014]). The information on cultural and socioeconomic resources presented in this section is largely summarized from information contained in these documents.

The Iñupiat are the resident population affected by oil and gas development in the region. The traditional homeland of the Iñupiat includes the Brooks Range, its foothills, and the river valleys that run toward the coastal plain and the Arctic coast. The coastal zone includes open waters of the Chukchi and Beaufort Seas in the summer and nearshore ice in winter. This area encompasses most of the North Slope from the coast south to just past Anaktuvuk Pass, as far west as Point Hope, and as far east as the Canadian border. Prior to sustained contact with Euro-Americans, the Iñupiat moved seasonally between these environments to hunt, trade, or join celebrations. Through centuries, the Iñupiaq way of life included unrestricted freedom of movement throughout the North Slope in order to harvest important subsistence resources. They also developed distinct socio-cultural customs with an emphasis on sharing and hospitality (BLM 2012; Brown 1979).

Contemporary Iñupiaq villages are located throughout the North Slope in Anaktuvuk Pass, Atkasuk, Barrow, Nuiqsut, Wainwright, Kaktovik, Point Hope, and Point Lay. Today these villages have the benefits of modern education, health and government services, and vehicular transportation. Modern technologies (electricity, gas, snow machines, and all-terrain vehicles) have reduced the time required to conduct a hunt or harvest, but have not reduced the reliance on traditional subsistence practices for food or the importance of these activities to the culture. Physical evidence of these practices includes the hundreds of Native allotments and hunting and fishing camps and cabins that are located along the coast and major rivers in traditionally used sites across the North Slope. Access to and use of these sites and the land around them is commonly the most highly valued aspect of life for North Slope Iñupiat.

Nuiqsut

Nuiqsut, population approximately 449, is the community closest to the area expected to be developed in the NE NPR-A. Nuiqsut was re-settled in 1973,¹ when 27 Iñupiat families left

¹ An earlier village in the vicinity was abandoned in the late 1940s because it had no school (DCCED 2016, online community database <https://www.commerce.alaska.gov/web/>).

Barrow and returned to their traditional hunting and fishing areas in the Colville Delta to live by more traditional cultural values. The Colville Delta area had been a gathering and trading place for the inland and coastal Iñupiat for centuries (BLM 2012; Brown 1979). The ANCSA Village Corporation for Nuiqsut is the Kuukpik Corporation, and the ANCSA Regional Corporation is the Arctic Slope Regional Corporation, and the local tribal government is the Native Village of Nuiqsut.

The Nuiqsut Cultural Landscape. Cultural landscapes are living and continually evolving spaces that reflect the relationship between a group of humans, their resources, and their environment. The Nuiqsut Heritage Cultural Plan (Brown 1979) defines four important characteristics of the Nuiqsut Cultural Landscape: areas of historical extended use; aboriginal trade routes; traditional land use inventory (TLUI) sites, and areas of current intensive subsistence use (Brown 1979). The Nuiqsut Heritage Cultural Plan describes the landscape as

“...a complicated geography that can be shown on a map only if the boundary is a shifting horizon. It is a composite of places and events that people have directly experienced or heard about in songs and stories passed down through generations. Here, in this landscape — recalled in memory culture — is the history, the knowledge, the spirit of thousands of years of the Iñupiat experience.”
(Brown 1979)

While it is difficult to determine the exact geographic extent of the Nuiqsut Cultural Landscape, the GMT1 SEIS (BLM 2014) mapped the geographic extent of the cultural landscape based on the historical extended use area documented by Brown (1979) and the contemporary use areas documented by Pedersen (1986), the Alaska Heritage Resource Survey, the Iñupiat Heritage and Language Center’s Traditional Land Use Inventory database, and more recent information collected by Stephen R. Braund and Associates (SRB&A 2010a, 2010b, 2011, and 2013a, 2013b). The cultural landscape encompasses the area from as far northwest as Barrow, as far south as Anaktuvuk Pass, and as far east as Kaktovik. It encompasses overland areas and coastal and nearshore areas of the Beaufort Sea as well as Teshekpuk Lake and portions of Fish Creek and the Colville, Itkillik, and Anaktuvuk river corridors (BLM 2014).

The Iñupiat in Nuiqsut are closely tied to the land and sea and their cultural survival depends on the availability of fish and game and access to traditional sites throughout the area. Travel routes, historic and contemporary camping locations, cabins, sod houses, grave sites, drying racks, storage cellars, and subsistence use areas are all located within the area. These places are “both old and new, sacred and useful,” and provide a spiritual link between the Iñupiat, their ancestors, and the land (Brown 1979; Iñupiat Community of the Arctic Slope 1979).

While hunting and fishing, traditional knowledge is passed from person to person and generation to generation, through the telling of oral histories, storytelling, and physical activities (Brown 1979; Iñupiat Community of the Arctic Slope 1979). Continuing these practices maintains cultural identity and Iñupiat ties to the landscape (BLM 2014).

Subsistence Resources. Residents of Nuiqsut, the “Kuukpikmiut” or “People of the Lower Colville River,” harvest fish and game on a seasonal round, following the migration of fish and land and sea mammals. Traditional knowledge gathered over centuries and passed from generation to generation analyzes changes in seasonal temperatures, various environmental factors, and animal migration patterns to determine when a resource will be harvested (Brown 1979; Iñupiat Community of the Arctic Slope 1979). Caribou hunting usually peaks in mid-summer but can occur almost any time of year. Fishing is prominent in summer, and individuals travel to the ocean to hunt seals and eiders. In the fall, individuals continue to harvest caribou and fish and pursue moose and bowhead whale through much of August and September. Fishing under the ice for Arctic cisco takes place mostly during October and November, while fishing for burbot (*tittaaliq*) rounds out the winter months. Wolves, wolverines, and fox are also taken during the winter months. Subsistence use areas in the region are more fully described in Appendix G of the GMT1 SEIS (BLM 2014).

Although the people of Nuiqsut live in a modern village, they rely heavily on wild fish and game. The Kuukpik Subsistence Oversight Panel and the Native Village of Nuiqsut communicate subsistence concerns to the oil industry, to government agencies, and to other entities including the Nuiqsut Whaling Captains Association. The entire population either participates in harvesting, processing, or receiving and eating subsistence fish and game (BLM 2012, 2014; Brown 1979).

Subsistence Use Areas. The Northeastern region of the NPR-A is within the Beaufort Coastal Plain. The Beaufort Coastal Plain is a treeless, wind-swept plain that gradually ascends from the Arctic Ocean south to the foothills of the Brooks Range (McTeague et al. 2015). Its coastal shores, braided rivers, and unique geographical features provide habitats that are important for a wide variety of wildlife including fish, birds, waterfowl, and furbearing mammals, all of which are important to local Iñupiat communities. Use areas in the region include spring geese hunting areas, late fall and winter caribou hunting areas, and winter wolf and wolverine subsistence areas. There are also numerous broad whitefish (*aanaakliq*), Arctic cisco (*qaaktaq*), grayling (*sulukpaugaq*), and burbot (*tittaaliq*) fishing use areas along the Colville River and its tributaries.

User access to all of these areas and resource availability are of great concern to the Nuiqsut residents. Issues of access include not only the hunters’ physical access to specific traditional locations and locations where the animals being sought may be moving to, but emotional and spiritual access to these locations as well. This access can be disrupted by visual impediments, noise, and odors that detract from the act of subsistence by affecting the experiential quality of the hunt. These disruptions may also displace the resources present in a given location. The residents of Nuiqsut are particularly vulnerable to any displacement of the caribou herd, as it is a main source of sustenance. Changes in access and changes in the movement of the animals used for subsistence have direct bearing on the costs, time, and amount of effort expended on each hunt, and harvest success rates.

Socio-cultural Systems. The socio-cultural system of the residents of Nuiqsut is based heavily on their subsistence lifestyle. The act of the harvest and sharing of the harvest are essential to the Iñupiat way of life and essential in keeping the community together and passing cultural knowledge to the next generation. Disruption in this lifestyle, be it fragmentation of land;

disruption of land and sea mammal migration routes; introduction of unequal monetary compensation; pollution from oil and gas development; or damage to resources from oil spills, results in a loss of the community involvement, physical space, and some of the resources the Iñupiat need to survive. It also devalues the physical landscape for Nuiqsut residents, who understand the landscape as an essential part of life in Nuiqsut. Levels of community involvement are important in subsistence activities because these activities promote transmission of skill, provide an extensive knowledge network of the location of food and water sources, and strengthen community cohesion. Impacts like these continue to result in diminished or lost cultural identity, which could result in health and wellness consequences for some individuals, such as increased levels of stress, including stress related to improper compensation for their time spent participating in land planning meetings (BLM 2014, meeting notes).

Subsistence and Socio-cultural Conditions and Trends

Condition and trend of certain elements, such as subsistence use, can be measured and evaluated; however, changes in other areas of socio-cultural systems are much more difficult to quantify for purposes of evaluating trends. The BLM has been working and will continue to work with local residents to understand the impacts and the trends in the community that can be addressed.

Subsistence Use

Baseline Condition. The Alaska Department of Fish and Game (ADF&G) reports harvest data from subsistence hunting and fishing. For Nuiqsut, its harvest database contains data from the years 1985 and 1993 for many subsistence resources and 2003–2006 for caribou only. In 1985 (baseline case for ADF&G), 40 households out of 76 estimated households were sampled. In 1993 (representative case for ADF&G), 62 households out of an estimated 91 households were sampled. In 2006, 78 households out of an estimated 96 households were sampled, but limited data are available regarding caribou harvests only. In all three of these surveyed years (1985, 1993, 2006), 100% of the households were using subsistence resources. The percentage of households that were successfully harvesting resources was 97.5% in 1985 and 90.3% in 1993. As shown in Table D-1, similar percentages also applied to caribou harvesting alone. In 2006, those households harvesting caribou comprised 59% of the households sampled. Resources harvested include, but are not limited to, various fish species, brown bear, caribou, moose, muskox, dall sheep, fox, squirrel, wolf, marine mammals (seal, whale, walrus, polar bear), various birds (e.g., goose, eider, duck, ptarmigan), eggs, and berries. Primary subsistence resources are caribou, bowhead whale, fish, waterfowl, and ptarmigan. Some species are taken more opportunistically when other species are being hunted, such as polar bears, walruses, and beluga whales. Subsistence harvesting occurs seasonally for the different resources and allows for year-round activity.

TABLE D-1. Caribou Harvest

Year	% Households Using Harvested Caribou	% Households Harvesting Caribou	Estimated Harvest (# of caribou)	Estimated Weight (lb)
1985	97.5	90.0	513	60,000
1993	98.4	74.2	672	82,000
2003	95.1	45.9	293	No data
2004	97.4	70.1	429	No data
2005	98.9	60.7	436	No data
2006	100.0	59.0	363	No data

Nuiqsut's annual subsistence harvest for all resources has ranged from approximately 160,000 lbs in 1985 to 267,800 lb in 1993, with caribou consisting of 60,000 lb (38%) and 82,000 lbs (30%) respectively.

Trends. One of the trends noticed in the ADF&G data, at least for caribou, is a reduction in the number of households that are participating in the hunt, although the percentage of users of subsistence resources remains very high (at or near 100%). It is recognized that the number of harvested resources varies based on the abundance of primary subsistence species (e.g., how many whales are harvested in any given year and its effect on the need for other species). Fewer households participating also appear to translate to reduced numbers of individual animals harvested. Resources where an increase in the percentage of households participating in the harvest was noted between 1985 and 1993, rather than a reduction, are wolf, red fox, marine mammals (especially seals), ducks, berries, and plants (ADF&G 2015).

The ADF&G study completed for years 2002–2007 (ADF&G 2011) illustrates that many of the areas repeatedly used for caribou subsistence harvest west of the Colville River could be substantially affected by development in the Greater Mooses Tooth Unit and, to a lesser extent, the Bear Tooth Unit (as shown in Figure 2-1). The hunt areas between the Colville River and Fish Creek, where the caribou harvest was estimated at 100–240 per year (ADF&G 2011), are the most likely to be affected and/or substantially disrupted. Effects could include displacement of desired resources and an inability of hunters to access the areas physically due to infrastructure barriers or mentally due to aesthetic, spiritual, acoustic, and/or experiential characteristics not in keeping with traditional values of what a hunt should be like. The BLM will continue to work with local residents and the latest and most up-to-date subsistence harvest data available.

Socio-cultural Systems

Baseline Condition. The number of residents of Nuiqsut is over 400, nearly 90% of which are Alaska Natives, as reported in the 2010 Census (U.S. Census Bureau 2016). Populations are very dynamic, but the cultural foundation of the village residents when Nuiqsut was established in 1973 was strongly rooted in the Iñupiat tradition, including a subsistence lifestyle, a tradition that continues today. The socio-cultural changes that are currently being observed and felt by

residents as oil and gas development has increased in the region are described in the trends section below.

Trends. Other aspects of the Iñupiat cultural traditions and community cohesion are important, but are harder to quantify or measure (see Appendix E for the conceptual model of subsistence and socio-cultural systems). For example, tensions related to the permitting process have been noted as increasing with increasing development. These tensions arise from both inter- and intra-community conflicts over inequalities in the beneficiaries of the development; stress with the process itself and the time and effort it takes to interpret the data and findings regarding effects on the population and its traditional subsistence practices; and consternation over the impacts identified regardless of the likelihood they will occur (e.g., accidents). Affected residents may experience a sense of distrust regarding whether their concerns are being heard and whether cumulative impacts are being appropriately addressed. This trend in increasing frustration with the process is currently qualitative, but through analysis of past public meeting transcripts, it is hoped that a more quantitative analysis of the trends can be generated in the future.

Another trend of concern to Nuiqsut residents is the devaluation of the Nuiqsut cultural landscape through the cumulative impacts of multiple projects whittling away at the traditional lands used for subsistence. As lands within the Nuiqsut cultural landscape are developed for oil and gas, there are fewer lands remaining to support traditional activities and the teaching of traditional knowledge to younger generations. The physical footprints of the projects are small, but the visual, acoustic, and experiential impacts resulting from the infrastructure are more far-reaching. The proximity to town and overlap with many of the most valuable subsistence use areas are factors that exacerbate the impacts of development. The impacts on the subsistence resources themselves are also difficult to quantify, as there are many reasons movement patterns or abundance of animals can change over time.

APPENDIX D REFERENCES

Alaska Department of Fish and Game (ADF&G), 2011. *Monitoring of Annual Caribou Harvests in the National Petroleum Reserve in Alaska: Atqasuk, Barrow, and Nuiqsut, 2003-2007*. Division of Subsistence Technical Paper No. 361. May.

ADF&G, 2015. "Community Subsistence Information System: Nuiqsut." Available at: <http://www.adfg.alaska.gov/sb/CSIS/>.

BLM (Bureau of Land Management), 2004. *Alpine Satellite Development Plan, Final Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Sept. Available at: <http://www.blm.gov/eis/AK/alpine/dspfeisdoc.html>.

BLM, 2005. *Northeast National Petroleum Reserve – Alaska Final Amended Integrated Activity Plan/Environmental Impact Statement*. Jan. Available at: [http://www.blm.gov/ak/st/en/prog/planning/NPR-A_general/ne NPR-A/ne NPR-A_feis.html](http://www.blm.gov/ak/st/en/prog/planning/NPR-A_general/ne_NPR-A/ne_NPR-A_feis.html).

- BLM, 2008. *Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. May. Available at: http://www.blm.gov/ak/st/en/prog/planning/NPR-A_general/ne_NPR-A/northeast_npr-a_final.html.
- BLM, 2012. *National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Nov. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=14702>.
- BLM, 2014. *Supplemental Environmental Impact Statement for the Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth One Development Project*. U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. Oct. Available at: <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=50912>.
- Brown, W.E., 1979. *Nuiqsut Paisajich – Nuiqsut Heritage: A Cultural Plan*. Prepared for the Village of Nuiqsut and the North Shore Bureau Planning Commission and Commission on History and Culture. (Note: Author is not listed in plan. Final page is an acknowledgements section written by Brown. This is cited as Brown 1979 in the NE NPR-A EIS.)
- Department of Commerce, Community, and Economic Development (DCCED), 2016. Online community database at: <https://www.commerce.alaska.gov/web/>.
- Iñupiat Community of the Arctic Slope, 1979. *Natural Petroleum Reserve in Alaska 105(c) Final Study Volume 1(b): The Iñupiat View*. U.S. Department of the Interior, Anchorage, AK. March.
- McTeague, M.L., et al., 2015. “Introduction,” in Trammell, E.J., M.L. Carlson, N. Fresco, T. Gotthardt, M.L. McTeague, and D. Vadapalli (eds.), 2015. *North Slope Rapid Ecoregional Assessment*. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Anchorage, Alaska. July.
- Pedersen, S. 1986. *Nuiqsut Subsistence Use Land Use Atlas*. 1986 Update, ADF&G, Division of Subsistence, Fairbanks, Alaska, File Report 1986-01.
- Stephen R. Braund and Associates (SRB&A), 2010a. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow MMS OCS Study Number 2009-003, United States Department of the Interior Minerals Management Service Alaska OCS Region.
- SRB&A, 2010b. Nuiqsut caribou subsistence monitoring project: results of 2009 hunter interviews Anchorage, Alaska, Prepared for ConocoPhillips Alaska, Inc.

SRB&A, 2011. Nuiqsut caribou subsistence monitoring project: results of year two hunter interviews and household harvest surveys. SRBA. Anchorage, Alaska.

SRB&A, 2013a. Nuiqsut caribou subsistence monitoring project: results of year 3 hunter interviews and household harvest surveys. SRBA. Anchorage, Alaska.

SRB&A, 2013b. Nuiqsut caribou subsistence monitoring project: results of year 4 hunter interviews and household harvest surveys. Anchorage, Alaska

U.S. Census Bureau, 2016. “Nuiqsut.” Available at: www.census.gov.

APPENDIX E:

POTENTIAL TYPES OF IMPACTS OF OIL AND GAS DEVELOPMENT IN NPR-A

Primary sources of impact associated with oil and gas development in the Arctic region include the construction, operation, and decommissioning of infrastructure, including roads, processing facilities, wells, well pads, pipelines, airstrips, bridges, communication towers, etc.; activities associated with the various phases of development (exploration, construction, operations, and decommissioning), including human activity, drilling, pumping and storage, operation of vehicles, aircraft, vessels, etc.; and effects from emissions (such as air pollution and dust), waste disposal (such as produced water, lubricants, and garbage), and spills and releases of oil or other hazardous materials.

The mechanisms by which infrastructure, activities, and emissions associated with oil and gas development cause impacts on physical, biological, and social systems are varied and complex. Typically, a given impact source will have multiple effects across resources. For example, infrastructure development effects on biological systems include, but are not limited to, direct and indirect habitat destruction or alteration; changes to species distribution; disturbance; displacement; interference with movement/migration; mortality and health effects. These effects may occur directly (e.g., bird mortality by collisions with structures) or indirectly by interfering with a natural process, such as drainage patterns that affect water availability that in turn affects the health and survival of vegetation and animals. Infrastructure development and operation may also affect social systems, for example, when facility construction requires disturbance of a cultural resource site and simultaneously creates a visual impact on nearby villages.

Effects of Oil and Gas Development on Subsistence Activities

Of primary concern to RMS stakeholders are the effects of oil and gas development on subsistence activities. Subsistence systems provide food security and other economic values, but they are also important to social and cultural systems (BLM 2012). Subsistence activities encompass sharing and distribution networks, cooperative hunting and fishing, and ceremonial activities. Subsistence hunting and other features of the subsistence way of life embody cultural, social, and spiritual values that are essential to Alaska Natives. Consequently, direct impacts from oil and gas development either to subsistence resources or the ability of Alaska Natives to harvest subsistence resources typically cause a variety of important indirect socioeconomic and health impacts, which are discussed below.

- **Loss of Traditional Use Areas.** Depending on the location of oil and gas facilities and related infrastructure, the project's "footprint," (i.e., the acreage that is actually occupied by facility components) can have a direct impact on subsistence use areas, particularly those used for fishing and for hunting caribou, geese, and furbearers such as wolf and wolverine. In addition to land areas occupied by the facilities themselves, hunters are likely to avoid areas up to several miles away from the facilities, per the discussion under "avoidance of developed areas" below. As a result, development could result in an area much larger than the "footprint" area of the facility being

effectively removed from the traditional harvest area of a given community. This can reduce the amount of subsistence harvesting for individuals or result in additional travel distance or time to obtain subsistence resources in other areas. Reduced subsistence harvesting may have negative health effects and negative economic and social impacts (see below). The increased travel has a variety of negative effects, including greater expenditure of time for subsistence activities, greater expenditures for vehicle fuel and repairs, and potential health impacts from additional travel-related accidents.

- **Access to Subsistence Areas.** The presence of oil and gas infrastructure and associated facilities (e.g., roads) can limit subsistence users' access to subsistence areas. Subsistence users may be forced to travel longer distances to avoid physical obstacles related to oil and gas infrastructure, experience physical problems using or crossing roads or crossing under pipelines, or find that travel through a certain area may be prohibited or restricted. As a result of reduced access to subsistence areas, subsistence users may have to travel farther to harvest subsistence resources, which increases time, travel, and other costs associated with subsistence activities.
- **Avoidance of Developed Areas.** Subsistence users may avoid areas of oil and gas activities. Reasons for avoiding development include: (1) the concern that discharging a firearm near the various facilities and infrastructure will result in liability for damage, death to a worker, or serious environmental consequences (e.g., an oil spill from a punctured pipeline); (2) previous negative experiences dealing with oil field security and personnel; (3) the belief that animals habituated to oil and gas infrastructure are contaminated and not safe for human consumption; and (4) other spiritual and aesthetic aversions to being on the land and hunting or fishing near infrastructure.

Avoidance of developed areas may extend for several miles from the actual location of facilities, thus potentially affecting a much larger area. As noted above, avoidance of the total area of any development in the planning area and lands around it could effectively remove the area from the traditional harvest area of a given community. If concerns about food contamination lead to reduced consumption of subsistence resources, this may increase the consumption of non-subsistence foods, which can in turn lead to economic problems, food security problems, and social, cultural, and possibly mental (stress, anxiety, depression) and physical (nutrition) health issues.

- **Aircraft Disturbance.** The noise and visual disturbance associated with aircraft overflights can disturb animals and disrupt hunts when low-flying aircraft spook the animals. Reduced hunting success may mean that additional money and time are required for additional hunting expeditions, or to purchase commercial meat. Hunters cannot avoid disturbance from aircraft by avoiding permanent infrastructure; therefore, impacts from aircraft can cause more acute stress and disruption, which can sometimes turn into long-term stress

and financial and food-security issues throughout the year. Lack of hunting success due to aircraft disruption can lead to reduced subsistence resource consumption, which, as noted above, can have negative economic, social, and health effects. Noise from air traffic could also create a nuisance around individuals' camps and cabins, possibly reducing their use as a base for subsistence harvests.

- **Disruption of Migrating Subsistence Species.** Noise, traffic, odors, and infrastructure associated with oil and gas exploration, facility construction and operation, and decommissioning could affect the availability of key resources such as caribou, waterfowl, and furbearers. Migrating subsistence species such as caribou may be displaced from areas of oil and gas activity, resulting in long-term localized effects. If subsistence species move away from areas of development, they could become more difficult to locate and harvest.
- **Direct Damage to or Contamination of Subsistence Resources and Habitats.** A small number of fish could be injured or killed, potentially affecting harvests in localized areas. Waterfowl might also avoid traditional harvest locations. Oil spills that enter water could contaminate or cause concerns about contamination of marine mammals and fish, which can lead to reduced consumption of subsistence resources, with potential subsequent negative economic, social, and health effects.
- **Cumulative Effects.** Overall, future development is expected to increase the severity of existing impacts, including: continued hunter avoidance of industrial areas, continued disturbance of hunters and wildlife from increased air and road traffic, reduced access to or loss of subsistence use areas, and reduced availability of subsistence resources in developed areas. There could also be substantial cumulative effects from climate change, including the inability to travel during the short goose-hunting season.

Social and Cultural Impacts of Oil and Gas Development

Oil and gas development has a variety of positive and negative social and cultural impacts. Positive impacts include increased employment opportunities and easier commuting and other travel-related social benefits associated with road development (including seasonal connection via ice road to the Dalton Highway). As noted above, some impacts are indirect effects related to oil and gas impacts on subsistence resources and activities; however, oil and gas development also has social and cultural impacts beyond subsistence.

- **Subsistence-Related Social and Cultural Impacts.** Subsistence hunting and harvesting activities are central to the cultural identity and social cohesion of North Slope communities. Because the subsistence way of life embodies cultural, social, and spiritual values that are essential to Alaska Natives,

impacts on subsistence resources and activities may lead to a variety of important social and cultural impacts.

Impacts on subsistence resources and activities may lead to reduced consumption of subsistence resources, which in turn may lead to economic and socio-cultural impacts. However, the devaluation of the cultural landscape is also a direct, indirect, additive, and cumulative impact related to subsistence. Residents believe that the cultural, spiritual, or other personal value placed on their families' camping, hunting, and fishing sites is substantially diminished when industrial infrastructure is developed nearby. There may be a loss of spiritual connection to the land.

If subsistence impacts lead to decreased participation in subsistence activities, this could have impacts on future generations, as harvesters may no longer be able to teach younger hunters about subsistence uses in traditional harvesting areas. Decreased subsistence harvesting and reduced participation in subsistence activities could lead to decreased sharing, decreased cooperative hunting and fishing, as well as decreased participation in subsistence-related ceremonies, all of which contribute to the social fabric of Alaska Native communities.

Finally, issues surrounding subsistence and impacts from oil and gas development on the subsistence lifestyle may be a significant source of stress within North Slope communities. This stress is compounded by concerns over the additional and synergistic effects of climate change, competition with sport hunters, and other impact sources on the subsistence lifestyle.

- **Other Social and Cultural Impacts.** Oil and gas development increases employment opportunities, and new roads may make it easier for residents to travel, including travel to work for those who work in the oil field. However, there are impediments to local employment in the oil field due to cultural issues and the lack of adequately trained local residents.

The permitting process involves a substantial amount of scoping, testimony, interviews, surveys, and requests for comments on observations and impacts. Such questions can elicit emotions and experiences that are linked to several decades of interactions with outsiders requesting information. Anxiety and intra- and inter-community conflict over the continuous overload of bureaucratic and legal processes involved with permitting and development is a source of frustration and disenfranchisement for Alaska Natives. Keeping track of oil company activities and NEPA or similar processes is a drain on residents' time and resources, and can be overwhelming. Disagreement and conflict over differing attitudes toward development, the use of new roads, and related topics is generated within individuals, families, the community itself, and with other North Slope communities. Although the economic benefits of oil development are substantial and widespread, disparities in the

economic benefits accrued by residents (e.g., village ANCSA corporation shareholders and non-shareholders) that result from development can also be a significant source of tension.

Oil and gas development increases contacts between Alaska Natives and non-Natives, such as non-resident workers. While there are positive aspects to the cultural interactions, negative aspects include, but are not limited to, the importation of alcohol into villages or lifestyles in conflict with traditional cultural values, which have both negative social and health impacts.

- **Cumulative Effects.** Increasing development activities on the North Slope may result in more residents obtaining employment in the oil and gas industry. Climate change could affect subsistence resources and land uses, creating significant social anxiety for the Iñupiat. Expected cumulative impacts include a mixture of socio-cultural benefits and adverse impacts that are major in extent.

Effects of Oil and Gas Development on Public Health

Oil and gas development may have a variety of positive and negative effects on public health. Increased income for individuals or families may improve health in affected communities through increases in the standard of living, reductions in stress, and opportunities for personal growth and social relationships. Increased income and employment opportunities may also improve diet and nutrition by providing money to fund subsistence activities. There also may be positive impacts on public health as a result of increased access to health care and facilities. Negative impacts on public health could result through changes in diet, nutrition, exercise, environmental exposures, infectious disease, safety, and acculturative stress. Similarly to social and cultural impacts, health impacts can result from impacts on subsistence resources and activities or from other causes not related to subsistence.

- **Subsistence-Related Public Health Effects.** Subsistence-related public health effects stem primarily from increased travel related to subsistence harvesting and changes in diet, nutrition, and exercise. When subsistence harvesters are forced to travel farther to harvest subsistence resources, this may increase travel times and costs for subsistence activities, and could potentially decrease harvests and increase risk of injury and travel-related accidents.

For some individuals, decreased success in subsistence harvesting leads to various hardships that increase emotional stress, and, as noted above, concern about impacts on subsistence activities are a general source of emotional stress for North Slope communities that may lead to negative health effects, especially if it contributes to depression, anxiety, or increased substance abuse. Similarly, individual, intra-community, and inter-community conflict

and associated stresses related to oil and gas development concerns may cause emotional stress that results in negative health effects.

Decreased consumption of subsistence resources, regardless of whether it is caused by avoidance of traditional use areas, decreased success at hunting caused by aircraft overflights, inadequate resources, or other causes, may affect diet and nutrition. If residents are unable to obtain adequate supplies of subsistence foods, they may shift to consuming commercially available foods, sometimes referred to as a “Western” diet, which may result in negative health outcomes, such as increased rates of diabetes, metabolic disorders, and associated chronic diseases.

- **Other Public Health Effects.** Impacts on public health not associated with subsistence impacts include environmental exposures, increases in infectious diseases, safety, acculturative stress, economic impacts, and the capacity of local health care services.

Oil and gas development is associated with impacts on air and water quality that can have negative health effects for at-risk populations when they are exposed to hazardous substances, for example, through poor air quality episodes or contamination of food sources or water supplies. An associated public health impact is increased stress associated with concerns about how to respond to health and safety incidents that could occur at oil and gas facilities, such as blowouts or breaches of pipelines or the additional risk posed by natural events such as floods.

An influx of non-resident workers to local communities may increase exposures to communicable disease, alcohol and drug use for local residents, as well as increasing stress and mental health issues associated with these activities. There may also be an increased prevalence of social pathologies, including substance abuse, assault, domestic violence, and unintentional and intentional injuries associated with economic growth.

The development of permanent and seasonal roads in the region also has the potential to induce increased travel and raises the risk of subsequent accidents and injuries.

- **Cumulative Effects.** Future oil and gas development could cause cumulative effects through impacts on subsistence that have negative health effects and from impacts on air quality, water quality, or spills. There could also be cumulative effects associated with climate change, through stress-related climate change impacts on subsistence and increased injury and trauma from longer and more difficult subsistence harvesting.

Environmental Justice Issues Associated with Oil and Gas Development

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” formally requires federal agencies to evaluate the potential for environmental justice impacts arising from their actions (Federal Register 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of oil and gas development in the Northeastern NPR-A on environmental justice issues follows guidelines described in the Council on Environmental Quality’s (CEQ’s) Environmental Justice Guidance under the National Environmental Policy Act (CEQ 1997). The analysis method involves the description of the geographic distribution of low-income and minority populations in the affected area, the assessment of whether the impacts of the development would produce impacts that are high and adverse; and if impacts are high and adverse, determination as to whether these impacts disproportionately affect minority and low income populations.

Oil and gas development is expected to have substantial environmental justice impacts on local communities, based on (1) findings that the community of Nuiqsut includes a minority population and (2) findings of major impacts on socio-cultural systems and subsistence. Negative impacts are anticipated to affect lower-income residents disproportionately, as they are more dependent on subsistence resources, but less capable of adapting to subsistence impacts. If subsistence harvests decrease as a result of oil and gas-related impacts, or subsistence-related travel costs increase, lower-income residents may be unable to spend more money on fuel and other subsistence-related expenses, and may be less able to shift to more expensive commercial food sources, thereby potentially experiencing decreased food security. The Iñupiat of the North Slope are also disproportionately impacted by climate change. Economic benefits related to oil and gas production are a countervailing positive impact. Based on all accumulated evidence and local testimony, it is reasonable to anticipate that other oil and gas projects will result in cumulative environmental justice impacts.

Oil and Gas Development Impacts on Ecological Systems: Air, Water, Vegetation, Fish, Birds, and Mammals

Oil and gas development will cause impacts on ecological systems, including air and water resources, plants, fish, birds, mammals, and other wildlife, and several threatened and endangered species.

- **Air Quality.** During construction, there could be short-term and transient emissions from fuel-burning equipment, drilling emissions, and fugitive dust sources. During operation, there could be ongoing and long-term emissions from heaters, vehicles, and other stationary and mobile sources; emissions from flaring; and fugitive dust. Cumulative impacts are difficult to estimate

but are expected to be minimal. Impacts could result from increased air emissions, including fugitive dust, pollutants, and greenhouse gases.

- **Water Quality.** Long-term impacts on local water resources could result from the placement of new infrastructure, including changes in drainage patterns and changes in stream flow. There would be short-term, temporary impacts from ice infrastructure (e.g., roads and pads). Cumulative effects would probably be small in magnitude and most impacts would be local in nature. Impacts could result from changes in surface drainage due to construction of roads and pads, and loss of wetlands and associated functions largely from construction of roads and pads and gravel mine development.
- **Vegetation.** Expected direct impacts on vegetation include removal as a result of the construction of oil and gas infrastructure, including construction of roads and pads and gravel mine development. There could also be indirect impacts from gravel, spray, and dust deposition near graveled surfaces. Areas of direct and indirect impacts could be within potential wetlands. Climate change and oil and gas and other development would contribute to cumulative effects. Impacts could include loss of upland and wetland vegetation communities and their associated functions, alteration of plant communities as a result of dust deposition, soil salinity change, increased snow drifting, changes to natural drainage patterns, and increased probability of colonization by non-native, invasive species.
- **Fish.** Expected impacts on fish would include injury at water-use intakes, barriers to fish movement, and impacts associated with altered water quality, physical habitat changes (water quantity, flow patterns, and geomorphology), point and non-point source pollution, and increased turbidity and sedimentation. Collectively, these impacts could contribute to reduced success at different life history stages, behavioral changes, diminished condition, susceptibility to pollutants or disease, shifts in fish species distribution, and mortality. Cumulative effects would likely be minor and localized.
- **Birds.** Expected impacts on birds include mortality and impacts on bird behavior, and nesting, brood-rearing, foraging, and molting habitats through habitat loss and alteration, disturbance from noise and visual activity, displacement from habitats, or attraction to habitats altered by thermokarst and early green-up adjacent to gravel infrastructure. If climate change over the next several decades were to result in substantial changes in weather patterns, then changes to vegetation types and distribution, insect abundance and timing of emergence could occur, and habitat disturbance impacts from oil and gas activities could be exacerbated. Cumulative effects, exacerbated by climate change, could include loss of bird habitat, long-term in duration, localized, and minor. Some residual adverse effects (on a small number of birds) could include direct and indirect loss of habitat, habitat fragmentation and behavioral alternation due to avoidance of developed infrastructure, vehicle

traffic, and human activity; and mortality from collisions with human infrastructure or vehicles.

- **Mammals.** Expected impacts on mammals include:
 - Physical habitat changes; displacement from (or attraction to) altered habitats; disturbance from noise or activity; obstruction of movement from construction activities.
 - Collisions (mortality); disturbance and obstruction of movement from vehicles or air traffic; defense of life and property (mortality); increased hunting; premature den emergence (grizzly bear) associated with vehicle and aircraft traffic and human activity during drilling and operations phases.
 - Obstruction of movement by pipelines and spills or leaks causing exposure to toxic materials from pipelines during drilling and operations phases.
 - Possible avoidance by parturient female caribou of marginal calving habitat.
 - A variety of cumulative impacts, including impacts associated with climate change, vegetation change, and other causes.

Impacts include wildlife habitat fragmentation; loss or alteration of habitat; behavioral disturbance by anthropogenic activities resulting in short-term displacement, deflection of movement or delay of movement; mortality; or altered survival or productivity.

- **Threatened and Endangered Species.** Threatened and endangered species subject to impacts include polar bear, spectacled eider, and Steller's eider; however, there are no Steller's eider found within the area of impact, and therefore no impacts are expected.

Expected impacts on polar bears include denning habitat loss or alteration, disturbance or displacement of denning females and cubs, incidental harassment of polar bears transiting the project study area, intentional hazing near occupied work sites, and mortality due to collisions or defense-of-life kills. There could be cumulative impacts from climate change and other development, including near-shore or offshore oil and gas development.

Expected impacts on spectacled eiders include habitat loss and alteration, disturbance and displacement, obstruction of movement, mortality from various causes, and impacts from spills. There could be impacts on a *small number* of nesting, brood-rearing, and staging spectacled eiders. Impacts could result from habitat destruction and fragmentation, disturbance, vehicle and air traffic, spills of hazardous materials, including oil spills and mortality from collisions with human infrastructure or vehicles.

Other Effects of Oil and Gas Development

In addition to the impacts described above, oil and gas development, regardless of where it would occur in the region, would also have impacts on the following resources or processes:

- **Climate and Meteorology:** Negligible impacts from greenhouse gas emissions.
- **Climate Change:** Negligible impacts from greenhouse gas emissions and particulate matter.
- **Cultural Resources:** Moderate direct and indirect impacts from ground disturbance, effects on subsistence activities and traditional use areas, and visual and noise impacts. Minor cumulative impacts. Impacts through direct impacts on artifacts and traditionally used sites and visual and noise impacts.
- **Economy:** Minor positive impacts from increased oil and gas revenues. Negative cumulative impacts from climate change.
- **Geology and Mineral Resources:** Minor impacts from drilling and annular disposal and injection of fluids.
- **Land Use:** Moderate direct impacts from construction of gravel pads, roads, and airstrips; excavation of gravel from the mine site; and installation of vertical support members (VSMs). Change from less to more intensive land uses and changes arising from new roads providing access to new areas. Cumulative impacts from other oil and gas projects. Impacts from development of previously undisturbed areas.
- **Noise:** Minor impacts on communities and wildlife from construction (short-term), drilling, gravel mining (short-term), vehicles, and aircraft. Cumulative impact from multiple projects.
- **Oil, Saltwater, and Hazardous Materials Spills:** Increased risks of spills, primarily related to equipment failure, on land. Minor cumulative impacts from multiple projects.
- **Paleontological Resources:** Negligible impacts expected.
- **Petroleum Resources:** The purpose of development is to utilize petroleum resources, for which royalties are paid. Cumulative impacts from other oil and gas projects and from climate change.
- **Recreation:** Negligible impacts from the presence of permanent facilities and associated noise. Cumulative impacts from other development and climate change.

- **Sand and Gravel Resources:** Minor impacts from loss of sand and gravel resources and effects from gravel mining. Impacts from loss of sand and gravel resources.
- **Soils and Permafrost (also Physiography/Geomorphology):** Minor impacts from loss of soil productivity due to road and pad construction and gravel mine development; minor impacts on thermal regime of permafrost from placement of gravel fill on the tundra; snowdrifts caused by gravel structures and blockage of natural drainage patterns. Soil compression, displacement, altered soil moisture, and effects of spills from construction and operation of oil and gas infrastructure. Cumulative effects from climate change.
- **Transportation:** Minor impacts from construction-related traffic on ice roads; interference with some winter travel on frozen channels from construction activities; additional local transportation options from new roads; and increased air traffic. Cumulative effects from construction of new roads in roadless areas.
- **Visual Resources:** Minor impacts from visibility of oil and gas facility construction activities and infrastructure (including lighting at night) during operations. Cumulative effects from other developments and from climate change. Impacts from infrastructure and lighting visibility.

Potential Residual Impacts

The following methodology was used to identify which of the impacts from oil and gas development in the Northeastern NPR-A (including cumulative impacts) are likely to be residual impacts (that is, remaining after mitigation measures have been applied):

- The BLM RMS project team reviewed the affected environment and impacts presented in the IAP EIS, the ASDP EIS, and the GMT1 SEIS.
 - The RMS project team reviewed the affected environment and the potential direct, indirect, and cumulative impacts for each resource value.
 - The RMS project team evaluated whether more detailed information was currently available that could influence the description of potential impacts from future development.
- The BLM RMS project team evaluated the mitigation measures (BMPs and lease stipulations) specified in the EISs and the associated RODs.
 - The RMS project team reviewed the mitigation measures presented in the IAP, ASDP, and GMT1 NEPA documents and RODs, determined which mitigation measures could be applicable to the actions evaluated for the RMS, and determined if there are additional measures that could be implemented to avoid, minimize, rectify, or diminish impacts over time.

- The BLM RMS project team identified the potential residual impacts from future development. These are the impacts that could not be avoided and/or minimized, rectified, or diminished over time, even with full application of the required BMPs and lease stipulations described previously.

The following table summarizes the Bureau of Land Management Project Team responses to these process steps.

TABLE E-1. Northeastern NPR-A RMS Impacts Summary Table

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Air Quality	<p>Moderate Impacts.</p> <ul style="list-style-type: none"> • During construction, short-term and transient emissions (including fuel combustion emissions from heavy equipment and small electric power generator engines, heaters, and other fuel-burning equipment); drilling emissions; and fugitive dust sources. • During operation, ongoing and long-term emissions from a heater; tailpipe emissions from vehicle travel; minor fugitive emissions of field gas from equipment and pipeline components; fuel combustion emissions from fuel-fired heaters, boilers, engines, storage tanks for flowback fluids, and other mobile sources; emissions from flaring at APF; and fugitive dust. <p>Cumulative Impacts. Cumulative impacts to the atmospheric environment would be low due to the relatively low quantity of emissions and short duration through the construction phase compared to existing North Slope infrastructure.</p>	<ul style="list-style-type: none"> • Development and implementation of an approved plan for limiting fugitive dust. • Stationary drill site equipment will be electrically powered or utilize natural gas. • Use of ultra-low sulfur diesel for all rolling stock, including portable heaters. • All oil and gas operations (vehicles and equipment) that burn diesel fuels must use “ultra-low sulfur” diesel • Powering all oil and gas operations (vehicles and equipment) by natural gas or electric power rather than diesel fuel to the extent practicable, or if not, gasoline rather than diesel. • The collection of air monitoring data both before and during the life of the project, the preparation of an emissions inventory and emissions reduction plan, air quality modeling, mitigation, changes to activities to reduce emissions, as determined necessary and appropriate by BLM, and public reporting of these data. • Road design, construction, maintenance, and operation requirements to minimize air quality impacts. • Site design and reclamation in accordance with an approved gravel mine plan. • A requirement that the permittee provide funding for monitoring to identify and address concerns related to air quality in the Nuiqsut area, develop monitoring reports, and provide funding for BLM technical review. 	Increased air emissions, including fugitive dust, pollutants, and greenhouse gas (GHG).

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Birds	<p>Minor Impacts.</p> <p>Potential mortality and impacts to bird behavior and nesting, brood-rearing, foraging, and molting habitats through habitat loss and alteration, disturbance from noise and visual activity, displacement from habitats, or attraction to habitats altered by thermokarst and early green-up adjacent to gravel infrastructure.</p> <p>Cumulative Impacts. The direct, indirect, and cumulative habitat loss of bird habitat generally would be of low intensity, long-term in duration, localized, and minor. If climate change over the next several decades were to result in substantial changes in weather patterns, vegetation types and distribution, and insect abundance, habitat disturbance impacts from oil and gas activities could be exacerbated additively, and perhaps synergistically, and extend beyond the life of the oil and gas fields. Changes in vegetation as a result of climate change would directly impact the amount and types of habitat available to tundra nesting birds. Such impacts of climate change could accumulate with any changes in soil thermal regimes that might occur as a result of past and future non-oil and gas and oil and gas activities in and near the NPR-A, potentially leading to synergistic impacts to bird habitat.</p>	<ul style="list-style-type: none"> • BMPs which ensure that solid, liquid, and hazardous wastes (including fuels) do not impact birds or their habitats, and to reduce the potential for garbage and shelters that attract predators. • BMPs and lease stipulations that protect bird habitats and food sources. • BMPs and stipulations that regulate the types of activities that can occur near water bodies, including rivers and streams, types of equipment that can be used in the planning area. • A Wildlife Avoidance and Interaction Plan and a Predator Management Plan, incorporating Federal, State, and local stipulations on wildlife interactions. • Development and implementation of a reporting system to monitor roadkill of birds and other wildlife on transportation routes. • Recommended design measures, including: <ul style="list-style-type: none"> - Implementing controls to minimize nesting opportunities for predatory/nuisance birds. - Designing facilities to minimize potential for bird strikes. - Limiting removal of water from freshwater lakes during the summer. - Monitoring water withdrawal volumes and water body recharge. <p>Timing restrictions on gravel placement on the tundra.</p>	<p>Some effects on birds from oil and gas activities would be unavoidable despite protective management measures: direct and indirect loss of habitat, habitat fragmentation and behavioral alternation due to avoidance of developed infrastructure, vehicle traffic, human activity, and vessel traffic in the vicinity of coastal ports; mortality from collisions with human infrastructure or vessels. The consequences of these effects are expected to last for the life of the oil and gas development and, depending on the level of rehabilitation, perhaps longer.</p> <p>Molting Geese. Some adverse impacts on molting geese would be unavoidable despite protective management measures. The additive effect of the direct/indirect effects from oil and gas activities and from a myriad of potential effects from the cumulative analysis imposed on molting geese will create some residual adverse impacts due to habitat destruction and fragmentation, disturbance, offshore development, vessel and air traffic, spills of hazardous materials, including oil spills, mortality from collisions with human infrastructure or vessels and salt water intrusion due to rising sea levels. These effects may be unavailable as these birds come from many different areas of the Northern Hemisphere to undergo molt in this location, and they have very strong preferences to specific areas and vegetation types, and it has been shown that they are especially sensitive to disturbance during this life stage.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Birds (Cont.)			<p>Brood-Rearing Geese. Some adverse impacts on brood-rearing geese would be unavoidable despite protective management measures. The additive effect of the direct/indirect effects from oil and gas activities and from a myriad of potential effects from the cumulative analysis imposed on</p> <p>Geese-rearing broods will create some residual adverse impacts due to habitat destruction and fragmentation, disturbance, offshore development, vessel and air traffic, spills of hazardous materials, including oil spills, mortality from collisions with human infrastructure or vessels, and salt water intrusion due to rising sea levels. These effects may be unavoidable as these birds have very strong preferences for specific habitats and vegetation types.</p>
Climate and Meteorology	<p>Negligible Impacts. Construction and operations activities would generate GHG emissions, but due to the quantity and duration of these emissions, project impacts to climate and meteorology are expected to be negligible.</p>	See air quality BMPs and stipulations.	Negligible.
Climate Change	<p>Negligible Impacts. The project would produce direct and indirect GHG emissions (carbon dioxide, methane, and other gases) that contribute to climate change. The project would also generate particulate matter that might affect climate.</p> <p>Cumulative Impacts. Cumulative effects of an individual project on climate change cannot be determined. Although the project is not anticipated to cumulatively impact climate change, the cumulative effect of climate change is likely more pronounced on the North Slope than elsewhere in Alaska and may include an increase in particulate matter to the extent shallow lakes and ponds dry up or are smaller, watersheds would experience a change to drier soils, and thermokarsting may increase as ice-rich permafrost becomes unstable with increases in ambient surface temperatures.</p>	See air quality BMPs and stipulations.	Negligible.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Cultural Resources	<p>Moderate Impacts.</p> <ul style="list-style-type: none"> • Destruction or damage to the landscape through ground disturbing activity; restricted access to multi-generational camps, hunting areas, and travel routes; and destruction or degradation of cultural sites or areas through construction activities or incidents associated with project activities. • Indirect impacts from altering the way subsistence hunters access hunting and fishing areas; altering routes used to access hunting areas and to travel between villages, cabins, and camps; decreased landscape use near project components and loss of cultural association with those areas; and gradual shifting of cultural activities away from areas within the cultural landscape due to avoidance of project components. • Visual and noise impacts to the cultural landscape caused by construction, operation, and reclamation of project components; changes to the viewshed due to project components; and the introduction of new landmarks associated with industrial infrastructure in culturally sensitive areas. <p>Cumulative Impacts. Because of the varying circumstances of occurrence surrounding the location and vulnerability of cultural resources, the significance of future cumulative impacts is difficult to assess. However, the cumulative impact would be expected to be minor.</p>	<ul style="list-style-type: none"> • Certain design and operational features described in Chapter 2 of the FSEIS. • Requirement to conduct a cultural and paleontological resources survey prior to any ground-disturbing activity, and to notify the authorized officer and suspend all operations in the immediate area in the event of a discovery. • Information and training for personnel concerning applicable stipulations, BMPs, standards, and regional environmental, social, traditional, and cultural concerns. • Prohibition of permanent facilities in the streambed and adjacent to certain rivers. • Prohibition of permanent facilities on the lake or lakebed and within ¼ mile of the ordinary high water mark of any lake zone III deep lake. • Permit by BLM, on a case-by-case basis, to allow low ground-pressure vehicles to travel off of gravel pads and roads at certain times. • CPAI's built-in design mitigation measures. 	<p>Direct impacts to artifacts and traditionally used sites (destruction, damage, removal, change in use, loss of cultural identity) will be limited to the project footprint during construction and operation. These could be caused by excavation of gravel, construction and maintenance of gravel roads and pads, airstrips, bridges, culverts, and construction of ice roads or any ground disturbance. Visual and noise impacts could occur over a larger area. The impacts to the cultural landscape will be detectable and moderate due to pre-activity inventories and surveys.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Economy	<p>Minor Impacts (positive).</p> <ul style="list-style-type: none"> Increased economic activity in the State, the North Slope Borough (NSB), and Nuiqsut. Increased revenues to the State, the NSB, and Nuiqsut, resulting from shared royalties, taxes, NPR-A grants, and other fees. Increased revenues to Alaska Native corporations from shared royalties. Increased job opportunities. Additional indirect positive impacts from spending by workers and government spending. Increased oil production in the Alaska North Slope that will result in additional secondary economic impacts. <p>Cumulative Impacts. Overall cumulative economic impacts resulting from increased development on the North Slope would have benefits at State, regional, and local levels.</p> <p>Climate change could negatively impact the economy for the North Slope; because villages are primarily located at or near sea level, any increase in mean sea level or violent storms may require relocation of part or all of villages and subsistence camps. This would have a major negative economic impact to the villages and the NSB, and a substantial impact to the State if it must help fund the relocation.</p>	<p>None.</p>	<p>None. Impacts are positive.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Environmental Justice	<p>Major Impacts; disproportionately high and adverse impacts to a minority population. Overall, impacts are expected to be long-term and of high intensity. The improved permanent access to subsistence use areas is expected to have a long-term, moderate beneficial effect for many residents of Nuiqsut while significantly diminishing the traditional and subsistence value of the area due to loss of land, disturbance to and possible deflection of resources attributable to the stature of the road, road traffic, the presence of the pipeline, and increased local hunting pressure.</p> <p>Cumulative Impacts. Overall, the GMT1 project in addition to other current and reasonably foreseeable future activities could increase the severity of existing impacts on Nuiqsut, Atqasuk, Wainwright, Point Lay, Barrow, and Anaktuvuk Pass. As oil and gas development activities occur over a larger area, direct impacts to the Iñupiat would be significant and could have long-term impacts affecting both current and future generations.</p>	See mitigation for subsistence activities and resources.	<p>The overall impacts to the minority community of Nuiqsut from GMT1 are expected to be long-term and high intensity. Environmental justice impacts are based on findings of major impacts to socio-cultural systems and subsistence. Negative impacts will affect lower-income residents more intensely, who are less capable of adapting to subsistence impacts. Economic benefits are a countervailing positive impact.</p> <p>Cumulative. Potential impacts to subsistence are considered as significant environmental justice issues. Socio-cultural systems impacts due to the conflict and tensions over the permitting process and disproportionately shared economic benefits of development are expected to increase with subsequent development. Climate change impacts the Iñupiat of the North Slope disproportionately and Iñupiaq subsistence activities are particularly dependent on ice, wind, and permafrost conditions. The cumulative impacts to the communities of Nuiqsut, Point Lay, Wainwright, Atqasuk, Anaktuvuk Pass, and Barrow would likely be additive to the extent that other reasonably foreseeable developments within the cumulative impacts evaluation could deflect or divert subsistence resources further away from the communities.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Fish	<p>Minor Impacts. Potential impacts include:</p> <ul style="list-style-type: none"> • Injury at water-use intakes, • Altered water quality, • Physical habitat changes (water quantity, flow patterns, and geomorphology), • Point and non-point source pollution, • Increased turbidity and sedimentation, and • Barriers to fish movement. <p>Collectively, these impacts could contribute to reduced success at different life history stages, behavioral changes, diminished condition, susceptibility to pollutants or disease, shifts in fish species distribution, and mortality.</p> <p>Cumulative Impacts. Direct, indirect, and cumulative impacts to fish and fish habitats are expected to be localized, minor, and additive, and are not expected to be synergistic.</p>	<p>The following BMPs and lease stipulations:</p> <ul style="list-style-type: none"> • Requirements for pumpable waste injection and temporary mud and cuttings storage. • Requirements for impermeable containment, spill prevention, and response planning. • Prohibition of equipment refueling and fuel storage exceeding 210 gallons within 500 feet of the active floodplain of any water body. • Prohibition of surface discharge of reserve-pit fluids, and winter water withdrawals from rivers and streams. • Limits, restrictions, and required procedures for water withdrawals. • Required practices for streambank protection. • Requirements for location of winter transportation bridges. • Prohibition on permanent oil and gas facilities being constructed within 500 feet from fish-bearing water bodies. • Requirements for pipeline construction and operation, and separation of roads and pipelines. • Minimization of impervious surfaces by encouraging a reduced development footprint. • Requirements for marsh and stream crossings. • Requirements for approval of the gravel mine site design and reclamation. • Requirements for hydrology and fish studies to determine the appropriate structures at stream channel crossings. • Restrictions on drilling in rivers, streams, and fish-bearing lakes. • Requirements for siting facilities and infrastructure (including pipelines) away from certain waterbodies. • Restrictions on discharge of pollutants from vehicle and equipment use, personnel camps, and produced fluids. • Setbacks from major rivers, including Fish Creek and Tiṇṇiaqsiḡvik (Ublutuooh) River. • Setbacks from deep water lakes. 	<p>Reduced success at different life history stages, behavioral changes, diminished condition, susceptibility to pollutants or disease, shifts in fish species distribution, and mortality.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Geology and Mineral Resources	Minor Impacts. Bedrock geology would be locally impacted by drilling of production wells. A minor amount of bedrock would be disturbed and relocated to the surface during drilling. Annular disposal and injection of fluids could impact subsurface geology.	See soils and permafrost BMPs and stipulations.	Bedrock disturbance and subsurface geology impacts.
Land Use (land ownership, use, and management)	<p>Moderate Impacts.</p> <ul style="list-style-type: none"> • Direct impacts from construction of gravel pads, roads, and airstrips; excavation of gravel from the mine site; and installation of VSMs. • Land use would change from primarily undeveloped land used principally for wildlife habitat, subsistence, research, and some recreation, to further oil and gas development (industrial use). With the project construction, industrial land uses would dominate in the immediate vicinity of the project footprint. • Use of the land and access would be changed by the construction of the CD5-GMT1 road. The CD5-GMT1 road would provide vehicle (e.g., off-road vehicle [ORV]) access to new areas. <p>Cumulative Impacts. Cumulative impacts to land use from oil and gas exploration, development, and production in the NPR-A and across the North Slope will result in development of previously undisturbed areas and will change the character of land use, resulting in increases in noise and disturbance, and potentially adversely affect habitats and subsistence. Most of the cumulative impacts from future development were expected to be localized to the development facilities.</p>	<p>The following design measures:</p> <ul style="list-style-type: none"> • Consulting with land owners or managers within or adjacent to the project area. • Ensuring project activities do not encroach on Native allotment or traditional land use sites through survey and demarcation. • Avoiding any trespass or impact to any allotment. <p>BMPs requiring the following:</p> <ul style="list-style-type: none"> • Areas of operation shall be left clean of all debris. • Preparation and implementation of a hazardous materials emergency contingency plan and a comprehensive spill prevention and response contingency plan. • Restrictions on refueling of equipment and location of fuel storage stations near floodplains and water bodies. • The collection of air monitoring data both before and during the life of the project, the preparation of an emissions inventory and emissions reduction plan, air quality modeling, mitigation, changes to activities to reduce emissions, as determined necessary and appropriate by BLM, and public reporting of these data. • Restrictions on the timing, locations, procedures, and equipment used for various activities that could potentially cause erosion and other types of damage to the tundra and soils. • BMPs for the construction and maintenance of crossings of waterway courses. 	Development of previously undisturbed areas within the subsistence use area for Nuiqsut will change the character of land use, resulting in increases in noise, odors, and disturbance, and potentially adversely affect habitats and subsistence uses.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Land Use (land ownership, use, and management) (Cont.)	--	<ul style="list-style-type: none"> • Road design, construction, maintenance, and operation requirements to minimize impacts and to protect subsistence use and access to subsistence areas. • Siting and facility design requirements to minimize the project footprint. • Site design and reclamation in accordance with an approved gravel mine plan. • Altitude restrictions for aircraft used for permitted activities. • Information and training for personnel concerning applicable stipulations, BMPs, standards, and regional environmental, social, traditional, and cultural concerns. • Setbacks of project facilities from portions of Fish Creek and from the Ublutuooh (Tiḡmiaqsigvik) River. 	--
Mammals (Marine)	<p>Negligible Impacts. Impacts on spotted seals, bearded seals, beluga whales, or other marine mammals rarely occurring off the coastline of Harrison Bay are not expected.</p> <p>If a large oil spill reaches open water during summer or fall, small numbers of beluga whales, bearded seals, and larger groups of spotted seals could be negatively impacted by contact or ingestion of hydrocarbons.</p> <p>Cumulative Impacts. The overall cumulative impact to marine mammals, notably beluga whales, spotted seal, and bearded seal, for the Harrison Bay and Colville River delta for the proposed project, conceptual GMT2, and other RFF projects is considered to be negligible.</p>	None; however, possible impacts from large oil spills are mitigated by BMPs and stipulations for spills (see below).	Seismic surveying, air and boat traffic, and construction activities may disturb small numbers of seals or whales, but events of this nature would be brief and would be unlikely to impact population levels or distribution. Noise from offshore drilling activities may also disturb some species and would be more long-term in nature. Increased barge traffic will likely displace some migrating whales and possibly other marine mammals. Large spills from offshore developments could cause significant mortality events, but such spills are low-probability events, so resultant mortality events would also be unlikely.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Mammals (Terrestrial)	<p>Minor Impacts.</p> <ul style="list-style-type: none"> Physical habitat changes, including hydrologic alteration long-term vegetation loss, dust impacts; displacement from (or attraction to) altered habitats; disturbance from noise or activity; obstruction of movement from construction activities. Collisions (mortality), disturbance and obstruction of movement from vehicles or air traffic; defense of life and property (mortality); increased hunting; premature den emergence (grizzly bear) associated with vehicle and aircraft traffic and human activity during drilling and operations phases. Obstruction of movement by pipelines and spills or leaks causing exposure to toxic materials from pipelines during drilling and operations phases. <p>Cumulative Impacts. Cumulative impacts on caribou are within the range of cumulative impacts from oil and gas activities considered by BLM. If climate change results in widespread changes in vegetation composition and insect abundance, disturbance effects of oil and gas activities to terrestrial mammals could be exacerbated. If these cumulative effects reduced caribou populations, there could also be a reduction in the abundance of predators such as wolves, bears, and wolverines.</p> <p>Other impacts that could prove to be synergistic rather than additive are the combined effects of vegetation change (from both human activities and climate change) and climate change-induced weather patterns on the productivity of all mammalian populations; vegetation change, climate change induced weather patterns, increased insect activity, and year-round development effects on the productivity of caribou populations; and of predation, oil development, and climate change on muskoxen.</p>	<p>BMPs requiring the following:</p> <ul style="list-style-type: none"> Areas of operation shall be left clean of all debris. Preparation and implementation of comprehensive waste management, hazardous materials emergency contingency, and comprehensive spill prevention and response contingency plans. Restrictions on refueling equipment and fuel storage station location near floodplains and water bodies. Prohibition of surface discharge of reserve-pit fluids and discharge of produced water in upland areas and marine waters. Preparation and implementation of bear-interaction plans. If an oil spill with potential impacts to public health occurs, consideration by BLM of the effects on subsistence food sources. Restrictions on certain activities near grizzly and polar bear dens and seal birthing lairs, and the conduct of surveys to identify bear dens and seal birthing lairs. Design of pipelines and roads to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. Site design and reclamation in accordance with a gravel mine plan approved by the authorized officer. Preparation of an ecological land classification map of the development area and geographical information system (GIS) files for all new infrastructure construction. Altitude restrictions for aircraft used for permitted activities. Information and training for personnel concerning applicable stipulations, BMPs, standards, and regional environmental, social, traditional, and cultural concerns. Permitting (on a case-by-case basis) low ground-pressure vehicles to travel off of gravel pads and roads. 	<p>Wildlife habitat fragmentation; loss or alteration of habitat; behavioral disturbance by anthropogenic activities resulting in short-term displacement, deflection of movement or delay of movement; mortality (e.g., vehicle strikes); or altered survival or productivity (e.g., altered energy balance leading to increased mortality or reduced parturition rates.)</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Mammals (Terrestrial) (Cont.)	--	<ul style="list-style-type: none"> • Prohibition against chasing wildlife with vehicles. • Surveys for the Alaska tiny shrew in certain areas. • Development of a Wildlife Avoidance and Interaction Plan and Predator Management Plan. • Seasonal ground vehicle traffic restrictions. • Provision of an annual bird and mammal roadkill report. 	--
Noise	<p>Minor Impacts. Noise sources include construction activities, drilling, and gravel mining; stationary sources such as generators and compressors; and mobile sources including heavy earth-moving equipment, large gravel-haul trucks, tractor-trailers, oil field service trucks, pickups, and other vehicles. Noise from aircraft overflights, landings, and takeoffs will be also be generated.</p> <p>Noise generated by construction, drilling, and operation of the project would impact the community of Nuiqsut and subsistence resources including caribou, birds, and other wildlife. Impacts are expected to be temporary.</p> <p>Cumulative Impacts. The direct, indirect, and cumulative impact from noise associated with the proposed GMT1, conceptual GMT2, and completion of CD5 and the Nuiqsut Spur Road would be moderate and long-term. Noise from construction and gravel mining would be limited primarily to the winter months and would terminate after about two years.</p>	<ul style="list-style-type: none"> • BMPs to minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities. • Occupational Safety and Health Administration (OSHA) standards for worker hearing protection, if and as necessary. 	See sections on fish, birds, mammals, special status species, subsistence, environmental justice (EJ), and recreation.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Oil, Saltwater, and Hazardous Material Spills	<p>Increased Risk of Spills. Spill history suggests the primary type of spill would be from equipment failure. Most spills would occur to the pad area or containment and result in minor impacts. A spill that reached water (very low likelihood) could have major impacts if subsistence resources were affected.</p> <p>Localized impact may occur from oil or hazardous material spills. The potential impacts may be greater if oil is sprayed under high pressure into the air, creating plumes to land and/or water.</p> <p>Large spills that directly or indirectly enter flowing water of the rivers or creeks that discharge to Harrison Bay, the Colville River delta (including the Nigliq Channel), and Kogru River mouth could have limited impacts on some marine mammals.</p> <p>A pipeline spill from the CD5 to GMT1 pipeline could spill oil into the Fish Creek wetlands, which could negatively impact important bird habitat. There is potential for pipeline spills where the pipeline crosses under the road, due to corrosion of the underground portion of the pipe.</p> <p>Oil spilled on land could also enter lakes or ponds and could be contained by the banks of those water bodies. If a spill were to enter moving water such as rivers and streams, spreading of oil would depend on the velocity or surface currents of the moving water.</p> <p>Cumulative Impacts. The incremental cumulative impact of spills is expected to be minor for all of the action alternatives.</p>	<ul style="list-style-type: none"> • Mitigation measures that require contingency planning, include setback requirements, and deal with the handling of fuel and other pollutants. • BMPs that minimize impacts from contaminants through effective hazardous materials contingency planning prior to transportation, storage, or use of fuel or hazardous substances. • BMPs that minimize the impact of fuel, crude oil, and other liquid chemical spills, including: <ul style="list-style-type: none"> - A comprehensive spill prevention and response contingency plan. - Setbacks for refueling of equipment and fuel storage near water bodies. - Training programs, operating procedures, monitoring, inspections, and equipment/facility specifications such as leak detection systems, oil spill response and other equipment designed for Arctic conditions. - Requirements for fuel and hazardous material storage containers. - Increased spill minimization measures at the Tiqmiaqsigvik (Ublutuoch) River Bridge. • Design specifications required under State-approved plans. • Measures to minimize and mitigate the occurrence of spills employed by CPAI North Slope operations. 	<p>Spills present a classic low-probability, high-risk scenario. The potential for spills increases with additional development, including the potential for spills in water. Although the risk of a large spill to water is low, the impacts to water, fish, and subsistence from a large spill in water would be high. Because most spills are small and most are on land, the incremental impact of spills is expected to be minor.</p>
Paleontological Resources	<p>Negligible Impacts. There are no documented paleontological resources in the project area; therefore, impacts are not expected.</p>	<p>Should a possible site be discovered, proper protocol for notification would be followed and setbacks established.</p>	<p>No impacts expected.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Petroleum Resources	<p>Major Impacts. Direct impacts primarily from extraction of petroleum hydrocarbon; however, that is the purpose of the project. In context, this would constitute a loss of the committed resources, but result in beneficial economic impacts.</p> <p>Cumulative Impacts: Cumulative impacts to petroleum resources would be major due to depletion, although primarily limited to the GMT Unit. If climate change causes the permafrost to continue to warm, its ability to support structures would diminish, which could affect development on the North Slope.</p>	None.	Loss of petroleum resources.
Physiography/ Geomorphology	Minor Impacts. See soils and permafrost impacts.	See soils and permafrost BMPs and stipulations.	See soils and permafrost residual adverse impacts.
Public Health	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Transient impacts on subsistence by diverting hunters and animals. Nuiqsut hunters could experience further limitation in their access to lands to the west of the village. Avoidance of productive land may reduce harvests and exacerbate dietary and nutritional outcomes. • Possible reduction in the use of individuals' camps and cabins as a base for subsistence harvests resulting from noise from air traffic and other sources. • Possible exacerbation of the shift away from a subsistence diet resulting from increased perception that development is causing contamination of traditional foods. 	<ul style="list-style-type: none"> • Provision of training for employees designed to ensure strict compliance with local and corporate drug and alcohol policies. • Provision of training for employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities. • Requirement for the permittee to contribute funds to create a public health monitoring program at a regional level to track health indicators that are vulnerable to impacts from oil and gas activities. • Requirement for the permittee to fund the creation of an Emergency Contingency Plan and associated Evacuation Plan for the community of Nuiqsut to identify the appropriate response by the community to a variety of health and safety events that could concur at the GMT1 development. 	There would likely be low impacts to specific health issues related to water quality accidents and injuries from new roads in the area; food, nutrition, and subsistence; and non-communicable chronic diseases. Medium impacts may result from exposure to hazardous materials (for example, episodes of poor air quality); the perception of contamination of traditional foods; and social determinants of health (depression, anxiety, and resulting social ills). There may be high positive impacts to public health as a result of increased access to health care and facilities. One aspect of stress described by local residents of Nuiqsut is the uncertainty within the community of how to respond to health and safety incidents that could occur at the GMT1

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Public Health (Cont.)	<ul style="list-style-type: none"> Increased travel times and costs for subsistence activities, and potentially decreased harvests and increased risk of injury and accidents resulting from avoidance by hunters of fixed production sites, particularly those near villages or in areas of heavy subsistence use. Increased travel and risk of subsequent accidents and injuries resulting from the development of permanent and seasonal roads in the region. Health hazards for at-risk populations from episodes of poor air quality associated with dust or emissions. Continued funding of existing health and social programs and the preservation of the current high level of indirect employment due to revenue to the NSB and village corporations. Increases in alcohol, drug use, and sexually transmitted infections commensurate with the level of economic growth and the degree of contact between outside workers and local populations. Potential to improve health through increases in the standard of living, reductions in stress, and opportunities for personal growth and social relationships resulting from increased income. Strengthened community and cultural ties and improved diet and nutrition through increased subsistence activities associated with improved income and employment. Increased prevalence of social pathologies, including substance abuse, assault, domestic violence, and unintentional and intentional injuries associated with economic growth. 	<ul style="list-style-type: none"> A requirement that to the extent practicable, engines of rolling stock (such as pick-up trucks, vans, buses, other trucks and trailers, and heavy machinery) used for oil and gas operations will be powered off when not in active use. A requirement for the permittee to contribute funding for development of an Emergency Contingency Plan and associated Evacuation Plan for the community of Nuiqsut. 	<p>development site, such as a blowout or breach of the pipeline.</p> <p>Cumulative. GMT2 and other reasonably foreseeable future projects could have an additive cumulative effect, generating potentially substantive changes in public health. The cumulative impacts of increased development to the south, west, and north of Nuiqsut may have synergistic effects with respect to disturbance of animals, and thus stress and increased travel time. The increase in development could result in a cumulative negative impact to human health resulting from impacts to air quality, water quality, or spills.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Public Health (Cont.)	<p>Cumulative Impacts. Future oil and gas development could have an additive cumulative effect, generating potentially substantive changes to public health. There could be synergistic effects with respect to disturbance of animals. This may result in changes to traditional hunting grounds and may require further energy (time and travel costs) to reach these resources. Additionally, the increase in development could result in a cumulative negative impact to human health resulting from impacts to air quality, water quality, or spills.</p> <p>Uncertainty over the impact of climate change on subsistence resources and related traditional lifestyles and culture, combined with new conflicts in use of the Chukchi and Beaufort Seas, is a cause of concern among Iñupiaq hunters and community members. Climate change may also result in increased injury and trauma, as unusual or unpredictable weather, water, snow, and ice conditions make travel more hazardous and people may travel greater distances to find marine or land mammals or edible plants.</p>		
Recreation	<p>Negligible Impacts.</p> <p>Recreation use in the project area could be negatively impacted due to the presence of permanent facilities and associated noise.</p> <p>Cumulative Impacts. Impacts from long-term or permanent facilities such as roads, pipelines, and gravel pads would accumulate and would result in the long-term loss of solitude, quietude, naturalness, or primitive/unconfined recreation, and wilderness-type values. These impacts could be locally adverse.</p> <p>As the climate warms in future years, the timing and location of recreation activities could change. Cumulatively there would be more activity, more human presence, increased noise, increased aircraft use, change in location of recreation activities, and correspondingly greater impacts on the setting, experiences, and desired beneficial outcome from use of public land. Also in the future as the climate gets warmer, the timing and location of recreation activities could change.</p>	BMPs and design features that would reduce the visual impact and noise could also reduce the area of impact on recreation.	Facility visibility and noise.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Sand and Gravel Resources	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Loss of sand and gravel resources. • Impacts to the tundra surface from gravel extraction, including removal of surface vegetation, and overburden and extraction of the underlying gravels. • Potential thawing of permafrost around the mine site perimeter, which would create additional landform changes. • Creation of shallow or deep-water habitats by gravel mining, with potential thaw bulb formation. • Long-term impacts to soil productivity in the footprint of gravel-extraction sites. • Mixing of organic and mineral horizons with the parent material from stockpiling of overburden. 	<p>Gravel extraction design measures (assumed, under existing ASRC mine site permit):</p> <ul style="list-style-type: none"> • Imposing a 500-foot buffer along the Colville River, and a 200-foot buffer around large lakes. • Requiring all temporary stockpiled material that is placed on the tundra be placed on an ice pad and removed prior to spring breakup. • Requiring that the top 12 to 18 inches of organic overburden be stockpiled separately from other overburden and used as the top layer in mine site rehabilitation at the end of each winter. 	<p>Loss of sand and gravel resources largely from construction of roads and pads and gravel mine development.</p>
Socio-cultural Systems	<p>Major Impacts.</p> <ul style="list-style-type: none"> • Increased employment opportunities (positive impacts). • Potentially easier commuting to work in the oil fields (positive impact). • Disincentives to local employment in the oil field due to policies of segregation of non-resident workers and residents, especially if residents are substantially outnumbered. • Continued or increased flow of drugs and alcohol into Nuiqsut and other North Slope Borough communities via the seasonal ice road • Community conflict over use of the roads (if residents cannot access the road system due to limits imposed on the privately owned access road). • Tensions related to the permitting process. • Devaluation of the Nuiqsut cultural landscape. • Disruptions to subsistence use areas, resources, and activities. • Increased intra-community conflict over differing opinions on development. 	<p>Best management practices, including:</p> <ul style="list-style-type: none"> • A requirement that areas of operation shall be left clean of all debris. • A requirement for the preparation and implementation a comprehensive waste management plan for all phases of exploration and development. • A requirement for the preparation and implementation a comprehensive spill prevention and response contingency plan for all phases of exploration and development. • The collection of air monitoring data both before and during the life of the project, the preparation of an emissions inventory and emissions reduction plan, air quality modeling, mitigation, changes to activities to reduce emissions, as determined necessary and appropriate by BLM, and public reporting of these data. • A requirement for the lessee to design and implement a monitoring study of contaminants in locally used subsistence foods. 	<p>Disincentives to local employment in the oil field due to policies of segregation of non-resident workers and residents, exacerbated by residents becoming substantially outnumbered by non-native non-residents.</p> <p>Continued or increased flow of drugs and alcohol into Nuiqsut and other North Slope Borough communities via the seasonal ice road.</p> <p>Community conflict over use of the roads if residents cannot access the road system due to limits imposed on the privately owned access road.</p> <p>Information processing and other tensions related to the permitting process. Anxiety and intra-community conflict over the continuous overload of bureaucratic and legal processes involved with permitting and development is a prime source of frustration and disenfranchisement. Keeping track of oil company activities and NEPA or similar processes is beyond the ability of the average resident.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Socio-cultural Systems (Cont.)	<p>Cumulative Impacts. Future development is not expected to result in substantial changes to population or employment levels for the community of Nuiqsut. Increasing development activities on the North Slope, particularly those that occur in areas accessible from the community of Nuiqsut by road, may result in more residents obtaining employment in the oil and gas industry. Several effects of climate change could affect subsistence resources and land uses, and are therefore likely to create significant social anxiety for the Iñupiat.</p> <p>The overall extent of expected cumulative impacts is not expected to result in overall impacts that would be more substantial than those caused by technology, other aspects of modernization, and climate change, and include a mixture of socio-cultural benefits and adverse impacts that are, on the whole, of a degree and intensity that can be characterized as major.</p>	<ul style="list-style-type: none"> • In the event of an oil spill, the requirement for BLM to consider the immediate health impacts and responses for affected communities and individuals and establish long-term monitoring for contamination of subsistence foods and public health. • A requirement for cultural and environmental training of personnel involved in oil field activities. 	<p>This institutional overload is felt more intensely by some groups of people than others: tribal governments have few paid staff, subsistence users often have full-time employment and are already pressed for time to harvest adequate amounts of resources. These individuals, who perhaps feel that they have the most at stake, are not able to participate at a consistent level and are not compensated for the time required to participate.</p> <p>Discussions about subsistence, change, and impacts often produce strong emotions. The permitting process involves a substantial amount of scoping, testimony, interviews, surveys, and requests for comments on observations and impacts. Such questions can elicit emotions and experiences that are linked to several decades of interactions with outsiders requesting information. Disagreement and conflict is generated within individuals, families, the community itself, and with other North Slope communities.</p> <p>The devaluation of the Nuiqsut cultural landscape is a direct, indirect, additive, and cumulative impact. Residents believe that the cultural, spiritual, or other personal value that they place on their families' camping, hunting, and fishing sites is substantially diminished when industrial infrastructure is developed nearby.</p> <p>Disruption to subsistence use area, resources, and activities is a direct and cumulative social impact. Subsistence hunting and harvesting activities are central to the cultural identity and social cohesion of the community of Nuiqsut.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Socio-cultural Systems (Cont.)			<p>O&G development will likely result in major socio-cultural impacts for Nuiqsut. Evidence shows that North Slope socio-cultural systems have been subjected to both positive and negative ongoing, additive, and synergistic cumulative impacts from oil and gas activities above and beyond the impacts caused by other aspects of colonialism, technology, previous development, community health and welfare, and climate change. Ongoing stresses are anticipated to be substantially more intense in Nuiqsut than in other NSB communities. Negative socio-cultural impacts associated with development will likely continue to match or outweigh the economic benefits of development in Nuiqsut.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Soils and Permafrost	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Impacts to the thermal regime of permafrost (including thermokarst formation, subsidence, and increased potential for soil erosion and sedimentation) from: <ul style="list-style-type: none"> - Placement of gravel fill for roads, pads, and airstrip on the tundra. - Snowdrifts caused by gravel structures. - Blockage of natural drainage patterns. • Localized compression of soils and vegetation from construction of ice roads and pads. (Impacts from long-term disturbance from ice pads, ice roads, and snow trails would be negligible.) • Displacement of soil and disturbance during installation of VSMs when constructing pipelines. • Soil impacts related to altered snow accumulation and shading of vegetation and the ground underneath pipelines. • Impacts caused by spills during construction (e.g., diesel fuel). <p>Cumulative Impacts. If global climate change persists, the cumulative impacts to soil from oil and gas development, and non-oil and gas development, on the North Slope could be greater than predicted. If the climate warms, the permafrost will thaw to an increased depth each season, which will cause varying degrees of impacts on subsidence, soil moisture, and vegetation.</p>	<ul style="list-style-type: none"> • Use of insulated conductors to minimize subsidence issues and provide near well bore protection. • Installation of thermosyphons adjacent to certain infrastructure components to protect the permafrost conditions and the infrastructure. • Additional design measures required by State and Federal permit conditions: <ul style="list-style-type: none"> - Placing a minimum of 5 feet of gravel fill. - Elevating heated buildings or structures on pilings. - Elevating all on- and off-pad pipelines above grade on VSMs. - Minimizing or avoiding impoundments by maintaining natural drainage. - Designing bridges and culverts to maintain existing surface drainage patterns, prevent erosion, and ensure adequate water flow to maintain soil ice features. - Installing thermosyphons around wells. Additionally, insulating well conductor piles. - Requiring workers to stay on gravel surfaces unless their job duties require them to be on the tundra. - Applying dust control measures to roads, pads, and summer mining activities, and minimizing dust settlement on vegetation or snow. - Reducing surface discharge of wastewaters through use of a disposal well, including zero discharge of produced water and drilling wastes. - Implementing operating procedures and maintenance programs to ensure the design measures remain in effect throughout the life of the project. - Implementing spill prevention and response programs. - Placing overburden for gravel mining either on previously disturbed area within the pit or on an ice pad. <ul style="list-style-type: none"> • Erosion control measures included in the project. SWPPP. 	Loss of soil productivity from construction of roads and pads and gravel mine development.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Subsistence	<p>Major Impacts.</p> <ul style="list-style-type: none"> • Spills (low probability, high risk). • Projects footprints' direct impact to subsistence use areas, particularly those for caribou, geese, and furbearers such as wolf and wolverine. Some winter fishing activities may also be impacted. • Disruption to subsistence hunting activities caused by aircraft traffic. • Reduced access to and user avoidance of traditional subsistence use areas. • Reduced value of traditional subsistence use areas. • Potential disruption and deflection of subsistence resources. • Decreased community participation and transmission of knowledge. <p>Cumulative Impacts. Overall, future development could increase the severity of existing impacts, including:</p> <ul style="list-style-type: none"> • Continued hunter avoidance of industrial areas, • Continued disturbance of hunters and wildlife from increased air and road traffic, • Reduced access to or loss of subsistence use areas, and • Reduced availability of subsistence resources in development areas. <p>These impacts could result in increased investments in time, money, fuel, and equipment and potentially affect hunting success. As oil and gas development activities occur over a larger area and impact a greater portion of subsistence use areas, subsistence users may alter their harvesting patterns and this could result in a loss of opportunities to harvest subsistence resources in traditional use areas. This loss of opportunity could have impacts on future generations, as harvesters may no longer be able to teach younger hunters about subsistence uses in traditional harvesting areas.</p>	<ul style="list-style-type: none"> • BMP H-1 NPR-A Subsistence Advisory Panel: tribal government representatives provide input and make recommendations to BLM on ways to minimize impacts to subsistence from oil and gas and associated activities. • Protective measures established in previous RODs for EISs in the NPR-A to minimize impacts of oil and gas activities and ensure the continued health of wildlife and subsistence resources, including measures designed to protect fish, birds, and terrestrial and marine mammals (for details, see BMPs and stipulations for these resources elsewhere in this table). • A requirement for the permittee to develop a Right of Access Agreement regarding authorized use of the roads associated with the project and hunting prohibitions, along roads and near project components. • A requirement for the permittee (in consultation with local hunters and local organizations) to facilitate, improve, and expand communication protocols to inform subsistence users of daily flight patterns and identify potential conflict areas during peak hunting times. • A requirement for the permittee to provide BLM with flight information needed to track and record aircraft flight data. • A requirement for BLM to establish a time period during peak caribou hunting when non-essential helicopter flights associated with BLM-permitted activities will be suspended near Nuiqsut. Also, the number of takeoffs and landings to support oil and gas operations with necessary materials and supplies shall be limited to the maximum extent possible. • A requirement for the permittee to begin employing unmanned aerial vehicles (UAVs) to conduct monitoring activities that otherwise require helicopters (i.e., pipeline inspections, studies, and other appropriate activities), when feasible. 	<p>Subsistence Uses of the Area. The Nigliq Channel, the Fish Creek area, and the branches of the Nigliq and land between the two rivers are among Nuiqsut's most productive and important fishing and caribou hunting areas and have been particularly important for residents with limited economic means and transportation options. The value of undeveloped land to the west of town increases as it becomes increasingly rare.</p> <p>User Access. Restricted access to subsistence use areas is experienced as a primary impact of oil development and is a central concern. Physical problems using or crossing the roads or crossing under pipelines will restrict user access.</p> <p>User Avoidance. Subsistence harvesters often avoid areas of development due to concerns about hunting near human or industrial activity, shooting near traffic, near infrastructure, and in particular near pipelines, and concerns about contaminants and the health of animals near development. Avoidance of the area will be at a greater distance than infrastructure's footprint and the loss of subsistence use areas could be larger than the direct overlap of future projects with documented use areas. The connection provided by the Kuukpik Spur Road could decrease the avoidance effect and act as a countervailing impact, but to date, conflict over the use of the privately owned road and stress associated with the impacts to access of the CD5 road have outweighed any countervailing impacts that the road system could create.</p> <p>Resource Availability. Noise, traffic, odors, and infrastructure could affect the availability of key resources such as caribou, waterfowl, and furbearers.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Subsistence (Cont.)	<p>Climate change and anticipated warming could significantly affect subsistence harvests and uses if warming trends continue as predicted. The reduction, regulation, and/or loss of subsistence resources would have severe impacts on the subsistence way of life for residents. If permafrost loss increases as predicted, there could be synergistic cumulative impacts on infrastructure, travel, landforms, sea ice, river navigability, habitat, availability of fresh water, and availability of terrestrial mammals, marine mammals, waterfowl, and fish, all of which could necessitate relocating some North Slope Borough communities or their population, shifting the population to places with better subsistence hunting, and causing a loss or dispersal of community.</p>	<ul style="list-style-type: none"> • A prohibition (except in emergencies and other special circumstances) of the permittee and its contractors using airboats on rivers on BLM-managed lands in the Nuiqsut subsistence use area. • A requirement for the permittee to monitor, through the life of the project, changes in subsistence activities in the community of Nuiqsut, by funding a study to quantify changes in subsistence use and harvest levels. • A requirement for the permittee to undertake a one-time economic study of subsistence at the beginning of the GMT1 project. 	<p>Overall project activity will be highest during construction periods. Impacts could lead to increased time, costs, effort, and risks for harvesters. Caribou are sometimes unable to pass under pipelines due to heavy snow drifts and may be unlikely to cross roads that are high and steeply sloped that the caribou cannot see over. Caribou, especially cows with calves, tend to avoid areas of human activity. The area is in the peripheral range of both the Teshekpuk Caribou Herd and Central Arctic Herd; therefore, Nuiqsut hunters are particularly vulnerable to changes in the distribution and/or behavior of caribou in these herds. Contamination or perceived contamination associated with development could result in reduced resource availability to subsistence users.</p> <p>Aircraft Traffic. Aircraft traffic is the most commonly reported impact on subsistence activities and will increase. Harvesters report failed hunts due to low-flying aircraft spooking the animals. Future development will result in additional flights, particularly during construction phases. For Greater Mooses Tooth 1, there will be an estimated 115 new flights per year for 30 years of operation of which 107 would occur during the June–September season (complete estimates are 3,112 per year with 1,564 during the summer/fall season).</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Subsistence (Cont.)			<p>It can be estimated that each new production pad will result in similar increases in aircraft flights. Hunters cannot avoid disturbance from aircraft by avoiding permanent infrastructure; therefore, impacts from aircraft can cause more acute stress and disruption. Acute disruption during the hunting season can turn into long-term stress and financial and food-security issues throughout the year: lack of success hunting caribou means lack of meat and can involve loss of money and time.</p> <p>Additional money and time is required for additional hunting expeditions or money to purchase commercial meat. Lack of success due to aircraft can lead to economic problems, food security problems, and social, cultural, and possibly mental (stress, anxiety, depression) and physical (nutrition) health issues</p> <p>O&G development could increase the severity of impacts on Nuiqsut subsistence uses in addition to introducing impacts on subsistence uses for other North Slope communities. Impacts include hunter avoidance of industrial area, increasing disturbance from air and road traffic, reduced access to or loss of subsistence use areas, and reduced availability of resources in development areas. These impacts could cause hunters to travel farther and into the traditional hunting grounds of other communities and could result in increased investments in time, money, fuel, and equipment and potentially affect hunting success. The effects of climate change could affect subsistence harvests, travel, and access.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Subsistence (Cont.)			Disturbance to, and displacement of, caribou could lead to an unavoidable reduction in the total annual caribou harvest by making the harvest more difficult, costly, and time consuming for subsistence hunters. Wolf and wolverine harvests would be reduced in areas of human activity, while bear and fox could habituate to oil and gas activities within the NPR-A. If oil and gas infrastructure were located in subsistence hunting areas, some (real or perceived) restrictions on access by subsistence hunters would be unavoidable.
Threatened and Endangered Species (Polar Bear)	<p>Minor Impacts for Some Individuals; Negligible at Population Level.</p> <ul style="list-style-type: none"> • Habitat loss or alteration. • Disturbance or displacement of denning females and cubs. • Incidental harassment of polar bears transiting the project study area. • Intentional hazing near occupied work sites. • Mortality due to collisions or defense of life kills. <p>Cumulative Impacts. When evaluating the currently proposed project in conjunction with the conceptual GMT2, climate change, and other RFF projects, these projects could have an additive cumulative effect with respect to polar bears. Further development may encroach on polar bear denning habitats, and the placement of additional infrastructure would increase disturbances, the potential for encounters, and obstruction to movement. Offshore development and development of onshore support facilities would have cumulative additive impacts to polar bears and their habitats. This impact would be anticipated to be long-term, localized, and, depending on the species and location, would range in intensity.</p>	<ul style="list-style-type: none"> • Preparation and implementation of bear-interaction plans to minimize conflicts between bears and humans. • Prohibition of heavy equipment within one mile of known or observed polar bear dens. 	<ul style="list-style-type: none"> • Habitat loss or alteration. • Disturbance or displacement of denning females and cubs. • Incidental harassment of polar bears transiting the project study area. • Intentional hazing near occupied work sites. • Mortality due to collisions or defense of life kills.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Threatened and Endangered Species (Spectacled Eider)	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Habitat loss and alteration. • Disturbance and displacement. • Obstruction of movement. • Various sources of mortality (e.g., vehicle collisions, nest predation). • Spills. <p>Cumulative Impacts. The overall cumulative impact to spectacled eiders for the Harrison Bay and Lower Colville River watersheds for the proposed project, conceptual GMT2, and other RFF projects is considered to be negligible.</p>	None listed in the FSEIS. Mitigation for birds would presumably apply.	Effects from direct, indirect, and cumulative effects would be additive, and some will be unavoidable and adverse to nesting and staging spectacled eiders. Some adverse impacts on spectacled eiders would be unavoidable despite protective management measures. The additive effect of the direct/indirect effects from oil and gas activities and from a myriad of potential effects from the cumulative analysis imposed on spectacled eiders will create some residual adverse impacts due to habitat destruction and fragmentation, disturbance, offshore development, vessel and air traffic, spills of hazardous materials, including oil spills and mortality from collisions with human infrastructure or vessels, habitat changes due to salt water intrusion. There are high density areas for spectacled eiders contained within the area covered by the Regional Mitigation Strategy, and as such, adverse effects to these birds may be unavoidable.
Threatened and Endangered Species (Steller's Eider)	<p>No impacts to Steller's eiders are expected to occur.</p> <p>Cumulative Impacts. The overall cumulative impact to Steller's eiders for the Harrison Bay and Lower Colville River watersheds for the proposed project, conceptual GMT2, and other RFF projects is considered to be negligible.</p>	None listed in the FSEIS. Mitigation for birds would presumably apply.	No impacts expected.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Threatened and Endangered Species (Yellow-Billed Loon)	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Habitat loss and alteration. • Disturbance and displacement. • Obstruction of movement. • Effects of spills. • Various sources of mortality (e.g., vehicle collisions, nest predation). <p>Cumulative Impacts. The proposed project, in conjunction with the conceptual GMT2 and other RFF projects, could have a small additive cumulative effect with respect to yellow-billed loons as further development may result in additional infrastructure and ice roads/pads over a wider area. In addition, the development of offshore development and associated onshore facilities may also have an additive cumulative effect with respect to yellow-billed loons, as this species is known to utilize marine waters. At any given location, the additive cumulative location would be dependent upon RFF project locations relative to loon populations and their priority habitat.</p>	<p>None listed in the FSEIS. Mitigation for birds would presumably apply.</p>	<ul style="list-style-type: none"> • Habitat loss and alteration. • Disturbance and displacement. • Obstruction of movement. • Effects of spills. • Mortality.

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Transportation (Local)	<p>Minor Impacts.</p> <ul style="list-style-type: none"> • Minor impacts to local transportation resulting from construction-related vehicle traffic on industry-constructed ice roads with no public access. • Interference with some winter travel on frozen channels from construction activities. • Operation of the facilities would result in lower levels of vehicle traffic than is anticipated during construction. • Increased air traffic to support transportation of work crews, materials, and equipment, and for special studies. • For 2019 and beyond, a 4% increase in total flights above baseline, including an approximate 7% increase in helicopter flights for special studies in the NPR-A which would occur from June through September. <p>Cumulative Impacts. The cumulative effect of GMT1 would be focused on the construction of an industrial gravel road system in an area currently roadless. For the GMT1 project, impacts to local transportation would occur during both the construction and operation phase. In general, impacts to local transportation range from minor to moderate on an interim to long-term basis.</p> <p>The cumulative impacts of these new transportation facilities, as they provide opportunities for other RFF projects to occur in the Umiat area, would be intense and long-term and would have both localized and regional benefits.</p>	<ul style="list-style-type: none"> • Tying transportation components of the GMT1 project into existing transportation infrastructure without additional modification. • BMPs and lease stipulations addressing design and operational features that reduce impacts and total area of disturbance. • An Aircraft Plan. 	<p>Winter cross-country travel by snow machine could be impeded by the presence of a permanent gravel road, should the road be constructed in such a way as to make crossing the road impossible. If unable to cross the road, or only able to cross the road at constructed ramps, then this would alter normal transportation by focusing routes through one particular area (i.e., to utilize ramps), or by resulting in travelers by snow machine having to travel further to go around existing road.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Vegetation and Wetlands	<p>Moderate Impacts.</p> <ul style="list-style-type: none"> • Direct impact to vegetation totaling 72.7 acres). • Indirect impacts from gravel spray and dust deposition extending up to 300 feet from the edge of the gravel footprint, total 587.3 acres. • All areas of direct and indirect impacts are within potential wetland. <p>Cumulative Impacts. Climate change may eventually lead to shifts in the composition of Arctic tundra. Permafrost may thaw to an increased depth each season, which will cause varying degrees of impacts on subsidence, soil moisture, and vegetation. The potential for many shallow streams, ponds, and wetlands in the Arctic to dry out under a warming climate is increased by the loss of permafrost. Such impacts of climate change could accumulate with any changes in soil thermal regimes that might occur as a result of past and future non-oil and gas and oil and gas activities in and near NPR-A, potentially leading to synergistic impacts to vegetation.</p> <p>Overall, the direct, indirect, and cumulative impact to vegetation and wetlands associated with the proposed GMT1, conceptual GMT2, and completion of other RFF projects would be moderate intensity and long-term duration.</p>	<ul style="list-style-type: none"> • BMPs on solid and liquid-waste disposal, fuel handling, and spill cleanup to reduce the potential impacts of intentional releases, spills, and solid waste. • BMPs to reduce air pollution-caused damage. • BMP for overland moves (and seismic work). • Lease stipulations on activities associated with oil and gas exploration. • BMPs affecting development through minimization of disturbance, such as facility design and construction of pipelines, roads, pads, airstrips, and other facilities. • Lease stipulation to facilitate the regrowth of Native vegetation following facility abandonment. • Lease stipulations for setbacks associated with development near rivers, lakes, and other specified habitats. • BMP to minimize the impacts to vegetation of summer tundra travel. 	<p>Loss of upland and wetland vegetation communities and their associated functions from construction of roads and pads and gravel mine development. Indirect effects of road and pad development are: alteration of plant communities as a result of dust deposition, soil salinity change, increased snow drifting, and changes to natural drainage patterns; increased probability of colonization by non-native, invasive species.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Visual Resources	<p>Minor Impacts. Construction and operation of the project would be visible from surrounding areas.</p> <p>Facilities and structures (e.g., CD5-GMT1 road, airstrip) would introduce a moderate contrast with the natural landscape when viewed from the foreground-middle-ground zone. The CD5-GMT1 road structure would be visible across the tundra.</p> <p>Cumulative Impacts. The overall cumulative impact to visual resources in the area from production facilities, an elevated pipeline system, gravel roads, and airports would be high. Cumulative effect to visual resources could extend over a mile on a clear day. Lights at permanent facilities would also be seen from a distance of several miles during winter.</p> <p>As development expands across the North Slope, primarily into areas where no infrastructure currently exists, so will the extent of impact on visual resources. Climate change could affect visual resource values by altering the current conditions of color, vegetation, land formation, adjacent scenery, and the presence of water. These would be an additive cumulative negative impact which would permanently alter the existing visual resources.</p> <p>Overall cumulative impact to visual resources in the immediate area of production facilities, elevated pipeline, gravel roads, and airports would be high.</p>	<ul style="list-style-type: none"> • Recommended painting or other means to blend structures with existing landscape. • Recommended lighting design to reduce lighting impacts from structures more than 20 ft tall. 	<p>Visibility of operating facilities and associated structures.</p>

Resource/Issue	Potential Unmitigated Impacts ^a	Applicable BMPs and Stipulations ^b	Potential Residual Adverse Impacts ^c
Water Resources	<p>Minor Impacts.</p> <p>Long-term impacts to local water resources resulting from the placement of new infrastructure, including:</p> <ul style="list-style-type: none"> • Changes in the drainage pattern. • Changes in stream flow. <p>Short-term, temporary impacts from ice infrastructure (e.g., roads and pads).</p> <p>Intensity of impacts is characterized as minor and of localized extent.</p> <p>Cumulative Impacts. Because of the abundance of water resources on the North Slope, the overall cumulative impact to water resources on the North Slope and in the NPR-A would probably be small in magnitude, and most impacts would be local in nature.</p>	<ul style="list-style-type: none"> • Requirement for all cuttings and drilling mud to be disposed of by injection, and allowing on-pad temporary storage of muds and cuttings. • Prohibition on permanent oil and gas facilities within 500 feet from fish-bearing water bodies. • Requirement for stream and marsh crossing design and construction. • Setbacks from major rivers (with exceptions for essential road and pipeline crossings). • 0.25-mile development setback from deep water lakes. 	Changes in surface drainage due to construction of roads and pads.

^a Direct, indirect, and cumulative impacts expected from O&G development, prior to application of BMPs and stipulations.

^b Anticipated BMPs and stipulations.

^c Adverse residual impacts (unavoidable impacts) remaining after application of BMPs and stipulations.