UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE AMBLER MINING DISTRICT INDUSTRIAL ACCESS PROJECT AT GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE ENVIRONMENTAL AND ECONOMIC ANALYSIS

The Alaska Industrial Development and Export Authority (AIDEA), a public corporation of the State of Alaska, proposes to construct a 211-mile industrial access road to provide access to the Ambler Mining District. The proposed road would cross the Western Preserve Unit (Kobuk River, hereinafter "Preserve") of Gates of the Arctic National Park and Preserve (GAAR), including crossing the Kobuk Wild and Scenic River. The legislation that established GAAR, Section 201(4) of the Alaska National Interest Lands Conservation Act (ANILCA), recognized the need for this access and requires the Secretary of the Interior to permit such access.

The Alaska Department of Transportation and Public Facilities (ADOT&PF) developed two road alignment options across the Preserve: AIDEA's proposed alignment and an alternative alignment, requested by the National Park Service (NPS). AIDEA proposed these two alignments in their initial permit application for consideration by the NPS and subsequently provided NPS with information regarding the relative economic feasibility of both alternatives, information detailing the construction, operation, and lifecycle costs. The NPS did not conduct a separate economic analysis of costs but took into consideration available estimates and studies. The Secretary of the Interior, acting through the NPS, and the Secretary of Transportation, through the Federal Highway Administration, prepared this environmental and economic analysis (EEA) to evaluate the two road alignments within the Preserve pursuant to ANILCA section 201(4)(d), which requires the analysis in lieu of an environmental impact statement.

This analysis is being prepared solely for the purpose of determining the most desirable route for the right-of-way and terms and conditions which may be required for the issuance of that right-of-way.

ANILCA requires the analysis to address two primary issues –

(i) alternative routes including the consideration of economically feasible and prudent alternative routes across the Preserve which would result in fewer or less severe adverse impacts on the Preserve; and

(ii) the environmental, social and economic impact of the right-of-way, including the impact on wildlife, fish and their habitat, and rural and traditional lifestyles, including subsistence activities, and measures which should be instituted to avoid or minimize negative impacts and enhance positive impacts.

National Park Service
US Department of the Interior

Gates of the Arctic National Park and Preserve
Alaska

AMBLER MINING DISTRICT INDUSTRIAL ACCESS PROJECT AT GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE

ENVIRONMENTAL AND ECONOMIC ANALYSIS

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Acronyms, Abbreviations, and Definitions

ADF&G	Alaska Department of Fish and Game
ADOT&PF	Alaska Department of Transportation and Public Facilities
AIDEA/the applicant	Alaska Industrial Development and Export Authority
ANILCA	Alaska National Interest Lands Conservation Act
applicant-proposed alignment	211-mile Ambler road alignment presented in AIDEA's application
AWC	Anadromous Waters Catalog
BLM	Bureau of Land Management
BLM EIS	Environmental Impact Statement to analyze impacts on Ambler road alternatives
DOWL	DOWL HKM, civil engineering consultants
EEA	environmental and economic analysis
EIS	environmental impact statement
FHWA	Federal Highway Administration
GAAR	Gates of the Arctic National Park and Preserve
IDT	interdisciplinary team
MP	milepost
NEPA	National Environmental Policy Act of 1969, as amended
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
ORV	outstandingly remarkable values (related to Wild and Scenic Rivers)
PEPC	Planning, Environment and Public Comment
Preserve	Western Preserve Unit (Kobuk River) of Gates of the Arctic National Park and Preserve
proposed Ambler road	proposed Ambler Mining District Industrial Access Project
ROW	right-of-way
SF299	Standard Form 299 (the right-of-way application)
USACE	US Army Corps of Engineers
USCG	US Coast Guard
USFWS	US Fish and Wildlife Service
WACH	Western Arctic caribou herd

CHAPTER 1: INTRODUCTION

The Alaska Industrial Development and Export Authority (AIDEA or the applicant), a public corporation of the State of Alaska, proposes to construct an industrial access road that provides access to the Ambler Mining District. This road of approximately 211 miles would extend from the Dalton Highway to the Ambler Mining District on the east bank of the Ambler River along the south flank of the Brooks Range (proposed Ambler road). AIDEA has requested a right-of-way (ROW) permit from Department of the Interior to build the proposed Ambler road across the Western Preserve Unit (Kobuk River, hereinafter "Preserve") of Gates of the Arctic National Park and Preserve (GAAR) to access the Ambler Mining District. The enabling legislation that established GAAR, Section 201(4) of the Alaska National Interest Lands Conservation Act (ANILCA; Public Law 96-487), recognized the need for this access and states that the Secretary of the Interior shall permit such access in accordance with the provisions of ANILCA 201(4).

The National Park Service (NPS), in cooperation with the US Department of Transportation, Federal Highway Administration (FHWA), prepared this environmental and economic analysis (EEA) in lieu of an environmental impact statement (EIS) in accordance with ANILCA Section 201(4) and the implementing regulations (43 Code of Federal Regulations § 36.13(a)). Per ANILCA and the implementing regulations, an EEA shall be prepared solely for the purpose of determining the most desirable alignment for the ROW and terms and conditions that may be required for issuance of that ROW on NPS lands. The EEA must consider alternative routes that are economically feasible and prudent, and which would result in fewer or less severe adverse impacts upon the Preserve. The EEA must also consider the environmental, social, and economic impacts of the ROW including the impacts of the alignments on wildlife, fish, and their habitat, and rural and traditional lifestyles (including subsistence activities), and measures that should be instituted to avoid or minimize negative impacts and enhance positive impacts.

The Alaska Department of Transportation and Public Facilities (ADOT&PF) developed plans for two alignments that cross the Preserve—AIDEA's proposed alignment (the northern alignment) and an alternative alignment, as requested by the NPS (the southern alignment). Since ADOT&PF developed these alignments based on their own engineering and design criteria, and AIDEA proposed them in their permit application, the NPS and FHWA have accepted that they both could be constructed to accomplish the purposes of the Ambler Mining District Industrial Access Project but present different economic and operational challenges. This document evaluates both alignments as required by ANILCA. No other feasible alignments were identified by the NPS, the applicant, or other stakeholders through the scoping and public comment periods.

The proposed northern alignment across the Preserve is 26 miles within the Preserve and 211 miles in total. The proposed southern alignment is 18 miles within the Preserve and 228 miles in total. Stream and river crossings are a major element in the cost of the project and their total number differs between the alignments.

Due to the need for the overall project—construction of a road for surface transportation from the Dalton Highway to the Ambler Mining District—to cross land managed by the Bureau of Land Management (BLM) and the need for other federal permits, the overall project is subject to the National Environmental Policy Act of 1969, as amended (NEPA). The BLM is the lead agency for the required NEPA analysis and is preparing an EIS (the BLM EIS) to determine the impacts from the applicant-proposed 211-mile alignment (applicant-proposed alignment), and other alternatives, for the construction and operation of a road to the Ambler mining district. The US Army Corps of Engineers (USACE), the US Environmental

Protection Agency, and the US Coast Guard (USCG) are the federal cooperating agencies helping to prepare the BLM EIS. The NPS and FHWA are participating agencies for the BLM EIS.

The proposed road would cross the Kobuk River, designated as a wild river under the Wild and Scenic Rivers Act. ANILCA § 1107(b) addresses the requirements for analyzing transportation and utility systems permitted under ANILCA that would cross a designated river. “Any transportation or utility system approved pursuant to this title which occupies, uses, or traverses any area within the boundaries of a unit of the National Wild and Scenic Rivers System shall be subject to such conditions as may be necessary to assure that the stream flow of, and transportation on, such river are not interfered with or impeded, and that the transportation or utility system is located and constructed in an environmentally sound manner.”

This chapter describes the purpose of the federal action, the project background, objectives, issues, and topics retained, and issues dismissed from analysis in the EEA.

PURPOSE OF FEDERAL ACTION

The purpose of the federal action is for the Secretary of the Interior and the Secretary of Transportation to respond to the applicant’s proposal for a ROW as required by ANILCA. The NPS and FHWA prepared this EEA to consider factors set forth in Section 201(4)(d) of ANILCA. The applicant has submitted an application for a ROW with plans for constructing a road across public lands managed by the NPS. The purpose of action by the Secretary of the Interior and the Secretary of Transportation is distinct from that of the applicant, which is discussed in the following section.

PROJECT BACKGROUND

History of Gates of the Arctic National Park and Preserve

Nomenclature Used in this Document

GAAR = Gates of the Arctic National Park and Preserve

Park = national park portion of Gates of the Arctic National Park and Preserve

Preserve = Western Preserve Unit (Kobuk River) of Gates of the Arctic National Park and Preserve; location of the NPS project area

When Congress established Gates of the Arctic National Park and Preserve in 1980 in ANILCA, it preserved a vast and undeveloped landscape that provided opportunities to experience solitude and the natural environmental integrity and scenic beauty in Alaska’s Brooks Range. GAAR is comprised of the national park containing 7,523,897 acres and two units that make up the national preserve—the Eastern Unit (Itkillik) and the Western Unit (Kobuk River), together containing 948,608 acres (Appendix A, Figure 1). GAAR is devoid of roads and other developments and consists of glacially carved valleys, rugged mountains, arctic tundra, and boreal forest inhabited by wildlife, such as caribou, grizzly bear, moose, gray wolf, and Dall’s sheep. Congress recognized that the wild and undeveloped character of the land and the opportunities it affords for solitude and wilderness travel were identified as special values of GAAR. Nearly all of the Park is a part of the national wilderness preservation system. The Preserve was established to provide for NPS management but allow for uses that would not be consistent with a national park designation, such as sport hunting under state law and road access to the mineral deposits in the Ambler Mining District to the west of GAAR. Congress included surface transportation access to connect the Ambler Mining District to the Dalton Highway in the establishment of GAAR, allowing for a transportation corridor across the Preserve.

Applicant Purpose and Need

The applicant's purpose for submitting an application to the Department of the Interior, in part, is to secure a ROW through the Preserve for the purpose of constructing an industrial access road to the Ambler Mining District. The proposed Ambler road is intended for industrial use, namely surface transportation to the mining district for mineral exploration and development. Access to the road would be controlled, with no public access and primarily limited to mining-related industrial uses. Any use

outside the scope of AIDEA's application would be subject to a separate permit process. The applicant requires a road because there are no existing roads/surface transportation options for accessing the Ambler Mining District (i.e., transportation via rail or barge were determined by both AIDEA and the BLM to be unfeasible).

AIDEA Application

In November 2010, the ADOT&PF notified the NPS of its intention to submit an application for access across the Preserve. The Alaska State Legislature funded ADOT&PF to study the feasibility of constructing the proposed Ambler road from the Dalton Highway to the Ambler Mining District. ADOT&PF identified multiple overland routes to the mining district, including two potential routes through the Preserve.

In 2013, the Governor of Alaska assigned the lead for the Ambler Mining District Industrial Access Project to AIDEA. AIDEA, working with DOWL HKM (DOWL), a private engineering firm, continued to acquire environmental and economic data to inform road feasibility and route decisions, prepare preliminary road designs, and prepare an application for a ROW. Throughout this process, the NPS and FHWA engaged in multiple meetings with ADOT&PF and AIDEA to identify data gaps. The NPS issued permits for AIDEA's pre-application field studies on NPS lands, which were performed to gather data and information on resources that may impact or be impacted by a road.

An NPS interdisciplinary team of GAAR and regional NPS staff was formed in May 2013 to address NPS responsibilities in responding to the application for a ROW. The NPS team worked in conjunction with FHWA, which provided technical expertise on road design and ROW stipulations. In addition to the studies coordinated by DOWL, the NPS conducted field studies related to park resources.

On November 24, 2015, AIDEA submitted a consolidated application in the form of a Standard Form 299 (SF299): Application for Transportation and Utility Systems and Facilities on Federal Lands. The application was submitted to the NPS, BLM, FHWA, USCG, and USACE. The application described an alignment from the Dalton Highway to the Ambler Mining District, with two alternative alignment variations for the segment crossing the Preserve. The northern alignment variation follows the southern foothills of the Brooks Range south of the boundary between the Preserve and the Park. The southern alignment variation crosses the Preserve farther south from the Park boundary and crosses the Kobuk River further downstream from the northern alignment. The portion of the proposed Ambler road that would cross the Preserve is approximately 26 miles for the northern alignment and 18 miles for the southern alignment (Appendix A, Figure 1). Both alignments would cross the Kobuk Wild and Scenic River as provided for in ANILCA. Neither alignment would cross the Park or designated wilderness.

An agency review of the initial application identified information deficiencies, which were conveyed to the applicant in a letter dated January 22, 2016. A revised application was determined to be complete and sufficient, and the permitting process was initiated June 30, 2016.

NPS PROJECT AREA

The NPS project area encompasses the northern and southern alignment within the Preserve, as described in Chapter 2 (Alignments). For each of the resource topics, the geographic area of analysis is described in Chapter 3 (Environmental Analysis); the area of analysis for all resources is within the NPS project area. For most resource topics, the area of analysis includes the entire NPS project area. The area of analysis is limited to the specific corridor surrounding the alignments within the NPS project area for wetlands. The NPS project area is presented in Figure 2 in Appendix A. Because the analysis in the EEA focuses solely on impacts within GAAR, it presents an incomplete assessment of impacts of the proposed Ambler road as a whole. For an analysis of impacts from the entirety of the proposed Ambler road, see the BLM EIS.

PUBLIC INPUT AND DEVELOPMENT OF THE ISSUES

The NPS requested public input to identify the issues relevant to the analysis of the two alignments. The NPS communicated with federal, state, and local agencies with legal jurisdiction or specialized expertise, communities in the project vicinity and broader region, non-governmental entities, and the general public. The NPS and FHWA coordinated with other federal agencies during the NEPA permitting processes, including BLM, USACE, and USCG.

Through this process, issues associated with the decision of where to locate the ROW across the Preserve were evaluated. Public input and agency consultation are discussed further in Chapter 4: Consultation and Coordination.

ISSUES AND RESOURCE TOPICS ANALYZED IN THE EEA

The NPS identified issues to be analyzed in the EEA through internal review and analysis, discussions with participating agencies, and input from the public. This EEA analyzes the impacts of the northern and southern alignments to the following resources within the Preserve in the "Environmental Analysis" chapter: hydrology, floodplains, and permafrost; wetlands; water quality; fish; caribou; archeological resources; visitor experience; socioeconomics; and wild and scenic rivers.

ISSUES NOT ANALYZED IN THE EEA

The following issues were reviewed for analysis but were dismissed. These issues are described below with the reasons that further analysis is not warranted. Generally, issues were dismissed if the impacts were consistent between the two alignments and therefore did not inform a route determination. Dismissal does not mean that the proposed road would not have impacts on a resource. It simply means that analyzing the topic would not aid in selecting an alignment. Per the requirements of ANILCA, Section 201(4)(d), the EEA identifies measures to avoid or minimize negative impacts to resources and enhance positive impacts, including for those issues dismissed from analysis. These are summarized in Appendix C (Recommended Mitigation Measures).

Air Quality

Road construction and operation activities could affect air quality through vehicle and stationary source emissions and generation of airborne particulates (fugitive dust), which may be enriched by heavy metals. In addition to affecting air quality, these sources can create visual impacts and potentially lead to the accumulation of trace metals in plants, water, and soils. Airborne contaminants, including metals such as zinc, copper, lead, and cadmium can injure or kill lichens, bryophytes, and vascular plants; change water quality; and pose a risk to aquatic biota (e.g., fish, and aquatic insects), which inhabit lakes, streams, ponds, and wetlands. The NPS considered the changes in air quality from construction and operation of the proposed Ambler road, recognizing the possible impacts on natural resources, human health, and visitor experience. The team determined that the changes in air quality would be similar between the two alignments, and an analysis would not inform a route selection decision. Air quality was dismissed as a stand-alone analysis topic, but the effects of fugitive dust were evaluated in the "Water Quality," Fish," "Caribou," and "Visitor Experience" sections. Measures instituted to avoid or minimize negative impacts to air quality would be implemented through terms and conditions required for issuance of the ROW. Recommended mitigation measures that could be included in the terms and conditions are presented in Appendix C.

Upland Vegetation

The Preserve contains largely undisturbed upland habitats that include boreal forest; needle- leaved, broad-leaved, and mixed forests; upland shrubs; and upland meadows (DOWL 2014a). The NPS considered the potential for impacts to vegetation along both alignments. Land disturbance associated with construction activities would remove native vegetation, leaving unvegetated, disturbed areas vulnerable to wind and water erosion. Indirect impacts include the potential for changes in species composition of mosses, lichens, and shrubs due to disturbance; colonization by non-native invasive plant species that could outcompete native species; and plant injury from deposition of contaminants-bearing fugitive road dust. The NPS recognizes that these impacts could occur from construction of the proposed road; however, upland vegetation was dismissed as a stand-alone analysis topic for several reasons. The upland habitat is consistent throughout the Preserve, meaning that impacts of the northern or southern alignment would have a similar impact on vegetation communities. Although vegetation is not carried forward for detailed analysis as a separate topic, it is discussed in the "Caribou" section as it relates to differences in caribou use of specific habitats within the NPS project area. Measures instituted to avoid or minimize negative impacts to upland vegetation would be implemented through terms and conditions required for issuance of the ROW. Recommended mitigation measures that could be included in the terms and conditions are presented in Appendix C.

Grizzly Bear, Moose, Gray Wolf, Dall's Sheep, and Birds

Grizzly bear, moose, gray wolf, Dall's sheep, and raptorial birds were considered for detailed analysis since their protection is a park purpose recognized by Congress when the Park and Preserve were created, and they are important resources for subsistence users. These species, however, were dismissed from detailed analysis. For grizzly bears, habitat use is similar in the northern and southern alignments, with similar numbers of bears, numbers of crossings, time of crossings, elevations, slopes, and land cover used (Joly et al. 2016). Because impacts are not substantially different between the two proposed alignments, grizzly bears were dismissed from detailed analysis.

Studies of moose movements and habitat use in the central Brooks Range are few but suggest that the areas of most frequent use are located at the eastern portion of the overall road alignment, close to the Dalton Highway (Joly et al. 2016). Previous studies of gray wolves indicate that the Walker Lake Pack contained 13 to 15 wolves and their home range occurred in proximity to the NPS project area, but the most recent survey of this pack was completed from 1987 to 1991 (Adams et al. 2008) and the data are not current. Without up-to-date population and movement data on wolves in the NPS project area, an analysis can consider available habitat and prey species (moose and caribou). The northern route is better drained and has more deciduous trees and shrub habitat, and more open lichen patches. These habitats provide better quality habitat for moose (and caribou), and thus for wolves. While this represents a difference between the two routes, the difference is not significant and there would not be discernable differences in the impacts on moose, and gray wolves for the northern and southern alignments. For this reason, moose and gray wolves were dismissed from detailed analysis.

GAAR contains significant populations of Dall’s sheep (Lawler 2004), a highly visible large mammal that occurs in mountainous habitats. This species is an important subsistence species for local residents and valued where sport hunting is permitted in preserves (NPS 2014, 2017a). Unlike caribou and moose, Dall’s sheep have distinct home ranges (Woolington 1997). Dall’s sheep occur west of Walker Lake and within portions of the Schwatka Mountains, which are north of the northern alignment (Rattenbury and Schmidt 2011). Although the northern alignment is closer in proximity to Dall’s sheep habitat than the southern alignment, neither alignment is sufficiently close to suggest likely impacts on Dall’s sheep population or habitat and Dall’s sheep were eliminated as a topic subject to detailed analysis.

Approximately 120 bird species have been documented in GAAR, including a variety of waterfowl, raptors, grouse, shorebirds, and passerines (NPS 2014). A list of 46 avian species most likely to be impacted by the proposed road was compiled and analyzed. Bird population data are not available for the NPS project area, and potential bird habitat for each alignment was estimated based on vegetation data. Bird habitat along the proposed alignments is similar and therefore the NPS did not treat this topic with further, detailed analysis.

Special-status Species

There are no federally listed threatened or endangered species that inhabit, breed in, or overwinter in GAAR. The yellow-billed loon (*Gavia adamsii*), a federal candidate for listing, may occasionally visit, but there is no known habitat for this species in GAAR. This species normally inhabits locations well outside the NPS project area. Likewise, there are no state-listed species in GAAR. Therefore, special-status species was eliminated as a topic for detailed analysis.

Human Health and Safety

Human health and safety risks include those related to exposure to construction materials containing asbestos, the presence of physical challenges, such as rockfall and subsidence, and risks from construction activities. Asbestos is a demonstrated carcinogen and exposure can occur from airborne asbestos fibers.

Naturally occurring asbestos has been documented in geological deposits adjacent to and west of the Preserve, although the precise location of and concentrations of asbestos-bearing materials is not known for the project area. There is potential for asbestos-containing material to be used in road construction if asbestos-free materials are unavailable in specific areas. Measures intended to minimize these risks are discussed in Appendix C. There are dangers associated with construction-related work, such as traffic hazards and vehicle collisions, and working in northern Alaska poses its own risks due to harsh and changing conditions. Measures instituted to avoid or minimize negative impacts to human health and safety would be implemented through terms and conditions required for issuance of the ROW but were not further analyzed for comparison of northern and southern alignments. Recommended mitigation measures that could be included in the terms and conditions are presented in Appendix C.

CHAPTER 2: ALIGNMENTS

This chapter describes two alignments proposed by the applicant for a ROW that would cross through the Preserve. Descriptions of the construction elements are also included in this chapter. Recommended mitigation measures that would avoid or reduce negative impacts are presented in Appendix C.

DESCRIPTION OF THE ALIGNMENTS

The two alignments, the northern alignment and the southern alignment, are described below and are based on the descriptions in the NPS SF299 Supplemental Narrative section of the application (DOWL 2016a). The daylight limits include the driving surface and embankments of the proposed Ambler road and represent the area of permanent, direct impacts. The applicant would require a buffer of approximately 10 feet on either side of the road for construction activities where temporary, direct impacts could occur. For this EEA, the footprint for each alignment is the combined area of the daylight limits and the 10-foot buffer on either side of the daylight limits. Also included are features associated with the alignment, including access roads, turnout lanes, culverts, and bridges.

Northern Alignment

The northern alignment is approximately 26 miles within the Preserve (Appendix A, Figure 2). It crosses into the Preserve north of the Helpmejack Hills and south of the southern boundary of the national park, and roughly parallels the national park boundary from the eastern boundary of the Preserve to the Kobuk River crossing. The proposed Kobuk River bridge is approximately 2.5 miles south of Walker Lake. After crossing the Kobuk River, the northern alignment passes approximately 0.25 mile north of Nutuvukti Lake then heads generally west and exits the Preserve at the Reed River.

Southern Alignment

The southern alignment is approximately 18 miles within the Preserve (Appendix A, Figure 2). It travels east-west across the narrowest portion of the Preserve, crossing into the Preserve south of the Helpmejack Hills and 12 miles south of the southern boundary of the national park. The southern alignment crosses the eastern boundary of the Preserve north of Norutak Lake. As it approaches the Kobuk River, the southern alignment parallels the Kobuk River to its south, traveling within 0.5 mile of the river for approximately 3 miles. After crossing the Kobuk River, the southern alignment continues west and parallels the Reed River to its south, approaching within 0.25 mile of the Reed River for approximately 1 mile before making a perpendicular crossing of the Reed River. The southern alignment continues north, exiting the Preserve and crossing into the Beaver Creek Valley.

Construction Elements

Components related to the construction of the proposed Ambler road as defined in the application include description of the ROW, construction phases, duration and timing of construction, and road support facilities. Table 1 presents a comparison of the elements for each alignment.

Description of the ROW

In their application, AIDEA proposed a ROW through the Preserve for a 50-year term that would typically be 250-feet wide and reclaimed upon the road’s closure. In most cases, this would allow for area beyond the construction daylight limits and the 10-foot buffer. The ROW would allow for future maintenance and repair activities, brushing, and minor relocation or realignment of the road if a problem develops. It would allow for drainage maintenance upstream and downstream of culverts. The ROW will be widened at specific locations to account for stream and river crossings and certain topographic features. For example, the northern alignment ROW widens up to 400 feet for stream and river crossings. The southern alignment ROW widens up to 325 feet at several locations due to topographic features. The applicant identified the conceptual alignment locations (including GIS files documenting the locations) but proposed locations of the ROW are not currently available for either alignment. The proposed alignments are approximately 80-feet wide and occur entirely within the 250 to 400 feet of the ROW. The proposed alignments will be refined in subsequent engineering and design phases based on the results of continued field surveys (DOWL 2016b) Additional design features of the proposed Ambler road are described in the "Road Support Features" section.

Table 1. Matrix Comparing Elements of Alignments

Project Element	Northern Alignment	Southern Alignment
Total Project Footprint within the Preserve (acres)	412	415
ROW[a] (width in feet)	250–400	250–325
Construction Daylight Limits within the NPS Project Area[b] (acres)	283	229
Road Length within the NPS Project Area (miles)	26	18
Culverts within the NPS Project Area (number)	539	317
Bridges within the NPS Project Area (number)	5	2
Bridge area within the NPS Project Area (acres)	12	18
Vehicle Turnouts within the NPS Project Area (number)	2a	2a
Material Sites within the NPS Project Area	1 (47 acres)	1 (61 acres)
Construction Camp/Long-term Maintenance Facility for Materials and Crew	0	1 (5 acres)
Airstrips within the NPS Project Area	0	1 (81 acres)

Source: DOWL 2016a

a As identified in the SF299

b Includes key project features (driving surface and embankments of the proposed Ambler road, material sites, construction camps, long-term maintenance facilities, airstrips, access roads, turnout lanes, culverts, and bridges)

Construction Phases

The applicant proposes to build and use the road in three phases. Figure 3 in Appendix A presents the typical sections for the phase I pioneer (seasonal use) road, phase II year-round, single-lane road, and phase III two-lane road. AIDEA's application states that project construction will begin in 2019 and occur intermittently over the life of the mining district, as described below. Transitions between phases of construction would respond to mine production and development activity in the district. The life span of the proposed Ambler road is a function of the need for surface transportation access by developments within the Ambler Mining District.

In May 2019, AIDEA clarified their application with additional information regarding the phasing of construction (AMDIAP 2019). Phase I would be completed in two years. Phase II would follow immediately and would be completed in two more years. Because the phase II single-lane road is expected to be sufficient for most development scenarios, culverts installed during phase I would be sized for the phase II road footprint. If future developments indicate the phase III two-lane road is desired, the culverts would be modified to accommodate the wider phase III road footprint (AMDIAP 2019).

Phase I. During phase I, a winter construction access trail would be established during the first year, and a pioneer road would be completed in the second year. Construction of the pioneer road would take place year-round, other than possible restrictions during spring break-up or bird nesting periods in compliance with the Migratory Bird Treaty Act. The pioneer road would be a single-lane, gravel-surfaced road, typically 16 feet wide (including 2-foot-wide shoulders) on a shallow embankment. All proposed bridges would be constructed as one-lane bridges in phase I and would remain as one-lane bridges through all construction and operational phases. Drainage structures installed in phase I construction would be designed to accommodate expansion to the phase II road footprint (AMDIAP 2019).

Phase II. Phase II construction would begin immediately after phase I construction is complete (AMDIAP 2019). Phase II would expand the pioneer road into an all-season, single-lane, gravel-surfaced road, typically 20 feet wide, over a full-thickness embankment. The single-lane full-embankment road would take two years to complete. This phase would result in year-round access but would likely be restricted to one-way traffic with guided truck conveys traveling east or west during specified hours.

Phase III. If traffic volumes on the road justify upgrading the road to two lanes, construction of phase III would commence. Expansion of the phase II single-lane, full-embankment road to a phase III two-lane, full-embankment road would take two years to complete. During this final stage, a two-lane, gravel-surfaced road, typically 32 feet wide, would be constructed over the existing phase II footprint. Culverts would need to be extended to accommodate the phase III footprint. The phase III road would be an all-season road designed to support mining exploration, development, and operations and any additional commercial usages allowed under permit.

Road Support Features

The applicant's project plans proposed construction of support facilities including material sites, construction camps, maintenance facilities, airstrips, access roads, turnout lanes, and bridges and culverts. Following the release of the draft EEA, the applicant worked to evaluate additional minimization measures, including removal of material sites, construction camps/maintenance facilities, and airstrips from the Preserve (AIDEA 2020). These elements are described below, and in chapter 3, the analyses provide discussions of the impacts on resources both with and without these facilities.

Material Sites. Material sites are planned to supply borrow material, gravel, and riprap for road construction and serve as staging areas for construction activities. One potential material site (approximately 47 acres) has been identified for the northern alignment located within the Preserve in the valley southwest of Walker Lake (Appendix A, Figure 4). One potential material site location has also been identified for the southern alignment within the Preserve near the Kobuk River (approximately 61 acres) (Appendix A, Figure 5). Proposed in conjunction with the material site located on the southern alignment are a construction camp (which would be developed into a long-term maintenance facility following construction) and an airstrip.

Construction Camps/Maintenance Facilities. One construction camp is proposed along the southern alignment adjacent to the airstrip within the Preserve. The camp would be approximately 5-acres, with room for helicopter landings, equipment and material storage, and employee facilities (e.g., housing, food service). Construction would occur in both directions from these camp areas, with equipment staged along the ROW via the pioneer road. Camps co-located with airstrips would transition to maintenance facilities following construction.

Airstrip. Airstrips would provide air support for road construction activities. An airstrip is proposed with the construction camp along the southern alignment with a footprint of 550-feet wide x 6,400-feet long (81 acres).

Access Roads. Four access roads with lengths ranging from approximately 290 to 1,600 feet along the northern alignment and five roads ranging from 260 to 5,500 feet along the southern alignment would be needed to provide access to material sites and water sources for construction and maintenance activities. Access roads would be two-lanes wide at full buildout. When the main road is one lane, two-lane access roads would be needed into material sites to avoid having to stack waiting trucks out on the main road.

Water Extraction Sites. Water would be used to aid in compaction of gravel as the road is built and for dust control and application of dust palliatives during its operation over the life of the road. Trailer-mounted portable pumps, typically four inches but sometimes larger, would fill water trucks via overhead fill pipes. A suction hose placed in a waterbody would supply water to the pump. A screened metal box on the hose end to would exclude fish and act as a debris strainer.

The applicant has proposed five water extraction sites along the northern alignment inside GAAR: one at the Kobuk River, three at unnamed streams, and one at an unnamed pond. Along the southern alignment, the applicant has proposed three water extraction sites inside the Preserve: one at the each of the Kobuk and Reed rivers and one at an unnamed pond.

Turnout Lanes. Within the Preserve, two turnout lanes (gravel surface) are proposed along the northern alignment (Appendix A, Figure 4) and two turnout lanes are proposed along the southern alignment (Appendix A, Figure 5). A turnout lane would be needed adjacent to the road at various locations to allow trucks to pull over to enable other trucks to pass and for emergency parking. Vehicle turnout lanes would be 20 feet wide and 250 feet long.

Bridges and Culverts. Within the Preserve, 5 bridges and 539 culverts would be needed to convey water across the northern alignment, and 2 bridges and 317 culverts would be needed for the southern alignment (Table 2). Considering the entire length of the Ambler road, the northern alignment would require 29 bridges and 2,903 culverts, and the southern alignment would require 25 bridges and 3,179 culverts.

Table 2. Summary of Water Crossing Structures within the NPS Project Area

Crossing Classification	Diameter	Number of Culverts and Bridges along the Northern Alignment	Number of Culverts and Bridges along the Southern Alignment
Culverts			
Minor	3 feet	533 (2,869 total)	316 (3,155 total)
Moderate	4 – 10 feet	2 (15 total)	0 (12 total)
Major	11 – 20 feet	4 (19 total)	1 (12 total)
Bridges			
Small	< 50 feet	0 (3 total)	0 (3 total)
Medium	50 – 140 feet	4 (15 total)	0 (12 total)
Large	> 140 feet	1 (11 total)	2 (11 total)

Source: DOWL 2016a and BLM Draft EIS

A majority of bridge construction activities would take place in the winter when waterbodies are frozen, facilitating vehicle crossings required during construction. Staging areas would typically be less than one acre and would be located within the construction daylight limits and 10-foot buffer when they are required inside of GAAR. Additional temporary staging and construction areas would be required for bridges. The size and location of these temporary staging and construction areas were estimated conservatively as a buffer around each bridge location, upstream and downstream of the river crossing and parallel to the abutment locations. For small bridges, a buffer of 100 feet was used; for medium bridges, a 200-foot buffer was used. For large bridges, specific buffers were created and ranged from 200 feet to the length of the bridge. Actual staging and construction areas would be further defined during detailed design depending on the topography of a given waterway crossing.

Communications Infrastructure. A fiber optics line would be installed within the roadbed during phase II construction of the proposed Ambler road. The communications infrastructure would include 7 to 12 radio towers across the distance of the entire Ambler road project. Towers would be 100- to 150-feet tall and would require a pad measuring 400 feet by 400 feet. Towers would be located at each long-term maintenance facility and several material sites over the entire road from the Dalton Highway to the Ambler Mining District. Each tower would require a generator shed, equipment rack shed, and 4,000-gallon fuel tank. A backup satellite communications system would also be installed for two-way radio coverage in the event of a failure of the fiber optic system. Five satellite dishes, each approximately 10-feet tall, would be co-located with the fiber optic equipment at maintenance facilities.

MITIGATION MEASURES PROPOSED BY THE APPLICANT

Construction projects in interior Alaska are challenging due to the extreme and dynamic environmental conditions. To protect natural and human resources, the applicant identified mitigation measures in their application, such bridge designs that adequately convey a 100-year peak flood, using State of Washington stream stipulation culvert width standards (1.2 times bankfull width plus 2 feet), considering the use of bridges instead of multiple culverts at braided stream crossings, an adaptive monitoring plan for monitoring, maintain, and repairing culverts, the use of more porous material in sensitive areas to allow more groundwater to flow through the road embankment, proposing a spill prevention and response plan, and revegetating fill slopes with native seed, trees, or shrubs. The NPS commit to working with the applicant to monitor resource conditions in the Preserve and bolster or refine mitigation measures in response to changing conditions and to ensure resource protection.

Since the applicant has not completed final engineering and design plans and continues to develop resource information needed to inform these plans, terms and conditions are discussed generally and focus on goals and objectives needed to protect resources rather than prescribing highly specific mitigation measures. Following the release of the draft EEA, the applicant worked to evaluate additional minimization measures, including removal of material sites, construction camps/maintenance facilities, and airstrips from the Preserve. Removal of these facilities from within the Preserve would mean that similar facilities would be sited outside of GAAR. This change in design would reduce impacts on resources within the Preserve, but it would create additional impacts on resources outside of the Preserve where these facilities would be located, and for the southern alignment, would increase project costs.[1]

[1] As explained by the applicant's contractor: "The [U.S. Army Corps of Engineers] asked AIDEA to evaluate the wetland impacts of Alternative B (inside and outside GAAR) if the material site, maintenance station, landing strip, and communications tower within GAAR was removed. As you know, Alternative B has a shorter length within GAAR, but the overall length of the corridor is 17 miles longer than Alternative A. The road is proposed to have a maintenance station about every 50 miles. This allows the stations to maintain 25 miles in either direction and provides for adequate signal regeneration for the fiber optic system and the backup communications systems (radio, satellite, etc.) Eliminating the maintenance station within GAAR would result in a gap of 162 miles between maintenance stations. Therefore, two new maintenance stations would be required: one west of GAAR near Beaver Creek (approximately milepost [MP] 148) and one east of GAAR just west of Hogatza River (approximately MP 120). Each of these sites would have a maintenance station, communications tower, and airstrip. To maintain the maximum available radio communication coverage, we would likely need to add at least one new communication tower just east of GAAR (near Norutak Lake)."

BLM evaluated a wide range of potential mitigation measures that are described in Appendix N of the BLM Final EIS. The NPS has reviewed and incorporated these potential mitigation measures for consideration in this EEA, with minor revisions largely designed to include NPS review and approval of certain measures specific to actions within the Preserve. These measures are presented in appendix C of this document.

CHAPTER 3: ENVIRONMENTAL ANALYSIS

This chapter analyzes the environmental consequences (impacts) that would occur as a result of construction of the proposed Ambler road on the northern and southern alignments. The following resources are addressed: hydrology, floodplains, and permafrost; wetlands; water quality; fish; caribou; archeological resources; visitor experience; socioeconomics and wild and scenic rivers.

The analysis takes into account the three-phase construction plans proposed by the applicant and described in Chapter 2. Individual impacts from each phase would be similar for most resources; however, the cumulative effect of multiple construction periods on the same resources could increase the impacts compared to the incremental effect of an initial concerted effort to complete the full development required for a road suitable for year-round use. The combination of phases I and II would reduce this additive effect. Phase III would represent a new construction effort, after mitigation and restoration of phase I and II construction.

The analysis also accommodated the fact that the proposed location for the alignment is preliminary and is expected to change once detailed studies are available. Likewise, while the applicant identified the conceptual alignment locations (including GIS files documenting the locations), precise and detailed locations of the ROW are not currently available for either alignment. To address this uncertainty, the impacts would typically be analyzed for the entire ROW, a wider area within which the alignment would be located, providing the applicant flexibility in final design. For most analyses, the impacts are discussed qualitatively and comparatively. For the wetlands analysis, acreages of impacts were identified based on the construction daylight limits and the 10-foot buffer.

The proposed northern alignment across the Preserve is 26 miles within the Preserve and 211 miles in total. The proposed southern alignment is 18 miles within the Preserve and 228 miles in total. While the southern alignment is 8 miles shorter than the northern alignment within the Preserve (the area of analysis for this EEA), the two alignments merge outside of the eastern and western Preserve boundaries. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve (Appendix A, Figure 2). These areas outside of the Preserve are evaluated in the BLM EIS.

GENERAL PROJECT SETTING

GAAR lies in the central Brooks Range of northern Alaska, mountainous terrain with numerous clear, fast-flowing streams and large scour lakes. Sparse black-spruce forests cover north-facing slopes and poorly drained lowlands. Boreal forests of white spruce, quaking aspen, and paper birch are typically found on south-facing slopes. Visitors discover intact ecosystems where people have lived with the land for thousands of years, and GAAR remains largely unchanged except by forces of nature. For millennia nomadic hunters and gatherers traveled the mountains’ forested southern slopes and the Arctic Coast. Many rural Alaskans continue to take sustenance from the land’s fish, wildlife, and plants and use these resources for food, shelter, clothing, transportation, handicrafts, and trade (NPS 2014).

Subsistence

In 1980, Congress formally recognized the social and cultural importance of protecting subsistence for both Native and non-Native rural residents when it passed ANILCA. This legislation created millions of acres of new national park and national preserve lands in Alaska and helped to preserve subsistence use.

The new law defined subsistence as “Customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade” (16 United States Code § 3113).

In 1981, ten communities near GAAR were designated by the NPS as *Subsistence Resident Zone Communities.* Alatna, Allakaket, Ambler, Anaktuvuk Pass, Evansville/Bettles, Hughes, Kobuk, Nuiqsut, Shungnak, and Wiseman were identified as communities with a significant concentration of subsistence users who have customarily and traditionally used GAAR resources. Resident zone status allows permanent residents within these communities to participate in subsistence activities on Park and Preserve lands in GAAR. According to the 2018 population estimates (US Census Bureau 2018), these communities include approximately 1,700 people.

Subsistence activities occur throughout the year and are concentrated along rivers that connect low-lying communities. Subsistence activities include hunting, fishing, trapping, and gathering of plants, as well as wood for heating homes. Subsistence activities are seasonal due to changing availability of animal and plant resources throughout the year. Winter trapping efforts concentrate on the harvest of lynx, wolverine, wolf, marten, hares, and fox. Hunting, fishing, trapping, and gathering, in repeated seasonal cycles, remains a vital part of evolving subsistence lifeways (NPS 2016).

Historically, the most important resource to the Native inhabitants in the area was caribou. The movement of caribou was a primary factor influencing the subsistence strategy of people in the central Brooks Range prior to contact with outsiders. Even today, caribou migrate seasonally and provide local people with sustenance. Other resources used by local people include fish, moose, Dall’s sheep, bears, waterfowl, marmot, ptarmigan, hare, furbearers, a variety of plant life, and even a few mineral deposits (NPS 2014).

The land area of GAAR is vast, and most resources, except for Dall’s sheep, typically are found in or near the valley floors. Subsistence users generally access their hunting grounds or fishing locations via all-terrain vehicles, snow machines, or boats. Off-road vehicles are not allowed throughout GAAR, except for specific lands around the Anaktuvuk Pass (NPS 2014). Figure 6 in Appendix A presents the historic and current use areas of the Alatna, Allakaket, Evansville/Bettles, Kobuk, and Shungnak communities in relation to the Preserve and the NPS project area.

Residents of the communities of Ambler, Shungnak and Kobuk have long-established hunting and fishing camps at private allotments and elsewhere along the banks of the Kobuk River. Acquired through demonstration of long-term use of an area and its resources, allotments represent family legacies within the region. Some are located very close to established villages (Devinney 2005). There are two private Alaska Native allotments in the NPS project area, one adjacent to Nutuvukti Lake and one along the Kobuk River near the southern border of the Preserve (Appendix A, Figure 6). The northern alignment would be approximately 1.5 miles from the allotment adjacent to Nutuvukti Lake, and the southern alignment would be approximately 6 miles from the allotment along the Kobuk River.

In the summer and fall, waterways remain an important method of accessing fish and terrestrial resources; however, during the winter months, these same waterways are used as frozen highways by snow machines. Accessing resources in the winter becomes easier by early November when waterways are frozen and snow cover makes travel by snow machine possible. Snow machine access can be hindered by deep snow and rugged terrain, which is why most winter use occurs in the northern half of GAAR where the land is treeless and has a shallow, wind-blown snowpack that makes snow machine travel less difficult. Hundreds of miles of valleys are traveled each winter within GAAR for subsistence purposes (NPS 2014). Within GAAR, the Kobuk River, up to the lower canyon, is still used for hunting, fishing, and gathering, and the Alatna River is still used for hunting Dall's sheep, moose, and bears throughout the Endicott Mountains. The Preserve is visited infrequently by caribou hunters, who mainly hunt caribou closer to their communities (NPS 2014).

The addition of a road through the Preserve would directly affect subsistence resources. Refer to the "Caribou," "Fish," and "Wild and Scenic Rivers" sections in this analysis for the impacts of the proposed Ambler road on these resources. Indirect impacts could also occur. Climate change, discussed in more detail in the following section, also indirectly affects subsistence users. Climate change impacts could affect when and where resources are available, as well as the time and energy required to acquire resources for subsistence use.

Section 810 of ANILCA requires that an evaluation of subsistence uses, and needs be completed for any federal determination to "withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands." An evaluation of potential impacts on subsistence under Section 810 of ANILCA was completed by BLM for the entire proposed Ambler road project; the NPS has regular contact with the upriver communities and has worked with BLM throughout the process. The Section 810 evaluation, findings, and determinations are available as Appendix E to the BLM Joint Record of Decision.

Climate Change

Climate is one of the most important drivers of ecological condition, particularly in Alaska where changes to the climate condition (e.g., temperature and precipitation) can have larger scale and more rapid impacts compared to areas within the continental United States. In GAAR, warming temperature due to climate change poses a major threat to resources. Statewide, over a period of 50 years, Alaska's average annual temperatures have increased by 3.4 º Fahrenheit (F); this has also led to an increase in the occurrence of snow-free days (by an additional 10 days recorded between 1970 and 2000), along with increased precipitation (US Global Change Research Program 2009). Some of the largest current impacts on the resources of GAAR from warming include an increase in length of growing seasons and effects on timing of snowmelt, as well as permafrost thawing and melting buried glacial ice (NPS 2017a).

Climate change models currently predict that GAAR will experience an increase of up to 10°F mean annual temperature over the next 60 years (NPS 2017a). This will likely be accompanied by longer persistent warm periods with temperatures above freezing in the winter. This is anticipated to decrease snow cover and increase melting/icing events, which can cause negative impacts on foraging animals, as well as increase the likelihood of desiccation of plant species left uncovered by snow (NPS 2017a).

Climate change is expected to cause the total annual precipitation to increase throughout the next century, particularly in the summer season. Precipitation in Alaska is projected to increase during all seasons by the end of this century and more extreme variation in flow regimes are also predicted (Markton et al.

2018). Variations in the type and timing of precipitation can disrupt wildlife cycles, such as bird migrations, availability of prey and plant species, and the molt/shed of prey species that depend on camouflage from predators (e.g., hares, ptarmigan). Additionally, warmer temperatures in the spring are expected to cause the timing of events (e.g., fire season and wildlife migrations) to shift, resulting in ecosystem-level ripple effects. Altered environmental factors from climate change will cause wildlife numbers to fluctuate and change migratory patterns in unknown ways. These variations could alter the availability of and access to key wildlife species used for subsistence by local residents (NPS 2017a).

Rivers will likely warm and become more filled with sediment seasonally, potentially changing species composition. A change or reduction of invertebrate prey species may result in a shift in the composition of aquatic species, which could affect piscivorous predators (e.g., bears, osprey).

Permafrost is projected to thaw across large portions of interior Alaska by 2100 under both low and high greenhouse gas emissions scenarios. A recent modeling study found that area of talik (unfrozen ground surrounded by permafrost) will see sporadic increase in the NPS project area, with almost total thaw of frozen ground within the GAAR boundary by 2100 (Panda et al. 2016). This has the potential to alter local hydrology and impact roads and infrastructure (Stewart et al. 2013; NPS 2017a). The growing season is projected to increase 15–25 days by 2050, and warmer spring temperatures already are linked to increased wildfire activity in Alaska (Stewart et al. 2013).

Climate change is occurring and will continue to occur in Alaska independent of the proposed Ambler road but the effects in the vicinity of the road could be exacerbated by changes in the thermal regime due to road development, and increased emissions. Climate change must be considered part of the current conditions in GAAR, although it creates a shifting baseline. Climate change is discussed in the discussion of impacts to the resources in the following sections, where appropriate.

HYDROLOGY, FLOODPLAINS, AND PERMAFROST

This section describes the hydrology, floodplains, and permafrost present within the NPS project area. We start the analysis of impacts with these resources because changes to these resources impact all of the other resources. If permafrost degrades, it can cause changes to ground and surface waters, and slumping of soils and rocks. Slumping of soil and rock (e.g., landslides, rockslides) can then impact nearby waterways – streams and surface flows – dumping soils and rock into streams, causing sedimentation of streams, and alteration of stream flow. Sedimentation and changes to streamflow impact the biological communities – fish, invertebrates, and others – that depend on the streams. Terrestrial animals can be affected by loss of and changes to habitat resulting from changes to the physical resources. Land and rockslides can also impact archeological resources, by dislodging them. As the basis of the ecological community in the Preserve, changes to the hydrology, floodplains, and permafrost would have far-reaching impacts to resources within the area. Available reports and data sources were reviewed and evaluated to determine current conditions and to predict the impacts from construction, operation, and maintenance of the proposed Ambler road. Minimal data are available for analysis of hydrology and floodplains within the Preserve. There are no US Geological Survey gaging stations within or upstream of the NPS project area. Similarly, there are no floodplain maps. This analysis is based on watershed mapping using data from US Geological Survey National Geospatial Program (USGS 2018) and the wetlands delineation completed by the applicant (DOWL 2014a). Information on hydrology found in AIDEA’s application (DOWL 2016b) and related studies (DOWL 2011; Kane et al. 2015) were also used.

Information about the potential for permafrost within the NPS project area was obtained from research conducted by NPS staff (Swanson 2016), Alaska Department of Transportation staff (Speeter 2015), AIDEA’s application (DOWL 2016b), and from a geologic hazards analysis completed by FHWA staff for this project (FHWA 2019). The FHWA analysis was designed to assess potential geologic hazards relative to road construction within the Preserve. The geographic area analyzed for hydrology, floodplains, and permafrost is the NPS project area (Appendix A, Figure 2).

Impacts

Surface flow patterns in northern Alaska are strongly influenced by the presence of permafrost, which restricts the percolation of water through the soil. The presence of discontinuous permafrost throughout the project area creates the conditions that allow for the extensive wetlands in the NPS project area.

Shallow surface water flow paths and saturated zones above the permafrost table would be regularly encountered in the NPS project area. Permafrost in the Preserve is lightly frozen and is vulnerable to thaw. Construction of the proposed Ambler road on thaw-unstable permafrost could cause additional thawing. Changes in permafrost increase the potential for slope instability as the active layer grows and the permafrost decreases. Thermally induced settlements can trap water at the toe of a road embankment, creating linear ponding. With the construction of the proposed Ambler road, natural drainage could be disrupted. Depending on drainage structure design, installation, and maintenance, sheet flow could be concentrated into point flow as it crosses the road, altering the hydrologic function. Proper location, design, installation, and maintenance of culverts are important to preserve hydrologic function and avoid changes in wetland type and function from one side of the road to the other. Surface waters maintain wetlands within the NPS project area, and ultimately, preserving natural flow patterns across the NPS project area would be critical to preserving the wetlands and aquatic environments. This section explains how the proposed Ambler road along the northern and southern alignments would impact the hydrology, floodplains, and permafrost within the NPS project area.

FHWA assessed geologic hazard and risk susceptibility on both proposed alignments (FHWA 2019). This geologic risk analysis is used to help identify areas where the interactions of various physical resources result in a higher likelihood of change to the physical environment. Areas of high or moderate-high risk are identified as areas where changes to permafrost would be expected to be greater. For more detail please consult the technical memorandum (FHWA 2019).

Hydrology and Floodplains. The NPS project area includes two major watersheds – the Kobuk River watershed and the Koyukuk River watershed. The proposed Ambler road only impacts tributaries to the Kobuk River watershed. Within the Kobuk River watershed are 14 subwatersheds potentially affected by the proposed alignments (Appendix A, Figure 7). More than 60% of the land within the NPS project area is covered by rivers, streams, lakes, or wetlands. In addition to the Kobuk and Reed rivers and Nutuvukti and Walker lakes, the NPS project area includes numerous small perennial and ephemeral streams. The rivers, streams, and smaller waterbodies in the Preserve are undisturbed and function naturally, having outstanding floodplain values for ecosystem quality. Little information is available on flow or flood history of these waterbodies. Peak runoff typically occurs in spring and early summer following snowmelt. Summer storms can also cause high flow events (DOWL 2011; Kane et al. 2015). Flooding caused by ice jams has been documented in areas near the NPS project area (within the larger project area for the BLM EIS) (Kane et al. 2015) and likely occurs on the rivers within the NPS project area.

The proposed Ambler road would be constructed on top of an embankment ranging from 3 to 8 feet or more above the current grade, creating essentially a dam and disrupting the flow of groundwater and surface water, including hundreds of ephemeral and smaller streams. To minimize disruption of groundwater flow, the applicant's proposal includes several hundred culverts (see Table 1) for smaller streams, rills, swales, wetlands, and areas of sheet flow. Bridges would be used for larger rivers. In their application (DOWL 2016b, p 28), the applicant noted that "detailed hydrologic calculations necessary to predict peak flood flows to ensure adequate hydraulic capacity at river and stream crossings have not yet been completed." To achieve their stated goal "to maintain hydrologic connectivity (DOWL 2016b p 27), the applicant proposes to use State of Washington stream stipulation culvert width standards (1.2 times bankfull width plus 2 feet), consider the use of bridges instead of multiple culverts at braided stream crossings, create an adaptive monitoring plan for monitoring, maintain, and repairing culverts, the use of more porous material in sensitive areas to allow more groundwater to flow through the road embankment (AIDEA 2020).

No gaging stations occur within or upstream of the project area, but a study completed for this project collected data on the Kobuk and Reed Rivers (Kane et al. 2015). For the Kobuk River, the study provides two years of data for water elevation and information about timing of ice breakup. Discharge data were not collected. Ice breakup varied in timing and duration between the two years studied (2013 and 2014). For the Reed River, data were collected from 2012 to 2014 on water level elevation, discharge, and ice breakup. Peak water elevation was similar for the three years studied. The maximum peak water elevation observed was slightly over bankfull. Water elevations over bankfull were also noted during ice breakup caused by ice jams. For the years studied, ice breakup and the resulting high flow occurred in the late May or early June time period for both the Kobuk and Reed rivers. High flow events continued through the summer due to rain events. In wet years, such as 2014, this led to sustained high flows (Kane et al. 2015).

Maintaining hydrologic connectivity is easier for larger rivers and streams with well-defined channels. The applicant proposes to design the bridges to span, at a minimum, the bankfull width of the natural channel (DOWL 2016b). Available data collected for the Kobuk and Reed rivers described above (Kane et al. 2015) suggests bankfull would not be sufficient to pass flow during ice breakup and ice jams. The risk of water and ice backup, causing erosion and gouging of streambanks, flooding, and other alterations of the river corridor, including impacts to fish habitat highlights a critical need for adequate bridge design and sizing to allow the free flow of water and ice at peak flow. The lack of historical flow data hampers the evaluation of the adequacy of the bridges to pass high flow events. Per the BLM's proposed mitigation (see Appendix N of the BLM Final EIS, Section 3.2.5.1), "All stream crossings would be designed based on site-specific information, such as fish species presence, seasonal in-stream flows and peak discharge, and floodplain regime (50- to 100-year flood events). Bridges would be designed to pass the 100-year discharge and culverts to pass the 50- to 100-year flood events, depending on size and fish presence. In developing estimates of flows and discharge for crossing design, climate trends would be used to improve the future discharge estimates and delineation of the floodplains." Implementing this type of measure within the Preserve will resolve the concern with the lack of historical data.

For waterbodies where culverts are used to maintain connectivity, AIDEA has committed to using a culvert design that is more protective of hydrologic connectivity than required by Alaska fish passage standards. AIDEA would also work with the Alaska Department of Fish and Game (ADF&G) and the USACE to create an adaptive management plan for monitoring, maintaining, and repairing culverts over the life of the road. Except for information reported for the Kobuk and Reed rivers (Kane et al. 2015), there are no data on stream size or flow for the many waterbodies crossed within the NPS project area. Culvert failure is a common problem for similar road construction projects in Alaska. Impacts result from ice jams due to incorrect sizing of culverts, or movement of the culvert caused by the freezing and thawing of the ground. If a culvert is not sufficient to pass all flow and maintain the hydrologic connectivity the same as existing conditions, it would alter the hydrology and floodplains. This could include ponding above the culvert and channelization and erosion downstream of the culvert. If the placement of the culvert changes (culverts can be moved or dislodged due to ground upheaval or road settlement caused by freezing and thawing), it could render the culvert ineffective. The culvert could be tipped above the streambed, preventing flow from entering the culvert. This could lead to ponding along the roadway embankment. The Preserve has extensive streams and surface flows that shape the local ecology. Each alignment includes several hundred culverts within the Preserve. In their application, the applicant acknowledges the challenges of maintaining hydrologic connectivity for this project. The applicant proposed additional data collection to inform design and mitigation measures to avoid and mitigate impacts (DOWL 2016b). Following the review of the draft EEA, the applicant worked to evaluate additional mitigation measures to minimize impacts to hydrology, as detailed above. The potential for permanent impacts to hydrology and other resources dependent on hydrology (permafrost, wetlands, fish, etc.) is high; however, the additional impact minimization measures proposed by the applicant would reduce the risk of impacts to hydrologic connectivity.

Aerial imagery of the proposed crossings within the Preserve shows that most rivers and streams are sinuous with braided sections, indicating these rivers and streams still have active channel migration. Floodplain values would be impacted by the construction of bridges and the long-term presence of bridges in the river channels. Concrete structures are immovable and as such, when located inside the floodplains, restrict the natural movement of streams. It is expected that the bridge piers would be inside the river channel, within the floodplain, and therefore would restrict natural channel migration. The bridges crossing the Kobuk River along either the northern or southern alignments would have multiple piers, including several in the river channel. The extent of bridge impacts to floodplain function cannot be fully assessed but ice jams, flood flows, and debris and sediment being obstructed at the juncture during periods of maximum water elevation are risks that need to be taken account in the bridge design process. Based on the very limited data collected (Kane et al 2015), it is reasonable to expect ice jams or high flows that surpass bankfull most years. More information on bridge design is needed to determine actual impacts to floodplain functions and values. To avoid impacts associated with peak flows, bridges should be designed to pass flows in excess of peak flows. Since the draft EEA, the applicant has agreed to evaluate crossings of braided streams to determine if using a bridge rather than culverts would reduce impacts on the stream and allow natural stream channel movement. This would reduce the potential for impacts on specific streams and rivers. Many of the impacts to floodplain values are discussed in the “Water Quality” and “Fish” sections of this chapter.

Construction of the embankment would consolidate soils below the roadbed, which would impact groundwater flow, potentially impeding flow and forcing groundwater to the surface. As noted in the application (DOWL 2016b), consolidation would be greatest near the surface, generally within the top 10 feet of the existing ground surface. If the groundwater were to surface, it would likely collect and lead to additional impacts to permafrost. Areas with shallow groundwater flows would be more susceptible to impacts from consolidation. Due to a lack of soil data it is not possible to identify these areas within the NPS project area.

Permafrost. Permafrost is ground (soil, rock, ice, and organic material) that remains frozen (below 0 degrees Celsius [°C] or 32°F) for two years or more. The active layer is a layer of ground material above the permafrost that melts and freezes each year. If ground temperatures increase, ice within the permafrost can melt, causing changes to the surrounding physical and ecological resources. Permafrost degradation impacts surface and groundwater hydrology, including interactions between surface and groundwater, and can lead to erosion and subsidence of soil and rock materials. Depending on the extent of degradation impacts can be severe including rock and landslides, slumping, local flooding, and the draining of thermokarst lakes and wetlands. Another effect of permafrost thaw is the release of carbon dioxide, methane, nutrients, and microbes which had previously been stored in the frozen ground.

Discontinuous permafrost occurs throughout the NPS project area. Because the NPS project area is currently devoid of human development, the permafrost is undisturbed, except for changes associated with climatic warming. A recent study of ground temperatures in the Preserve (Swanson 2016) indicates that ground temperature along the two alignments hovers just below the 0°C (32°F). Permafrost temperatures in the NPS project area are relatively warm, near −1°C (30°F) (Swanson 2016). As Swanson (2016) noted, permafrost that is near the freezing point of water is highly susceptible to thaw and subsidence with minor changes in the thermal regime.

The susceptibility of the permafrost to thaw in the NPS project area was documented through a series of photos during soil studies by Speeter (2015). An area that was first subjected to fire (reducing the organic mat that serves insulating layer over the permafrost) and then heavy rains the following year became vulnerable to extensive thaw and erosion, eventually leading to landslides in the area. This documents that frozen soils at this latitude within the Preserve are thermally unstable and can easily result in structural failures if the organic mat is compressed, removed, or burned and/or exposed to surface water that accelerates melting and erosion (Speeter 2015).

Water ponding along the toe of the road embankment, due to poor drainage within and adjacent to the embankment, compaction of the vegetation mat above the permafrost, or alteration of groundwater and surface water flows can all act as heat sinks or cause changes in the thermal regime. As ice in the permafrost melts and the water drains away, these changes can create new heat sinks and exacerbate the problem, causing impacts beyond the initial area of impact. Vehicle traffic and a dark gravel surface material would also cause increases in ground temperature under and adjacent to the road. Measures proposed by the applicant are described in their application and summarized in Section 2.4.4 of the BLM EIS. Measures include additional data collection, detailed thermal modeling to inform design, more conservative culvert design, the potential for using bridges instead of culverts in some locations, the use of more porous fill material in proximity to Nutuvukti Fen, potential move the road alignment further north in the area of the fen to increase the distance between the fen and the road, and developing an adaptive management plan for tracking culvert function. While proposed design measures could avoid and minimize impacts to permafrost from road construction and operation, the susceptibility of the permafrost to thaw in the NPS project area could still lead to degradation. As noted above, impacts to permafrost lead to impacts to other resources. These impacts could be realized at some locations along the entire length of the proposed Ambler road within the Preserve and could permanently alter the permafrost and hydrology at some locations within the NPS project area.

Comparative Analysis

The proposed Ambler road would likely have significant impacts on hydrology, floodplain function, and permafrost within the Preserve, requiring mitigation measures. Some of the rivers, streams, and other waterbodies in the NPS project area would be altered by the construction of the embankment for the road and the bridges and culverts required.

Without appropriate mitigation measures, the bridges, culverts, and the road embankment would likely have significant adverse impacts on floodplain functions and values. During and after construction of the new facilities, degradation of the permafrost would occur as a result of exposure of the permafrost, compaction of the soil above the permafrost, and alteration of surface and groundwater flow. Measures proposed by the applicant could avoid and reduce some impacts, but impacts would still occur. More than 60% of the land cover within the NPS project area consists of waterbodies or wetlands. Changes to the hydrology, floodplains, and permafrost would alter these resources and the ecological communities that inhabit these areas and so measures to preserve the ecological integrity of these systems would be important.

The probability of impacts on the local hydrology and floodplain function from culverts is likely even greater than for bridges because there are more culverts and there is even less information about peak flow conditions. Along the northern alignment, there are over 500 culverts proposed within the Preserve compared to 300 along the southern alignment.

The bridges crossing the Kobuk River along either the northern or southern alignment would have multiple piers, including several in the river channel. The southern alignment would also use a multi-span bridge to cross the Reed River (for a total of two large bridges within the Preserve), and the northern alignment would use four medium-sized bridges to cross four other rivers within the NPS project area (for a total of five bridges within the Preserve). AIDEA and ADOT&PF conducted field investigations that support siting the Kobuk River bridge location, and they recommend the northern alignment as a preferred bridge crossing location because it is located within a relatively straight reach (approximately a mile long) that is geographically constrained by a significant "high bluff" on the west of the west side of the river, thus decreasing the likelihood of significant lateral migration relative to the southern location. Appropriate design measures should increase bridge stability and scour protection and avoid potential lateral migration from degrading the stability of the bridge crossing.

In addition to the proposed Ambler road, the applicant proposes to construct support facilities within the Preserve. The applicant proposes material sites along both alignments to be used to mine gravel for road construction and maintenance. The material site within the Preserve along the northern alignment would be 47 acres, and the material site along the southern alignment would be 61 acres. Within the Preserve along the southern alignment, the applicant proposes a construction camp, long-term maintenance facility and an airstrip co-located with a material site. The construction camp/maintenance facility would be about 5 acres and the airstrip would be 81 acres. The northern alignment includes a similar facility, but it is located outside of the Preserve, thus avoiding direct impacts to Preserve lands. Compaction of the soil from construction would impact the permafrost as described above. Depending on the exact siting of the material sites, construction camp and airstrip, surface waters would be impacted in different ways. While the applicant would work with the NPS to avoid surface waters, given the extensive surface waters in the Preserve (approximately 60 percent of the area is covered by surface waters or wetlands), and the size of the material sites and construction camp, it would be difficult to avoid all impacts to surface waters and floodplains. The NPS would work with the applicant to avoid and/or mitigate impacts, including the possibility of locating these facilities outside of GAAR to avoid impacts to Preserve lands altogether. In commenting on the Draft EEA, the applicant indicated they would consider removing the support facilities described above from within the Preserve but doing so would result in the construction of additional facilities along the southern alignment outside the Preserve. If so, the impacts described above would not directly occur within the Preserve; however, greater impacts associated with these facilities would occur on resources outside of the Preserve.

Approximately 65 acres, or 24% of the area of the northern alignment within GAAR is at a high risk of having negative impacts from geologic hazards associated from the roadway construction and long-term maintenance (Appendix A, Figure 8) (FHWA 2019). Approximately 53 acres, or 19%, of the area of the northern alignment within GAAR is at moderate high risk. Approximately 45 acres, or 21% of the area of the southern alignment within GAAR is at a high risk and 78 acres or 37% is at moderate high risk. The sections of the alignment ranked moderate-high or high would likely be at risk for significant changes to the physical resources, which could result in adverse impacts on the local hydrology and permafrost as a result of road construction and long-term maintenance.

Conclusion

The types of impacts on hydrology, floodplain function, and permafrost would be similar for the northern and southern alignments. The northern alignment would require more culverts and bridges on NPS lands than the southern alignment. Impacts associated with these crossings would be reduced by implementation of appropriate mitigation measures. As discussed above, the construction and long-term maintenance of bridges and culverts could alter stream flow, floodplain functions and values, and degrade permafrost, to some degree despite mitigation efforts. This possibility is not significantly different for either road alignment.

Development of the southern alignment, as proposed, could include the construction and operation of a material site and associated facilities along the Kobuk River within the Preserve, whereas the northern alignment would only have a material site. The southern alignment would have fewer potential impacts from the placement of culverts but would have the direct and certain impacts associated with the support facilities, impacting approximately 152 acres along the Kobuk River. If the support facilities could be moved outside the Preserve, the impacts under the southern alignment would be reduced significantly; however, this would result in an additional disturbance to permafrost, surface waters, and floodplains outside of the Preserve. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. These areas outside of the Preserve, including the additional impacts of the longer southern alignment, are evaluated in the BLM EIS.

WETLANDS

Wetlands are identified as those areas with hydrophytic vegetation, hydric soils, and positive wetland hydrology. Little actual data on wetlands exists for GAAR, but it has been estimated that approximately 60% of the landscape is wetlands, if so, that would mean approximately 5 million acres of the 8.4 million acres of GAAR are wetlands. This section identifies the impacts that could occur to the wetland systems present along the alignments within the NPS project area (Appendix A, Figure 2). This analysis examines the areas within the construction daylight limits, a 10-foot road buffer, and a 328-foot wide buffer for each alignment. A buffer extent of 328 feet (100 meters) was chosen based on data collected for the Dalton Highway (Myers-Smith et al. 2006; Auerback et al. 1997).

Available wetland data and wetland delineation reports were reviewed and evaluated to determine current conditions of wetlands within the NPS project area and to predict the impacts on wetlands from construction, operation, and maintenance of the proposed Ambler road. National Wetlands Inventory maps, which are prepared from the analysis of high-altitude imagery and identify wetlands based on vegetation, visible hydrology, and geography, were used by the applicant as the starting point for a 2014 wetland delineation conducted along a 2,000-foot-wide corridor along the alignments (DOWL 2014a). Within the 68,067-acre area evaluated, 39,949 acres were identified as potentially jurisdictional wetlands, 1,115 acres of Waters of the United States, and 27,003 acres of uplands.

A second wetland assessment was conducted in January 2017 to provide a detailed functional assessment of wetlands within the Preserve (Ives and Schick 2017). This data study primarily used the data presented in the DOWL 2014 wetland delineation to calculate wetland acreages, as it is the only source of comparable wetland information for both inside and outside the Preserve. Wetlands provide a number of functions from an ecological and human perspective. The pristine and relatively undisturbed nature of the wetlands within the NPS project area allows them to perform a number of important ecological functions. Table 3 presents the functions that were used to assess the wetlands within the NPS project area and which functions are provided by the wetlands.

Table 3. Functions Provided by Wetlands in the NPS Project Area

Wetland Functions	Provided by Wetlands in the NPS Project Area
Flood Flow Regulation	✓
Sediment, Nutrient, and Toxicant Removal	✓
Erosion Control and Shoreline Stabilization	✓
Organic Matter Production and Export	✓
Maintenance of Soil Thermal Regime	✓
Threatened and Endangered Species Support	
Bird and Mammal Habitat Suitability	✓
Fish Habitat Suitability	✓
Rare Plant Habitat and Native Plant Diversity	✓
Subsistence Use	✓
Groundwater Discharge	
Groundwater Recharge	

Source: Ives and Schick 2017

Eight wetland types were observed along the northern and southern alignments within GAAR; these can be grouped as palustrine forested wetlands, palustrine scrub-shrub wetlands, palustrine emergent wetlands, open water, and riverine wetlands. Figures 9 and 10 in Appendix A present the wetlands that occur along the northern and southern alignments, respectively.

Wetlands in GAAR are an important part of the landscape since these wetlands are unaltered by direct anthropogenic disturbances and are in relatively pristine condition. The foundation of this intricate wetland system is the unimpeded flow of water over the entire NPS project area. Wetlands provide a number of functions from an ecological and human perspective. The high quality of wetlands in the NPS project area allows them to perform many of these important ecological functions.

Impacts

Overall, the construction of the proposed Ambler road and related support facilities (material sites, construction camp, long-term maintenance facility and airstrip) would result in long-term, adverse impacts to wetlands within the NPS project area. Construction would result in placing fill in wetlands, altering hydrology, degrading permafrost, removing vegetation, altering vegetation communities, and changing soil conditions. All of these modifications could result in transition in habitat types, degradation of habitat, alteration or loss of wetland functions, and potential ecosystem changes. Modifications would impact wetland function, carbon storage and assimilation, nutrient cycling, and other water quality services.

Both alignments for the proposed Ambler road would cross a substantial number of wetlands. It is assumed that both alignments are completely underlain by discontinuous permafrost. The presence of permafrost creates the conditions that allow for the extensive wetlands in the NPS project area. Surface flow patterns in northern Alaska are strongly influenced by the presence of permafrost, which restricts the percolation of water through the soil. Road construction on permafrost soils would likely change the thermal regime and lead to permafrost degradation and changes in hydrology. These changes to the permafrost and hydrology would impact wetlands and the wildlife that depend on these wetlands.

The development and maintenance of the proposed Ambler road in wetland areas and within drainages to wetland areas would impact the hydrology of the wetland system by impounding water upstream of the road, if the culverts were not placed properly or if they fail to function properly during the life of the road. This could result in isolating wetlands from upstream hydrology (Ives and Schick 2017). The northern and southern alignments both generally run perpendicular to the slope of the surrounding terrain, increasing impoundment effects and hydrological disconnection. Proper location, design, installation, and maintenance of culverts are important to preserve hydrologic function and minimize changes in wetland type and function in wetlands upstream and downstream of the road and culverts. Pooling of water along the road may increase the rate of permafrost thaw, further impacting wetlands along the road and increasing the potential for erosion (Ives and Schick 2017). As permafrost thaws, near-surface moisture drains to deeper soil levels, resulting in further loss of wetland habitat (Avis et al. 2011).

The applicant has proposed additional data collection and modeling to better design the road to avoid the impacts described above. Additional mitigation measures are provided in the application to avoid and or reduce impacts to hydrology and permafrost, and thus to wetlands. As stated, the applicant has also identified additional mitigation measures to reduce impacts since the application was submitted (ADIEA 2020). The NPS and FHWA would work collaboratively with the applicant in the design of data collection efforts, design of the road and construction of the road to avoid impacts to wetlands, hydrology, and permafrost.

Surface waters maintain wetlands within the NPS project area and ultimately preserve natural flow patterns across the NPS project area. The disturbance or loss of wetlands would also impact the ecological functions currently present in the NPS project area. Some wetlands in the NPS project area provide fish habitat; this function could be impacted through the alteration of localized hydrology. Changes in wetland vegetation that result from road impacts would potentially impact the thermal regime, shoreline stabilization, fish and wildlife habitat, nutrient regime, water clarity, and other chemical qualities of the water.

The northern and southern alignments would sustain similar temporary and permanent direct and indirect impacts on wetlands as a result of construction, operation, and maintenance of the proposed Ambler road, but the acreages of wetlands impacted would differ between the two alignments. Direct effects to wetlands in the construction daylight limit and 10-foot road buffer would include the placement of gravel fill, construction of culverts, and bridges within wetlands (Ives and Schick 2017). Direct impacts represent a total and permanent loss of wetland acreage. Indirect impacts are those that would occur on wetlands within 328 feet on either side of the road's 10-foot buffer. Although impacts could occur beyond 328 feet, these impacts would be expected to be negligible. Indirect effects would be those that result in the alteration of the functions of the wetland, including changes to hydrology, vegetation, soil characteristics, and underlying permafrost, and other factors (Ives and Schick 2017). Further, ions (e.g., metals, calcium, chloride) from foreign materials could be dissolved and transported to surrounding aquatic systems, causing water quality alterations. The magnitude, frequency, and duration of water quality alterations are important considerations that can influence wetland systems. These types of impacts are described in the "Water Quality" section.

Comparative Analysis

The northern and southern alignments would likely result in long-term adverse impacts to wetlands within the NPS project area, causing alteration or permanent loss of wetland functions. Since the four most dominant wetland types are the same for both alignments, the functions of these currently pristine systems are likely very similar; however, the alignments differ in the amount of wetland acres impacted. Table 4 presents the direct and indirect wetlands impacts calculated based on the results of the 2014 wetland delineation.

Using the 2014 delineation, approximately 1,272 acres of wetlands would be impacted along the northern alignment (including direct and indirect impacts; Table 4). Of these wetlands impacted, approximately 174 acres would be permanently lost (Table 4). Without effective mitigation measures, the northern alignment would also impact Nutuvukti Fen, which is located approximately 0.25 mile downstream of the alignment. Nutuvukti Fen is classified as a patterned fen, which means that it is composed of peat (partially decomposed plant remains) and its surface is covered by an intricate pattern of ridges and pools. There are few patterned fens in interior Alaska, and Nutuvukti Fen is one of the largest (NPS 2017a). The US Environmental Protection Agency (USEPA) identifies Nutuvukti Fen as an aquatic resource of national importance (ARNI). The fen provides biological diversity and supports plants and other organisms unique to the ecosystem. Nutuvukti Fen is recharged by drainage through glacial outwash soils where the proposed Ambler road would be constructed. This fen borders Nutuvukti Lake, and runoff from the fen feeds directly into the lake.

Upstream impoundments could disrupt recharge of this fen. The applicant has committed to address potential impacts to this fen through mitigation, including using porous materials in the road embankment in this area to allow groundwater to flow through the road, reducing the impact but possibly not eliminating it. Fens are an important part of the ecosystem because of their biological diversity and hydrologic characteristics, underscoring the importance that measures be incorporated during design and construction to protect this resource.

Table 4. Impacts to Wetlands in the Preserve Based on the 2014 Wetland Delineation

Wetland Class	Northern Alignment Direct (Acres)	Northern Alignment Indirect (Acres)	Southern Alignment Direct (Acres)	Southern Alignment Indirect (Acres)
Palustrine Emergent Wetland	1.3	11.1	1.2	12.6
Palustrine Scrub-Shrub Wetland	85.6	588.5	85.6	461.9
Palustrine Forested Wetland	78.5	473	139.6	707.7
Open Water	0.02	5.3	0.1	2.8
Riverine	8.6	20.4	13.7	20.6
Wetland Total	**174.1**	**1,098.3**	**240.2**	**1,205.60**
Upland/other	238.4	1083.4	174.9	463.7
Total Land Affected	**412.5**	**2,181.7**	**415.1**	**1,669.3**
Grand Total	**2,594**		**2,084**	

Source: DOWL 2014a

On the southern alignment, approximately 1,446 acres of wetlands would be impacted (including direct and indirect impacts, Table 4). Of these wetlands impacted, approximately 240 acres would be permanently lost (Table 4).Impacts to wetlands from the construction of the support facilities (material site along the northern alignment and a construction camp, long-term maintenance facility, airstrip, and material site along the southern alignment) are included in the acreage estimates above. The NPS would work with the applicant to avoid and/or mitigate impacts, including the option of locating these facilities out of the Preserve to minimize or avoid impacts to Preserve lands. If the facilities could be moved outside of the Preserve, it would reduce the acreage of wetlands impacted slightly. Using the 2014 delineation, there would be no real difference in the acreage of wetlands impacted along the northern alignment (1,272.32 to 1,272.22 acres of wetlands, including direct and indirect impacts). Wetlands permanently lost along the northern alignment would not differ. On the southern alignment, without the support facilities, impacts to wetlands would be reduced from 1,446 acres to 1,422 acres (including direct and indirect impacts). Wetlands permanently lost along the southern alignment would be reduced from 240 acres to 217 acres.

Conclusion

The northern alignment would impact fewer acres of wetlands in the Preserve. If the facilities proposed for the southern alignment could be moved outside the Preserve, the impacts along the southern alignment would be reduced within the Preserve but would still impact more wetlands than the northern alignment. The northern alignment would impact the Nutuvukti Fen. The applicant has agreed to mitigate such impacts by using porous materials in the roadbed and moving the road away from the fen to the extent possible. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. These areas outside of the Preserve are evaluated in the BLM EIS.

WATER QUALITY

This section focuses on the water quality of the Kobuk and Reed rivers and Nutuvukti Lake in terms of physical and biological parameters. The proposed Ambler road project could have impacts on any waterbody near the road. Baseline data for most streams within the Preserve do not exist, but the impacts on water quality of the numerous streams crossed by the road are expected to be similar along the two alignments. Therefore, this analysis focuses on the watersheds within the Preserve that drain into the major lakes and rivers and areas where the alignment crosses direct tributaries to those rivers. The geographic area analyzed for impacts on water quality is the NPS project area (Appendix A, Figure 2).

Available data were reviewed and evaluated for the discussion of the current conditions of the Kobuk and Reed rivers and Nutuvukti Lake. All construction, operation, and maintenance activities within the NPS project area were analyzed to determine the potential impacts on water quality from erosion, sedimentation, contamination (i.e., fugitive dust and spills), water extractions, and permafrost degradation. The potential impacts on water quality are discussed qualitatively.

Water quality is a function of the physical and chemical characteristics of an aquatic system. Water quality characteristics are typically determined by measurements of conductivity, pH, temperature, hardness, alkalinity, and dissolved oxygen. Water quality is also influenced by the concentrations of metals, contaminants, and asbestos. Aquatic organisms have a range of tolerances for water quality characteristics that are necessary for survival, growth, and reproduction. Although these parameters are necessary, they are not exclusively sufficient for understanding and interpreting potential adverse effects that can occur in an aquatic system. Water quality in GAAR is pristine with highly oligotrophic, clear waters with few contaminants. Currently, the water quality of the aquatic systems surrounding the two proposed alignments is influenced by the native soils and their source of water. Because of the high latitude of the NPS project area, most of these aquatic systems are likely fed by snow melt. Limited human activity occurs in the areas surrounding the proposed road alignments. Due to the current absence of roads and vehicles in this area but acknowledging limited floatplane and very limited motorized boat traffic, there has been low potential for spills of oil, gas, other vehicle fluids, or road deicers to enter surface waters through runoff. Within the NPS project area, water quality parameters have been measured and published in reports since the 1980s for lakes (Jones et al. 1989) and since the 1960s for rivers (Brabets 2001).

Nutuvukti Lake is within the Preserve, located directly downstream from the northern alignment, and is the only large lake within the Preserve that would be directly impacted by the proposed Ambler road. Nutuvukti Lake is characterized as a low altitude lake (< 250 m elevation) surrounded by forest (LaPerriere et al. 2003; Jorgenson et al. 2009). Lakes in GAAR typically have watersheds dominated by floodplain forest, deciduous brush, spruce with lichen, and black spruce with moss vegetation (LaPerriere 1999). The Kobuk and Reed rivers flow within and outside of GAAR and the NPS project area (Appendix A, Figure 7). Water quality in the Kobuk River is considered to be unaffected from its natural state, and most of the other surface waters in GAAR remain almost totally unaffected by pollutants (NPS 2014). Overall, the lakes and rivers in GAAR have high water quality and are considered pristine.

Based on available data, the USEPA has identified the Kobuk River and associated tributaries and wetlands as an ARNI. The USEPA also identified the Nutuvukti Fen within the Kobuk River Watershed as an ARNI. According to the USEPA, the Kobuk River and associated wetlands and tributaries provide important habitat and migration corridors for resident and anadromous fish species. While data gaps exist for this pristine area, known harvested species within the Kobuk drainage include anadromous chum salmon, arctic grayling, and whitefish, including sheefish, and several more. The Kobuk River is well known for supporting sheefish spawning and trophy fishing, as well as caribou, moose, black and brown bears, bird species, native vegetation, and other migratory and resident species.

Impacts

Construction, operation, and maintenance of the proposed Ambler road and associated support facilities (one material site along the northern alignment and a construction camp, long-term maintenance facility, airstrip and material site along the southern alignment) through the Preserve for the transportation of mining related material have the potential to cause both physical and chemical alterations to the current water characteristics, leading to adverse changes in water quality in the surrounding aquatic environments (Hedrick et al. 2010; Viadero and Fortney 2015; Dudka and Adriano 1997). Suspended sediment in water can also cause disruptions to aquatic systems by decreasing light penetration for aquatic vegetation (Hansmann and Phinney 1973; Lenat et al. 1981; Hedrick et al. 2010). Sedimentation and erosion, as well as water extractions, can alter water temperature and water chemistry, including dissolved oxygen and turbidity. Fugitive dust carrying metals has the potential to cause issues related to metal toxicity of aquatic organisms, and road dust can introduce particulate matter to surface waters, increasing sedimentation. Any changes in water quality from baseline conditions to which aquatic life in a particular system are adapted would have direct adverse impacts to aquatic species.

Erosion and Sedimentation. During construction of the proposed Ambler road and support facilities (material sites, construction camp, long-term maintenance facility and airstrip), surficial vegetation would be removed, exposing underlying soils and creating the opportunity for sediments to erode or become airborne. Effective management practices for controlling erosion are important to implement during construction, especially with consideration of heavy rain events and spring melt conditions. Ground disturbing activities would occur during all three phases of construction. The impacts on water quality from sedimentation and erosion would likely be highest during construction. The phased construction of the road, as proposed by the applicant, would cause repeated impacts, resulting in overall greater impacts on water quality. Operation of the support facilities could also pose erosion risks and careful mitigation measures should be planned for these road-related facilities.

The roadway would disturb natural slope drainage and could create focal points of higher energy flow, increasing available energy for erosion and deposition at and below culvert locations. Eroding soils could be transported away from the road and end up in downgradient streams, rivers, and lakes. It is possible that wind-driven erosion could transport dust to waterbodies upgradient of the construction area, but the main impacts would likely arise from erosive forces carrying waterborne sediments downstream. Snowmelt from the road surface could also carry soil particles into waterbodies.

Any eroded sediments entering aquatic systems would have adverse impacts on water clarity and chemistry. In addition, sediments in waterbodies can abrade sensitive membranes, such as gills, of aquatic organisms (Sutherland and Meyer 2007). Sediments eventually settle to the bottom of lakes and rivers, where they can cause impacts by decreasing light penetration for aquatic vegetation and covering the habitat of macroinvertebrates and spawning fish (Hansmann and Phinney 1973; Lenat et al. 1981; Hedrick et al. 2010).

The applicant proposes using riprap and porous matting to stabilize cut slopes and culvert ends to prevent erosion and sediment discharge into waterbodies. To further prevent erosion and maintain, the applicant proposes to use State of Washington stream stipulation culvert width standards (1.2 times bankfull width plus 2 feet) and to use more porous material in sensitive areas, such as Nutuvukti Fen, to allow more groundwater to flow through the road embankment. These standards are more protective than those originally proposed by the applicant (AIDEA 2020). The NPS and FHWA would work with the applicant to collect baseline data prior to the commencement of construction and to monitor conditions during construction, operation, and maintenance activities to ensure erosion and sediment controls remain effective.

Fugitive Dust and Spills. Metals in ore concentrates, mining-related products, and materials used for road construction, operation, and maintenance could be introduced into waterbodies as a result of the proposed project. The road would be constructed of crushed gravel, which would generate fugitive dust.

To reduce road dust the applicant would apply a dust palliative such as calcium chloride during road construction and operation.

Safety measures employed for concentrate hauling trucks using similar industrial roads can reduce the risk of truck accidents and trailer overturns/spills, but accidents can still occur on an infrequent basis (AIDEA 2017; Turner 2003). During initial mine development, approximately 80 trucks per day are anticipated on the proposed Ambler road (40 round trips). The number of vehicles is expected to increase over time as other mines are developed within the mining district and could reach approximately 168 round trips per day year-round (BLM 2019). The ore concentrate would be loaded into sealed containers within a loading facility at the mines, which would then be loaded onto trucks and transported from the Ambler Mining District to the Dalton Highway and beyond. Properly functioning containers can reduce the risk of ore concentrate escapement. Trucks exposed to concentrate and ore-rich muds at the mine site and during loading and unloading activities pose a risk of generating dust containing elevated levels of metals (copper, lead, zinc, silver, and gold) as trucks traverse the road, including the section through the Preserve (Brumbaugh and May 2008, Neitlich et al. 2017). Truck washing procedures, if implemented effectively, can reduce this risk. These risks also dissipate with distance from the mine and loading sites and are expected to be reduced by the point at which trucks enter the Preserve. The use of construction equipment is likely to result in the introduction of some amount of contaminants, such as fuel or oil, entering surface waters from leaks or spills. Well-designed and carefully implemented mitigation measures can reduce the risk of spills.

Any gravel dust, dust palliatives, and ore concentrates not contained by sound operational procedures and various mitigation measures could be carried into downstream waterbodies during snowmelt and rainfall events. Dry fallout of dust would also occur. The applicant proposes to install culverts at stream crossings and in areas with sheet flow. Appropriately sized culverts are necessary to convey water in a manner similar to natural conditions; however, if the culverts clog with debris or ice, it could cause water to flow around the clogged culverts and over land. Such flooding could pick up fugitive dust particles and other contaminants, and eventually end up in the aquatic environments. Under some conditions, metals and other compounds could dissolve in surface water and be transported to downstream aquatic systems.

Increased inputs of metals to aquatic systems from fugitive dust or fuel or ore concentrate spills, however uncommon, could potentially disrupt natural functioning of the aquatic food chain (Eisler 2000; Peplow and Edmonds 2005). While the levels of injury in aquatic systems along the Red Dog Haul Road is thought to be low (Exponent 2007), risk assessment would require site-specific information on both contaminants and receptors. Heavy metals, such as zinc and copper, can destabilize ecosystems; bioaccumulation of heavy metals in some organisms can cause toxic effects on biota (Pandey 2014). The physical and chemical characteristics of water at a site can influence an organism’s response to a metal and can be used to explain and understand metal toxicity. Toxicity of metals to aquatic life generally increases as conductivity, pH, hardness, and alkalinity decrease (DiToro et al. 2001).

Foreign materials may alter water characteristics, including pH and water hardness and affect water quality. Slight alterations in these water parameters would not necessarily result in adverse effects to aquatic organisms, but it is possible that the overall water quality may be degraded to the point where it has modest adverse effects on aquatic life. Nutuvukti Lake is oligotrophic with fairly low productivity, and the addition of inorganic nutrients could affect productivity and biodiversity of the lake (Roch et al. 1985).

The applicant’s design for the proposed Ambler road would incorporate the latest technologies for dust minimization and mitigation based on ongoing research conducted by the University of Alaska Fairbanks. The NPS and FHWA would work with the applicant to monitor fugitive dust, to identify issues, and to employ additional protective measures for dust abatement where necessary.

Flow Reduction from Pumping Operations. Temporary water extractions from waterbodies are proposed for construction and maintenance activities associated with the road. Removal of water from streams and lakes could impact flow and water levels, which could adversely affect water quality through changes in temperature, dissolved oxygen, and turbidity. This could adversely impact aquatic life.

Because the applicant has not specified the volume and frequency of water necessary for construction, operation, and maintenance of the proposed Ambler road and because the volume, flow, and other characteristics of most waterbodies in the NPS project area are unknown, an analysis of the effects of water extractions cannot be performed. Data gaps are addressed in the recommended mitigation measures in Appendix C.

Permafrost Degradation. Climate change is causing degradation of permafrost, as discussed in the "Hydrology, Floodplains, and Permafrost" sections in this chapter. Permafrost degradation, particularly in regions with high ice content, has a strong effect on water quality. Increased nitrogen, total dissolved solids, turbidity, and dissolved sources of organic carbon are all common impacts to water quality following permafrost degradation. Studies in the region indicate that permafrost thaw can lead to slumping and landslides, resulting in considerable suspended sediment flux in rivers during periods of active thermal erosion (see discussion in hydrology, floodplains, and permafrost earlier in this chapter).

Erosion and road runoff could increase sedimentation in streams and water bodies, resulting in increased deposition of previously frozen inorganic material to rivers and lakes, which changes water chemistry (O'Donnell et al. 2017; Houben et al. 2016). Some changes observed in lakes include reductions in nutrient availability and primary productivity (Houben et al. 2016). Climate change is currently occurring and is expected to continue. The proposed Ambler road would contribute to widespread permafrost degradation, and preserving permafrost under the road would be difficult, even under the current climate.

Comparative Analysis

The proposed Ambler road would likely have impacts on water quality within the Preserve. This section focused on two major rivers and one lake, but the Preserve contains hundreds of smaller rivers and streams that feed into these major waterbodies. This analysis is simplified due to a lack of information on the individual waterbodies that would be impacted by construction, operation, and maintenance of the proposed Ambler road.

The northern alignment would cross the Kobuk River via a large bridge and pass north of Nutuvukti Lake. Table 5 presents the number of subwatersheds that would have direct and indirect impacts on the large waterbodies within the NPS project area (Appendix A, Figure 7). Without flow data for the waterbodies, the extent of the impacts downstream from the proposed Ambler road cannot be estimated; however, based on the flow pattern of each subwatershed, the potential for direct and indirect impacts can be determined.

Table 5. Number of Subwatersheds in the NPS Project Area with Direct and Indirect Impacts on Large Waterbodies

Waterbody	Northern Alignment Direct	Northern Alignment Indirect	Southern Alignment Direct	Southern Alignment Indirect
Kobuk River	7	2	4	0
Reed River*	--	--	1	0

* The northern alignment crosses the Reed River outside of the Preserve.

Nutuvukti Lake is located downgradient of and in close proximity to the northern alignment. The landscape in that area also has limited capacity to absorb or moderate the effects of erosion or spills before contaminants reach the lake. The land between the proposed Ambler road and the lake is predominantly permafrost with a shallow active layer that is typically water-saturated. As a result of this permafrost and the slope of the topography and geology in the area of Nutuvukti Lake, sediment erosion and spills would run directly into the lake. Fugitive dust containing metals and other foreign materials could also enter directly into Nutuvukti Lake. As a result, Nutuvukti Lake could be adversely impacted by construction, operation, and maintenance of the proposed Ambler road.

The northern alignment would cross the Kobuk River within GAAR. Waterbodies crossed by bridges would have fewer impacts than those crossed with culverts, as there is less chance for bridges to be clogged with ice and debris. The Kobuk River would be adversely impacted from sedimentation and erosion downstream of the proposed road, especially during construction activities. Nine watersheds crossed by the northern alignment would have direct and indirect inputs into the Kobuk River (Table 5), as the flow pattern would cross the road and lead to the Kobuk River or its tributaries. The introduction of mine-related dust or compounds used for road construction and maintenance could impact water characteristics, including water chemistry, and could degrade water quality to a point where it would have adverse impacts on aquatic communities.

The southern alignment would cross the Kobuk and Reed rivers via large bridges inside the boundaries of GAAR. As stated for the northern alignment, bridge crossings would result in fewer impacts from sedimentation and erosion than culvert crossings. Impacts on rivers would be similar to those described for the northern alignment, with the potential for eroded sediments and metal contaminants to impact water quality downstream of the road alignment. Under the southern alignment, four subwatersheds would have a direct impact on the water quality of the Kobuk River, and one would have a direct impact on the Reed River (Table 5).

The applicant has proposed five water extraction sites along the northern alignment inside GAAR, one at the Kobuk River, three at unnamed streams, and one at an unnamed pond. Along the southern alignment, the applicant has proposed three water extraction sites inside the Preserve, one at the each of the Kobuk and Reed rivers and one at an unnamed pond. Construction of the access roads to the waterbodies, including the Kobuk River, would cause impacts during construction and operation, as the roads would be dirt or gravel and erosion would occur. Due to the lack of information for volume and frequency, the impacts from water extraction on the waterbodies cannot be estimated at this time.

The material sites would be active gravel pits and would include mining equipment to extract the gravel and trucks to transport the gravel. Runoff from the material sites could increase sedimentation in surface waters. There is one material site proposed along each alignment within the Preserve. The material site along the southern alignment is adjacent to the Kobuk River, creating a greater potential for impacts to the Kobuk River. In addition to the material site, the applicant proposed a camp, long-term maintenance facility, and airstrip along the southern alignment adjacent to the Kobuk River. Impacts to the Kobuk River and other nearby surface waters could be caused by the operation of construction and maintenance equipment, the release of hazardous materials used to operate and maintain the equipment, release of wastewater to septic systems or lagoons, use of water for potable water consumption, and release of pollutants from the burning of solid waste, potentially including sewage sludge. The burning of solid waste could cause pollutants to become airborne and settle in adjacent surface waters. The construction and operation of these facilities along the banks of the Kobuk River would likely cause impacts to the water quality of this pristine river. If the applicant could move these facilities outside the Preserve, these impacts would be avoided within the Preserve; however, similar impacts could occur outside of the Preserve depending on where the facilities were located.

Conclusion

The types of impacts on water quality would be similar for the northern and southern alignments. The larger number of culverts on the northern alignment within the Preserve could result in greater potential for impacts from sedimentation and erosion than along the southern alignment (539 and 317 culverts for the northern and southern alignments, respectively). However, the support facilities proposed for the southern alignment adjacent to the Kobuk River would have the potential to cause long-term, adverse impacts to water quality. If the applicant could relocate material sites and support facilities outside the Preserve, these impacts would be avoided within the Preserve. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. These areas outside of the Preserve are evaluated in the BLM EIS.

FISH

This section focuses on the physical habitat and life history parameters of fish populations of the Kobuk and Reed rivers and Nutuvukti Lake and their tributary streams in proximity to the NPS project area. The geographic area analyzed for impacts on fish is the NPS project area (Appendix A, Figure 2). Although few fish surveys have been conducted, it is assumed that current fish diversity and populations are healthy in the NPS project area. Available data were reviewed and evaluated to discuss the current conditions of the Kobuk and Reed rivers and Nutuvukti Lake and to analyze direct and indirect impacts from road construction, operation, and maintenance on fish populations. The impacts on fisheries are discussed qualitatively and focus on areas where sportfish and subsistence species are known to occur.

Construction, operation, and maintenance activities were analyzed to determine the effects on fisheries from stress, changes in water quality and quantity, fish passage obstruction, and habitat destruction and fragmentation. Fish are an important subsistence resource used by surrounding communities and impacts to fish populations would have impacts on these communities.

Seventeen species of fish are known to inhabit streams and lakes throughout GAAR (Table 6). Species most often harvested for subsistence in the Kobuk drainage include anadromous chum salmon and whitefish, including sheefish, although baseline surveys are lacking for about half of the waterways in the Kobuk drainage (ADF&G 2018). Sport harvest is concentrated on Walker Lake and the Kobuk River for lake trout, sheefish, and salmon, although sportfishing takes place in many other areas of GAAR. Sheefish and chum salmon are known to spawn in the Kobuk River (NPS 2014). The upper Kobuk River supports the largest spawning concentration of sheefish in Alaska, and the Kobuk is well known for its world-class sheefish trophy fishing (BLM 2020). The most widespread species in GAAR is the arctic grayling, which is found in nearly all permanent watercourses and those lakes that have an outlet stream. Table 6 identifies whether the fish species are anadromous or resident species. It is important to note that for anadromous species, rivers and streams are not just habitat but important migration corridors and should be considered essential habitat required for completion of their life cycles.

Table 6. Fish Known to Occur in GAAR

Common Name	Scientific Name	Subsistence / Sport Fishing Species?	Typical Life History
Alaska Blackfish	*Dallia pectoralis*	Yes / No	Resident
Arctic Char	*Salvelinus alpinus*	Yes / Yes	Resident
Arctic Grayling	*Thymallus arcticus*	Yes / Yes	Resident

Common Name	Scientific Name	Subsistence / Sport Fishing Species?	Typical Life History
Broad Whitefish	*Coregonus nasus*	Yes / Yes	Resident or Anadromous
Burbot	*Lota lota*	Yes / Yes	Resident
Chinook Salmon	*Oncorhynchus tshawytscha*	Yes / Yes	Anadromous
Chum Salmon	*Oncorhynchus keta*	Yes / Yes	Anadromous
Dolly Varden	*Salvelinus malma*	Yes / Yes	Resident or Anadromous
Humpback Whitefish	*Coregonus pidschian*	Yes / Yes	Anadromous
Lake Trout	*Salvelinus namaycush*	Yes / Yes	Resident
Least Cisco	*Coregonus sardinella*	Yes / Yes	Resident or Anadromous
Longnose Sucker	*Catostomus catostomus*	Yes / No	Resident
Ninespine Stickleback	*Pungitius pungitius*	No / No	Marine / Estuarine, Resident, or Anadromous
Northern Pike	*Esox lucius*	Yes / Yes	Resident
Round Whitefish	*Prosopium cylindraceum*	Yes / Yes	Resident
Sheefish	*Stenodus leucichthys*	Yes / Yes	Resident or Anadromous
Slimy Sculpin	*Cottus cognatus*	No / No	Resident

ADF&G is responsible for maintaining the Anadromous Waters Catalog (AWC), which is the Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes. The AWC has identified almost 20,000 streams, rivers or lakes throughout Alaska that are specified as being important for the spawning, rearing or migration of anadromous fish, but more than half of water bodies identified have not been surveyed (ADF&G 2018). Lacking surveys, NPS biologists evaluated the water bodies along the two alignments for the potential to provide spawning, rearing, or migrating habitat for anadromous fish. ADF&G surveys have found fish at all locations surveyed and as more surveys are completed, the results will continue to expand the number of AWC streams in the NPS project area. For the purposes of this analysis, it is assumed that all perennial streams, which are extensive throughout the NPS project area, would have resident or anadromous fish and thus would need fish passage at road crossings. Additional fisheries surveys would be necessary to determine the presence or absence of fish in all streams that would be crossed by the northern and southern alignments. Data gaps such as these are addressed in the recommended mitigation measures in Appendix C. In addition to fish surveys, information from community elders helped characterize the fish populations within the NPS project area. Community elders have indicated that there is important habitat for sheefish spawning on the Reed River, which is located between the two alignments. The southern alignment would cross the Reed River approximately 7 miles from sheefish spawning habitat on the mainstem of the Kobuk River (BLM 2020).

Impacts

The Preserve is currently undeveloped and experiences consumptive use of the resources by subsistence and recreational user groups. Despite this consumptive use, population dynamics and the natural life cycles of fish species are largely uninterrupted in the Preserve. The rivers and streams in the Preserve support several important fisheries, including large runs of arctic char and chum salmon and spawning grounds for sheefish.

The proposed Ambler road would cross the Preserve via either the northern or southern alignment and would include installation of several hundred structures (bridges and culverts) to maintain hydrology within the NPS project area. Without appropriate mitigation, the project would result in potentially significant changes to fish habitat conditions through changes in water quality and hydrology, habitat fragmentation, and the addition of barriers to fish migration. Assuming drainage structures friendly to fish passage are constructed and maintained, road impacts to water quality would have the most drastic effects on fisheries along each alignment. Impacts to water quality are discussed more extensively in the "Water Quality" section.

Anadromous fish migrate extensively; therefore, it is important to analyze both direct and indirect project-related impacts that could disturb migratory fish. In addition to the direct impacts to fish habitat, other concerns include environmental changes induced by the proposed Ambler road and potential climate-driven changes that may be accelerated due to phased road construction. These potential changes include permafrost degradation; increased turbidity from poor soil stability and erosion along the alignment; changes in riparian vegetation due to shrub encroachment resulting from road dust; and increased sedimentation that could impact essential fish habitat. Fish could also be affected from temporary water extractions, depending on the location, frequency, and quantity of water removed. The alignments would differ in where streams and rivers are crossed, which could possibly affect spawning habitat.

Habitat Alteration and Bioaccumulation. Impacts to rivers and streams from road, bridge, and culvert construction and maintenance, should they occur, would impact fish habitat. As discussed previously, degradation of permafrost can result in soil slumping, causing large quantities of soil and rock to impact surface waters. Permafrost degradation also alters the surface and subsurface hydrology, which can cause erosion and sedimentation of streams and alter streamflow. The Preserve is home to important fisheries and the rivers in the Preserve provide important habitat, including spawning habitat for some species. Sedimentation in spawning habitat can eliminate use of the areas for spawning and reduce the viability of eggs spawned in the area. Runoff from the proposed road would carry fine sediment or spill remnants to streams, lakes, and wetlands. Suspended and subsequent settling of fine sediment in water can cause issues in aquatic systems by decreasing light penetration for aquatic vegetation and covering habitat of macroinvertebrates and spawning fish (Ritchie 1972; Hansmann and Phinney 1973; Lenat et al. 1981; Hedrick et al. 2010). This would ultimately reduce the productivity, survival, and growth of fish. The destruction of aquatic habitats through erosion and sedimentation is typically long- term, impossible to restore, and difficult to mitigate placing a high priority on avoiding these initial impacts. Depending on the severity, runoff could impact additional fish habitat downstream of the chosen alignment.

As discussed in the "Water Quality" section, the construction, use, and maintenance of the proposed Ambler road could contribute heavy metals, salt, organic molecules, ozone, and nutrients to the environment, which are currently at natural levels in this undisturbed area. Effective mitigation measures can reduce the risk of adverse impacts on water quality and water chemistry from road salts, organic molecules, ozone, and nutrients, and in turn, protect fish habitat. Road surface runoff would enter local waterways during all phases of construction and during maintenance of the proposed Ambler road from snowmelt, flooding, erosion, and sedimentation. If highly mineralized gravel sources are used or if the geologic composition significantly differs from the local geology, road runoff would change local baseline water quality affecting fish at chronic or even lethal levels (Al-Chokhachy et al. 2016). Further, the use of dust palliatives, such as calcium carbonate, could influence water quality through road runoff. Because fish are adapted to specific flows and chemistry and anadromous fish imprint on and home to natal water quality, significant changes in natural water chemistry parameters, if they occur, could impact fish production.

Metals including lead, aluminum, iron, cadmium, copper, manganese, nickel, zinc, and boron are present in gasoline and road salts and can be spread to habitats adjacent to the road via wind and runoff

(Trombulak and Frissell 2000). Contamination of soils, plants, and aquatic organisms from heavy metals increases with the amount of traffic present and decreases with distance from the road; however, contaminating particles spread exponentially farther in aquatic environments when compared with terrestrial environments (Trombulak and Frissell 2000). Further, deicing agents can increase the mobility of chemical elements in soils, assisting in the contamination of aquatic environments (Forman and Alexander 1998). This could lead to impacts on fish populations not only directly adjacent to the road, but also downstream of the road. Metals bioaccumulate in the tissues of fish and other aquatic organisms. When fish ingest toxicants present in water and food sources through the gills and from consuming prey, they are not able to break down or excrete the substance, leading to bioaccumulation.

Fish Passage Obstruction and Habitat Fragmentation. In order to reproduce, feed, and recycle nutrients between ecosystems, fish need to be able to migrate between waterways throughout various life stages. Currently, fish passage within the NPS project area is uninterrupted as there is little to no human development present in GAAR. Human developments, such as roads, often act as barriers to fish passage. Fish spawning, rearing, and migratory habitat is commonly lost as a result of improperly designed or installed bridges and culverts. Culverts permanently destroy streambed habitat for the entire length of the culvert and indirectly impact adjacent habitat areas. Improperly designed or installed bridges and culverts would lead to changes in water velocity in streams and rivers impairing fish migration and isolating fish populations from other areas of the watershed (Envirowest Environmental Consultants 1990; Harper and Quigley 2000; Wofford et al. 2005). Industrial stream crossings are shown to influence physical habitat characteristics in freshwater ecosystems, restrict biological connectivity, and impact fish community structure (Maitland et al. 2016).

Fish migration barriers created by roads without adequate fish passage frequently fragment headwater populations of salmonids and other migratory fish. Eventually, these permanent barriers could reduce the distribution and density of a population by encouraging selection for non-migratory behavior (Furniss et al. 1991; Trombulak and Frissell 2000). Although the research available for the location of fish spawning and rearing near each of the alignments is not extensive, the absence of data does not mean absence of fish or fish spawning. For the purpose of this analysis, it is assumed that both alignments would pass through at least some rearing or spawning areas. These areas could be seriously impacted if the road, culverts, or bridge structures impede fish migration, prevent the flow of groundwater leading to a decrease in fish egg survival and limit water inflows to groundwater charged wetlands, streams, and lakes.

Culverts would be installed using stream simulation principles; however, sustaining the proper conditions in the harsh conditions of interior Alaska is difficult. As part of the Fish Passage Inventory Database, culverts are classified on their ability to support fish passage. Of the 967 culverts mapped in Alaska, 518 were classified as red culverts, meaning that they do not provide passage during all or part of the year.

Another 186 culverts are classified as gray, or that they likely serve as a barrier to fish passage, though additional assessment is necessary (ADF&G 2019). These data indicate that approximately 54% of the surveyed culverts in Alaska are failing to provide fish passage. On the Kenai Peninsula, the Kenai Watershed Forum has been assessing culverts for 15 years. Of the 270 culvert crossings in salmon streams, 129 (48%) provide inadequate passage and 93 (34%) provide marginal passage (Kenai Watershed Forum n.d.). The number of failing culverts on Kenai Peninsula and the state of Alaska suggest that the standards required by ADF&G for fish passage are not adequate long-term. The Matanuska Susitna Basin Salmon Habitat Partnership actively funds and supports assessment, restoration, protection, and education programs to protect salmon. This organization has funded projects to restore fish passage from failing culverts, which include replacing failing culverts with embedded culverts, bridges, and step-pool systems (Mat-Su Basin 2019).

To achieve their stated goal "to maintain hydrologic connectivity" (DOWL 2016b), the applicant proposes to use State of Washington stream stipulation culvert width standards (1.2 times bankfull width plus 2 feet). These standards are more protective of hydrologic connectivity than those required by Alaska fish passage standards (0.9 times bankfull width typically used for fish passage culvert design width in Alaska under the 2002 Memorandum of Agreement between ADF&G and ADOT&PF). The applicant would also consider the use of bridges instead of multiple culverts at braided stream crossings and create an adaptive monitoring plan for monitoring, maintaining, and repairing culverts, (AIDEA 2020). The NPS and FHWA would work collaboratively with the applicant to monitor the functionality of the drainage structures and quickly identify and resolve issues, such as clogging or perching, that would affect fish passage.

Comparative Analysis

The proposed Ambler road could have significant impacts on fish populations within the Preserve and throughout the project area in proximity to and downstream of the road segment through the Preserve. This analysis is simplified due to a lack of information on the population extent of the individual species present within the NPS project area that would be impacted by construction, operation, and maintenance of the proposed Ambler road.

Based on available data, the northern alignment crosses one designated AWC stream and the southern alignment crosses four designated AWC streams. It is important to note that AWC designations are continuously being added as more surveys take place within the NPS project area. Sheefish is an important anadromous fish species, both for subsistence and sport-fishing, that requires specific spawning habitat characteristics and is sensitive to environmental changes. The distance to the closest known sheefish spawning area from the northern alignment is approximately 12 miles, while the southern alignment is approximately 7 miles from the closest sheefish spawning area (BLM 2020). The adverse impacts on fisheries from construction and operation of the proposed Ambler road under both alignments could result in appreciable effects, including mortality and habitat destruction and fragmentation, habitat avoidance and displacement, migration alterations, and water quality effects from fugitive dust and erosion. Small changes in water quality can have relatively large impacts on fish production if they cause chronic effects, impairs migration, or causes mortality.

A functional wetland assessment for the proposed Ambler road project was prepared in 2017 and included in this effort was an estimate of the area of direct and indirect impacts on riverine wetlands within the Preserve (Ives and Schick 2017). These estimates are presented in Table 7.

Table 7. Direct and Indirect Impacts on Rivers and Stream Habitat within the Preserve

Riverine Class	Northern Alignment Direct (Acres)	Northern Alignment Indirect (Acres)	Southern Alignment Direct (Acres)	Southern Alignment Indirect (Acres)
Major Rivers	0.14	5.33	0.33	13.73
Large Streams	0.06	3.38	0.08	0.33
Low-Gradient Small Streams	0.35	2.63	0.81	5.46
High-Gradient Small Streams	0.05	0.39	0	<0.01
Total	**0.60**	**11.73**	**1.22**	**19.52**

Source: Ives and Schick 2017

Fish passage impacts along both alignments could be severe if hydrology is not maintained, which is a significant issue with culverts in Alaska. However, as previously stated, the applicant has committed to complying with Washington State standards for culvert sizing and adaptive management of waterbody crossings, and the NPS would work with the applicant to monitor drainage structures and identify and correct any issues that would affect fish passage in waterbodies in the Preserve. The northern alignment would have direct and indirect impacts on approximately 12.3 acres of rivers and streams and the southern alignment would affect approximately 20.7 acres (Table 7). Direct impacts would occur within the footprint of the road for each alignment. Indirect impacts are those that would occur to rivers and streams within 328 feet on either side of the road. Indirect effects would be those that result in the alteration of the functions of the riverine wetland, including changes to hydrology, vegetation, soil characteristics, and underlying permafrost, and other factors (Ives and Schick 2017).

Although these impacts, as described for wetlands, apply to rivers and streams, it is important to note that impacts from sedimentation and runoff could affect areas downstream of the road alignment beyond the 328-foot buffer. The northern alignment could have adverse impacts on fish populations at Nutuvukti Lake because of the proximity of the proposed alignment to the lake and the slope and geography of the land between the alignment and the lake, as discussed in the "Water Quality" section. The applicant would examine the conditions near Nutuvukti Lake to determine if the road could be moved further north in this area; if this is possible, it could reduce impacts to fish and fish habitat in Nutuvukti Lake.

The applicant has proposed five water extraction sites along the northern alignment inside the Preserve, one at the Kobuk River, three at unnamed streams, and one at an unnamed pond. Along the southern alignment, the applicant has proposed three water extraction sites inside the Preserve, one at the each of the Kobuk and Reed rivers and one at an unnamed pond. Construction and operation of the access roads to the waterbodies, including the Kobuk River, could cause erosion and sedimentation, resulting in impacts to fish habitat. Water extractions would likely be the cause of stress for fish leading to flight response or avoidance of preferred habitat during the water extraction process. More details on the volume of water needed or the frequency of extractions for construction, operation, and maintenance of the proposed Ambler road are necessary to accurately assess the impacts of water extraction on fish.

The support facilities (material sites, construction camp, maintenance facility, and airstrip) proposed for construction and operation of the proposed Ambler road could impact fish resources and habitat. Impacts to water quality from the facilities could degrade fish habitat with sedimentation being a particular concern. The Kobuk River is an important river for salmon, sheefish and other species and contains important spawning habitat. The construction of these facilities for the southern alignment adjacent to the Kobuk River could cause long-term, adverse impacts to many of the fish species found in the river. The NPS would work with the applicant to avoid and/or mitigate impacts, including the option of moving these facilities out of the Preserve to avoid impacts altogether, eliminating the potential for impacts to water quality in the Preserve from these facilities. This would, however, result in similar impacts to resources outside of the Preserve where the facilities would be sited.

Many rural Alaskans continue to live off the land, relying on natural resources for food, shelter, clothing, transportation, handicrafts, and trade. Fish are an important resource for people who live a subsistence lifestyle. Within GAAR, the Kobuk River is used for fishing (NPS 2014). Within the NPS project area, there are two private Alaska Native allotments, one adjacent to Nutuvukti Lake and one along the Kobuk River near the southern border of the Preserve (Appendix A, Figure 6). Impacts to the water quality and fish habitat in the NPS project area would have a direct adverse impact on fish as a subsistence resource.

Conclusion

Overall, the types of impacts on fisheries and fish habitat would be similar for northern and southern alignments and could include habitat destruction and fragmentation, habitat avoidance and displacement, migration alterations, and water quality effects from fugitive dust and erosion. Although the northern alignment is located further upstream in the Kobuk River watershed, affecting a greater number of subwatersheds, the southern alignment would have direct and indirect impacts on a larger area of river and stream habitat than the northern alignment. The southern alignment would also be closer to a known sheefish spawning area than the northern alignment (approximately 7 miles versus 12 miles, respectively). Impacts described for fish could adversely affect the subsistence communities, as fish are an important subsistence resource. If the applicant could relocate material sites and support facilities outside the Preserve, the additional impacts from the material site, construction camp, long-term maintenance facility, and airstrip located on the southern alignment adjacent to the Kobuk River and material site along the northern alignment could be avoided within the Preserve, although the relocated facilities would have impacts on resources outside the Preserve. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. These areas outside of the Preserve are evaluated in the BLM EIS.

CARIBOU

This section focuses on the caribou of the Western Arctic caribou herd (WACH), the largest herd in Alaska. Caribou are an important resource to GAAR, nearby communities, and the general public. Caribou are an integral part of the arctic ecosystem and are an essential resource to residents who live a subsistence lifestyle.

The ecosystems within GAAR are currently natural and healthy and support diverse wildlife communities, including caribou. GAAR is entirely within the annual range of the WACH, which encompasses more than 140,000 square miles (Wilson et al. 2016). Although the Preserve contains only a small portion of the WACH range, it was retained as a resource topic in this EEA due to the importance of this species. The geographic area analyzed for impacts on caribou is the NPS project area, specifically the area along the northern and southern alignments (Appendix A, Figure 2). The NPS project area is at the southeastern corner of the migratory area of the WACH (Appendix A, Figure 11), and caribou generally move north to south in this area. Caribou complete semi-annual migrations, through the orange area shown in Figure 11 in Appendix A, from their calving grounds, shown in pink, to their winter range, shown in light blue.

Caribou distribution is highly variable from year to year and decade to decade. In response to the expansion of human activity, such as transportation infrastructure and recreational facilities, caribou populations in Norway have abandoned their historical migration routes (Panzacchi et al. 2013). Wilson et al. (2016) showed that WACH migration was delayed by a month for about 30% of the individuals that encountered the Delong Mountain Transportation System in northwest Alaska. Baltensperger and Joly (2019) also showed WACH avoid human infrastructure, such as roads. They used GPS telemetry data from 211 adult female caribou and distribution modeling to identify use within the WACH range. The modeling incorporated dozens of climatic, topographic, and anthropogenic predictors and indicated that though caribou regularly use several areas, in general the migratory areas shift annually across the region (Baltensperger and Joly 2019). These observed and modeled shifts indicate that the WACH modifies its movement over time. Minimizing impacts to caribou across the WACH range, including current and historic areas, may be significant preserving in the long-term health of the WACH.

Table 8 presents the area (square miles) included in each portion of the caribou range, as well as the area (square miles) within GAAR and the NPS project area. Figure 11 presents this generalized information visually; however, this map is qualitative and does not precisely capture the herd's long-term or current usage of the area. For example, small bands of caribou are often found outside areas identified as high use areas, and the WACH frequently use the project area in winter (Wilson et al. 2014; Joly et al. 2016). These variations are not captured in the Figure 11 depiction of the herd's range.

Table 8. Total Area of Generalized Caribou Range Types and Area of the Caribou Range within GAAR and the NPS Project Area*

Range	Total (square miles)	GAAR (square miles)	NPS Project Area (square miles)
Summer Range	29,147	475	0
Migratory Area	34,329	8,672	546
Winter Range	26,402	323	0
Calving Grounds	7,992	0	0
Outer Range	47,891	3,734	<0.1

* Areas based on a qualitative range map developed prior to 2009

Monitoring of the WACH has been conducted by the NPS and collaborating agencies since 2009 and detailed methodologies can be found in the Caribou Monitoring Protocol for the Arctic Network Inventory and Monitoring Program (Joly et al. 2012). Caribou are outfitted with collars equipped with GPS technology that transmits position data via satellite at 8-hour intervals. Up to the 2019 annual report, 240 collars were deployed and nearly 574,000 GPS locations were recorded from WACH caribou (Joly and Cameron 2019).

Available data on caribou within the Preserve collected between 2009 and 2015 were used to determine the baseline conditions for caribou, including available habitat and movement patterns. Data collected and trends observed near other roads and development in caribou habitat in Alaska were assessed to predict potential impacts from the proposed Ambler road project. Figure 12 in Appendix A presents the caribou crossings within the NPS project area. Based on GPS locations, straight-line vectors were drawn between consecutive locations to show individual caribou crossings of the proposed alignments. Between 2009 and 2015, there were 40 collared caribou tracked crossing the overall northern and southern alignments, with 22% more caribou crossing the overall northern alignment than the southern. Within the Preserve, however, there were 28 recorded caribou crossings of the proposed northern alignment compared to only 4 of the southern alignment (Appendix A, Figure 12; Joly et al. 2016).

Currently, population dynamics and the natural life cycles of caribou within GAAR are largely uninterrupted. Caribou migrate extensively; therefore, it is important to analyze both direct and indirect project-related impacts that could disturb caribou resources. Construction of a road through a large roadless area could alter habitat, cause changes to vegetation communities, and inhibit migratory movement. Construction and the traffic associated with operation of the proposed Ambler road were analyzed to determine the effects on caribou from impacts to their habitat, food resources, movement, and distribution. The presence of the proposed Ambler road could lead to habitat loss, fragmentation and/or degradation and could influence wildlife movements.

Impacts

The implementation of the proposed Ambler road across the caribou migration route would introduce human development where there was none previously. This could cause impacts to caribou, such as mortality and flight response, habitat loss, avoidance and displacement, movement alterations, and geophysical alterations (Bolger et al. 2008). The long-term effects of road impacts on caribou are not fully known. While any one effect alone may not be detrimental, there may be cumulative negative effects on population, health, natural movements, and distribution.

Mortality and Flight Response. Disturbance from road noise can elicit a flight response in caribou, causing caribou to panic and run, resulting in increased energy expenditure, displacement from preferred habitats, and potential for mortality from vehicle collisions.

Displacement and Movement Alterations. Studies have shown that caribou avoid development, such as roads and human settlements, and these developments may act as a barrier and displace caribou. Caribou may travel up to 9.3 miles to avoid roads and up to 11.2 miles to avoid settlements (Plante et al. 2018). In addition to increasing the distance caribou traveled, the presence of roads increased movement rates for caribou (Plante et al. 2018). Since both the northern and southern alignments within the Preserve are located within the migratory area of the WACH, road-related disturbance over time may lead to displacement and ultimately abandonment of previously used habitat. The noise generated from the Ambler road and the affiliated facilities would also contribute to habitat avoidance by caribou, though the level and duration of noise at these facilities would vary. Habituation to disturbance has not been adequately demonstrated in caribou (Lawhead et al. 2006; Cronin et al. 1994); recent studies have concluded that long-term habituation to industrial development in caribou in the Arctic is not likely (Johnson et al. 2019; Plante et al. 2018).

Roads can be semi-permeable barriers, and although the crossing of such barriers is possible, caribou would still be affected by the road when trying to move between seasonal ranges (Wilson et al. 2016). Roads may delay caribou migration or deflect caribou from migration routes until the caribou find a suitable crossing point (Child 1973; Panzachhi et al. 2013; Leblond et al. 2013; Wilson et al. 2016). In 2015, Wilson et al. studied the effects of the Red Dog Mine Industrial Access road on WACH caribou. This study found that even though the volume of traffic on the Red Dog Mine road was very low (49 round trips per day, or just over 4 vehicles per hour, 24 hours per day), the physical road affected the migration of approximately 30% of collared individuals, representing approximately 72,000 individuals according to 2017 population estimates. These individuals exhibited altered and unusual routes of travel and took about 33 days to cross the road (ten times longer compared to the other 70% of caribou) (Wilson et al. 2016). Between 2002 and 2010, Panzacchi et al. studied the movements of migrating female caribou in Norway. When the caribou reached a road in the middle of their migratory pathway, the caribou changed direction and traveled parallel to the road for approximately 5 days. When crossing the road, the caribou did so during a time of low road activity at the highest rate of speed observed during their movements. Panzacchi et al. (2013) concludes that the road hampers spring migration and may delay the arrival to the calving ground.

Increased Predation. Predators, such as wolves, use roads and other linear corridors as travel routes (James and Stuart-Smith 2000). Wolves using linear corridors are able to move quicker and increase the distance traveled daily. Further, wolves often choose to travel along corridors instead of forests (Dickie et al. 2017). In Canada, wolves using linear corridors (seismic lines) increases predation risk for caribou, as the corridors are bringing wolves into caribou-preferred habitats (Latham et al. 2011; DeMars and Boutin 2018). The northern and southern alignments would both provide linear corridors that could provide a travel route for wolves. The level to which wolves would use the road corridors is unknown, however, as they prefer corridors with low human activity (James and Stuart-Smith 2000).

Fugitive Dust and Geophysical Alteration. As stated in the “Water Quality” section of this report, metals in ore concentrates, mining-related products, and materials used for road construction, operation, and maintenance have the potential to be introduced into waterbodies as a result of the proposed project. This could contaminate drinking water and vegetation within caribou-preferred habitats near the chosen alignment, but proper mitigation measures should reduce these risks. The proposed Ambler road would be constructed of crushed gravel. Fugitive dust would be generated during mining of the material for the road and during construction, operation, and maintenance of the road. This fugitive dust would be released in plumes, and when the dust settles, it can degrade and contaminate vegetation, including lichens and mosses near the chosen alignment (Neitlich et al. 2017, Hasselbach et al. 2005). Along the Red Dog Mine haul road, fugitive dusts enriched with zinc decreased lichen cover beyond 1.2 miles (2000

from the road (Exponent 2007). The applicant has proposed mitigation measures, such as dust palliatives and using sealed containers to transport ore, which would be essential to reduce fugitive dust along the length of the road. The release of ore-containing dust from the haul trucks would be low for the proposed Ambler road; however, the dust generated from use of the road would still cause impacts. Traffic volumes and speed limits along the proposed Ambler road are expected to be higher than those for the Red Dog Mine haul road, which could lead to greater impacts from dust than measured for the Red Dog Mine. The NPS and FHWA would work with the applicant to monitor fugitive dust and to identify and mitigate contamination issues to the extent possible.

Comparative Analysis

The NPS project area is on the periphery of the current WACH range, but data show a portion of the herd wintering or migrating in GAAR, including the Preserve and the NPS Ambler Road project area. The herd is known to widely vary its range use at the decadal scale. Within the Preserve, the impacts on WACH from the northern and southern alignments would be similar, although slightly more pronounced on the northern alignment.

The northern alignment is located further within the WACH migratory area, although the entire project area is located at the southeastern corner of that migratory area (see figure 11, Appendix A). Joly et al. (2016) reported that caribou crossing of the overall northern alignment was 22% more frequent than crossings of the southern alignment. This study examined data from a sample of collared caribou that represent larger trends among the entire herd. The study found 21 individual caribou crossed the overall proposed northern alignment for a total of 131 crossing events, compared with 19 individuals on the overall southern route for a total of 106 crossing events. Within the Preserve, 28 collared caribou crossings were recorded for the northern alignment compared to 4 collared caribou crossings recorded for the southern alignment (Joly et al. 2016). While these are small absolute numbers, they are representative of broader trends of caribou movement, showing a greater intersection of caribou movement with the northern alignment than the southern alignment within the Preserve, while the differences on the overall alignments are much smaller.

Studies have shown that roads can act as obstacles for migrating caribou. As detailed above, studies of the Red Dog Mine Industrial Access road found that this road affected the migration of approximately 30% of collared individuals; however, neither this nor other gravel roads are known to serve as complete barriers to caribou movement.

Lichens are the primary food source for caribou and caribou preferentially use habitats that have higher lichen availability during winter (Joly et al. 2010). Both alignments exhibit similar vegetative land cover composition (Joly et al. 2016). Vegetation along both alignments within the NPS project area is predominantly spruce forest, with areas of deciduous forest and low shrub and lichen habitat. The northern and southern alignments provide a similar percentage of low shrub/lichen habitat than the southern alignment (8.4% along the northern alignment compared to 7.9% along the southern alignment) (Joly et al. 2016). The presence of the proposed Ambler road near lichen-rich habitats could displace caribou within the Preserve from some lichen-rich resources and impact the abundance of this important food source due to direct habitat loss from the road, and potential degradation by fugitive dust depending on the effectiveness of dust mitigation measures (Wilson et al. 2016).

As compared to the northern alignment, the support facilities along the southern alignment (material sites, construction camp, long-term maintenance facility, and airstrip) proposed for construction and operation of the proposed Ambler road could more significantly impact caribou. The types of impacts would be similar to those described for construction and operation of the road itself, as the suite of caribou responses to threats are limited to flight and avoidance. If these facilities could be located outside of the Preserve, this would reduce impacts on caribou within the Preserve, but these impacts would occur outside the Preserve where the facilities would be located.

Historically, the most important resource to the Alaska Native inhabitants in the area was caribou. Currently, the Preserve is visited infrequently by caribou hunters, who mainly hunt caribou closer to their communities (NPS 2014). However, impacts on a small percentage of the WACH range from the proposed Ambler road within the Preserve could have an impact, though likely minimal, on subsistence hunting throughout in their range. Studies have shown the development can result in lowered subsistence harvests (Wolfe and Walker 1987; Guettabi et al. 2016; Magdanz et al. 2016). Impacts on the WACH as it relates to subsistence uses considering the full length of the road are analyzed in the ANILCA Section 810 Analysis and the BLM EIS.

Conclusion

Construction and operation of either alignment would result in some adverse impacts to caribou, including mortality and flight response, habitat loss, avoidance and displacement, movement alterations, geophysical alteration, and fugitive dust. The types of adverse impacts would be similar for the northern and southern alignments, but the data illustrate that caribou use habitat along the northern alignment within the Preserve more frequently, resulting in a greater potential impact from the northern alignment on caribou than the southern alignment. Studies have shown that similar roads can, in some cases, alter movement and behavior, and similar behavioral responses could be expected to occur from the proposed Ambler road to some degree. Effects on a small portion of the WACH range from the proposed Ambler road would be unlikely to result in population-level impacts but could potentially have an adverse impact on subsistence users, whether they hunt in the Preserve or elsewhere. The southern alignment would have additional impacts on caribou in the Preserve when taking into account the additional facilities to be required. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. These areas outside of the Preserve are evaluated in the ANILCA Section 810 Analysis and the BLM EIS.

ARCHEOLOGICAL RESOURCES

GAAR has a rich, well-preserved, and significant archeological record that documents an estimated 13,000 years of human activity. Examples of archeological sites found in GAAR include campsites, villages, hunting overlooks, fish camps, caribou drive lines, and historic gold mining operations. There are archeological resources within GAAR that are both historically important and important to contemporary users of lands within GAAR. Evaluation of cultural resources will continue in the context of the National Historic Preservation Act Section 106 compliance process within the scope of the broader Ambler Road project. The NPS is a participant in the development of a multi-party programmatic agreement and cultural resource management plan that will ensure proper consideration and management of cultural resources.

More than 1,800 archeological sites have been identified within GAAR; however, only a handful of archeological surveys and inventories have been conducted within the Preserve and adjacent areas, including portions of the national park. Nevertheless, the distribution and nature of archeological resources is known well enough to understand that archeological resources can be expected to be present, abundant, and well preserved. Although most known sites have not been thoroughly evaluated to determine their significance, many sites are known to have high research value (Baltensperger et al. 2019).

The proposed Ambler road would cross areas of cultural importance, which include archeological resources, and ground-disturbing construction activities could impact archeological deposits. Current studies and modeling efforts show that differences may exist in archeological site distribution between the two proposed alignments. The geographic area analyzed for impacts on archeological resources is the NPS project area (Appendix A, Figure 2).

Due to the large amount of un-surveyed area, the NPS used a set of hundreds of documented archeological sites within the Preserve and the adjacent national park to develop a spatial model predicting the relative likelihood of finding undocumented archeological sites in unsampled areas of the NPS project area. The model uses 11 factors to calculate probability of existing resources, including the distance to lakes, elevation, distance to anadromous streams, distance to rivers, distance to villages, distance to the coast, ecotype, slope, aspect, surficial geology, and distance to streams (Baltensperger et al. 2019).

The spatial model results predicted areas of high archeological site potential in valleys associated with the Kobuk River, especially in association with large glacial lakes. Proximity to lakes was the most important predictor in the model development followed by elevation and proximity to anadromous streams and large rivers. Areas within 0.5 mile of lakeshores (especially near Walker and Nutuvukti lakes) were predicted to have higher probability for archeological resources than areas away from water bodies. Elevations between 500 and 1,000 meters (0.3 and 0.6 mile) and areas adjacent to anadromous water courses, including the Upper Kobuk and Reed rivers and Beaver Creek were also predicted to have a high likelihood of archeological sites. The spatial analyses demonstrated substantial differences in the prediction of high-potential archeological areas that would be affected by the northern and southern alignments (Baltensperger et al. 2019).

In addition to archeological resources, NPS staff documents and manages information regarding ethnographic resources. Ethnographic resources at GAAR are those cultural and natural features that are of significance to traditionally associated peoples. Traditionally associated peoples generally differ as a group from other park visitors in that they typically assign significance to ethnographic resources or places closely linked with their own sense of purpose, existence as a community, and development as ethnically distinctive peoples. NPS staff will continue work with local Alaska Native communities to identify these resources and minimize effects both directly and within the scope of the broader Ambler Road project. The multi-party programmatic agreement and cultural resource management plan being developed for the project includes ethnographic resources and places of traditional importance.

Impacts

Adverse effects to archeological resources would be caused by ground disturbance or construction within a documented or undocumented archeological site. These actions would result in adverse effects by causing damage to or alteration of a historic structure or cultural feature; displacement or removal of contributing or associated object or cultural feature; altering aspects of the historic landscape or setting that make a site culturally significant; or restricting access to traditional cultural places or resources, including culturally important plant, animal, or material resources. In addition to impacts from road construction, the material sites along the northern and southern alignments would have similar impacts on archeological resources. The southern alignment would also have a construction camp, long-term maintenance facility, and airstrip. An increase of people at material sites and the associated facilities along the southern alignment could present risks of unauthorized collection of artifacts.

Comparative Analysis

Archeological surveys for the proposed Ambler road alignments are limited. The applicant identified and surveyed locations of interest. However, only 41 locations were surveyed based on a previous version of the road alignment that does not perfectly align with the alignment proposed in the permit application.

The NPS has not completed surveys specifically for the proposed Ambler road project; however, the NPS has conducted surveys in the general project area. These surveys are a relevant basis for generally characterizing the archeological potential and significance in the NPS project area. Adequate archeological resource surveys are needed to better understand the extent of archeological resources along the alignments.

The NPS archaeological potential model results show that the proposed northern alignment would involve a larger area with high potential to contain archeological sites compared to the southern alignment within the Preserve (Baltensperger et al. 2019); however, this analysis does not account for the presence of support facilities along the southern alignment. Both alignments have the potential to affect archeological resources in the Preserve due to the proximity to prominent water bodies. The northern alignment is near Walker and Nutuvukti lakes, as well as the Kobuk River, while the southern alignment crosses both the Kobuk and the Reed River.

The highest potential for resources exists within the corridor of the Kobuk River. The northern alignment would travel within 0.25 mile of the river for approximately 1.7 miles and the southern alignment would travel within 0.25 mile of the river for approximately 0.8 mile; however, the southern alignment would also construct an airstrip, construction camp, maintenance facility, and material site within portions of the boundary. The presence of support facilities along the southern alignment (i.e., airstrip, material site, construction camp, long-term maintenance facility) adjacent to the Kobuk River could have a large impact on archeological resources, as combined the features would cover approximately 147 acres of land adjacent to the Kobuk River. Adverse effects from such facilities could be avoided by locating all material sites and associated features outside the Preserve, if feasible. However, depending on the location, impacts to archeological resources could occur outside of the Preserve. The southern alignment would also cross the Reed River within the Preserve, but there is less area of high archeological potential at this crossing compared to the Kobuk River. Although the types of sites along the alignments are unknown, most of these resources would likely be lithic scatters. Other site types could include artifact scatters, cabins, cache pits, cairns, camps, faunal remains, rock features, hearths, and other features. The impacts along each alignment would be direct and adverse resulting from surface and subsurface construction activities.

AIDEA will be required to inventory archaeological, historic, and ethnographic resources within the Area of Potential Effects for the entire route, and mitigate any adverse effects, according to the stipulations in the Section 106 Programmatic Agreement. The Programmatic Agreement applies to all project activities and to all phases of the project, regardless of land ownership, and is included as Appendix J of the BLM FEIS.

Conclusion

The northern and southern alignments both have the potential to impact archeological resources through ground disturbance. Predictive modeling indicates that the greatest potential for the presence of archeological resources is near lakes and anadromous waterbodies. Both alignments cross the Kobuk River, which has the highest potential for archeological resource potential within the NPS project area. The southern alignment also crosses the Reed River; however, the location of the northern alignment near both Walker and Nutuvukti lakes increases the potential for impacts to archeological resources (this potential has not been fully evaluated by historical information or by site surveys). If all materials sites and associated facilities could be located outside of the Preserve, the southern alignment would be less likely to encounter archeological resources within the Preserve than the northern alignment, based largely on its location in relation to Walker and Nutuvukti lakes. When including mileage outside of Preserve boundaries to the junctions where the northern and southern alignments merge, the southern alignment includes 43 miles outside of the Preserve, while the northern alignment includes only 18 miles outside of the Preserve. The southern alignment includes significantly more exposure to waterbodies and thus potential for degradation of archeological resources outside of the Preserve. The relocation of support facilities from within the Preserve could have impacts on archeological resources outside of GAAR depending on where these facilities are sited. The impacts from constructing the entire length of the Ambler road alternatives covered in the BLM EIS.

VISITOR EXPERIENCE

Visitors come to national park system units to experience the unique characteristics of each unit. For many visitors, being immersed in a natural environment or a cultural landscape is the experience they are seeking. The quality of the recreational opportunities available affects how visitors experience the area. People visit GAAR for a variety of reasons and to engage in recreational activities that include hiking, camping, backpacking, river float or canoe trips, packrafting, wildlife viewing, birdwatching, photography, fishing, and hunting (only in the preserve units).

GAAR is extremely remote and rugged, and travel to the Park and Preserve is complicated, weather dependent, and expensive. Visitation at GAAR is difficult to track. Visitors are not required to register or pay a fee to enter; however, concessionaires permitted by the park with commercial use agreements operating within GAAR must provide a report to the NPS that includes the number of visitors they took into the Park, Preserve and wilderness. Between 2015 and 2017, concessionaires brought between 400 and 1,000 backcountry visitors to GAAR (Pace 2020) and in 2018 and 2019, there were approximately 840 and 450 visitors to GAAR, respectively. The most common form of visitor access in GAAR is by aircraft; however, the number of visitors backpacking across GAAR using packrafts to cross rivers and lakes is increasing. Visitors that access Walker and Nutuvukti lakes via aircraft participate in a variety of activities. For those that float the Kobuk River, Walker Lake is a more common place to start than Nutuvukti Lake, and most visitors traveling from Walker Lake travel south, not north. Nutuvukti Lake is a popular landing spot for fishing and hunting for both sport and subsistence.

Walker Lake was designated a National Natural Landmark in April 1968 (NPS 2019) and is one of the most visited locations in the park. From 2013 to 2019, the annual visitation average to the Walker Lake area was approximately 65 people. This visitation average was determined from counting visitors who participate in the NPS program for bear resistant food containers, which loans out the containers free of charge, and those traveling with a registered guide. Consequently, these visitor use data are minimal and likely underrepresent visitation. GAAR has a low number of visitors when compared to other large parks, but the amount of time each visitor spends in GAAR is one of the highest of all national park system units with an average length of stay of 8 to 10 days.

GAAR is widely recognized as a premier wilderness park in the national park system, encompassing nearly 8 million acres of areas set aside from development as part of the National Wilderness Preservation System. The arctic ecosystems of GAAR are managed to protect their wild and undeveloped character and provide continued opportunities for subsistence activities. A 2017 wilderness character assessment of GAAR showed the Park and Preserve to have well-preserved wilderness characteristics (Pace et al. 2017). Neither the northern or southern alignments for the Ambler road transect the Park or designated wilderness.

The geographic area analyzed for impacts on visitor experience is the NPS project area (Appendix A, Figure 2). This section explains how the proposed Ambler road along the northern and southern alignments would change the visitor experience by altering the landscape and the recreational opportunities in the Preserve.

Impacts

GAAR is valued for its remoteness and naturalness and receives very limited visitation. The remote location, challenging access, and current NPS management all combine to provide a relatively small number of visitors with unique wilderness recreation opportunities. The northernmost portion of the NPS project area includes a small section of Gates of the Arctic National Park, which is designated as Wilderness. Both routes are located outside the national park and outside of designated Wilderness. Under the proposed Ambler road, recreational opportunities for visitors would not change once the construction is complete, but the opportunity may be different in areas near the road (for better or worse). The proposed Ambler road would be the only substantial human-made development inside the Preserve. The visual and auditory intrusion on the natural setting of GAAR would result in impacts on the visitor experience. Changes to the viewshed and soundscape from the presence of the proposed Ambler road and the activity associated with it would affect visitors, including those floating on the Kobuk River.

Construction. Visitors would be restricted from areas of active construction for safety concerns. Construction would create impacts on the viewshed and soundscapes due to the use of heavy equipment and activities associated with road construction, including building bridges across rivers and streams.

Construction activities would occur periodically throughout the life of the road, as the applicant proposes to build the road in phases over a decade or longer, and road maintenance would be an ongoing activity for the life of the road.

Viewshed Impacts. Vegetation clearing for the road and associated features would alter views within the NPS project area. Once constructed, the contrast of color between the proposed Ambler road and the surrounding natural lands would be apparent to visitors. The applicant proposes to revegetate fill slopes with native vegetation to reduce the contrast between the gravel road and the existing forest. A visual resource inventory was completed to characterize the scenic quality of the Preserve in the NPS project area and to provide a baseline against which to compare the potential impacts of the proposed alignments (Meyer and Sullivan 2016; DOWL 2014b). The viewshed analysis simulated the footprint associated with a 32-foot wide crushed aggregate road at representative observation points that would represent the potential viewer experience (Meyer and Sullivan 2016; DOWL 2014b). The viewshed analysis determined that the proposed Ambler road along the northern alignment would be visible from 167,623 acres of GAAR. Approximately 88,647 acres of this area has a very high cumulative scenic inventory value, thus having adverse impacts on the viewshed compared to current conditions. (Meyer and Sullivan 2016). Comparatively, the southern alignment, which goes through the narrowest portion of the Preserve, would be visible from 166,428 acres of GAAR, and approximately 81,428 acres of the area has a very high cumulative scenic inventory value (Meyer and Sullivan 2016). Figure 13 in Appendix A presents the area from which the northern and southern alignments would be visible based on the viewshed modeling. Thus, the viewsheds impacted by each alternative would be fairly comparable.

Where the impacts to viewshed differ between the alternatives is for areas within the national park (designated wilderness), which have a very high cumulative scenic inventory value. The northern alignment would be visible from 39,165 acres and the southern alignment would be visible from 18,324 acres (Meyer and Sullivan 2016). The northern alignment can be seen from more than twice the national park area compared to the southern alignment, including from the southern half of Walker Lake (Figure 13). These impacts would be long-term, lasting at least as long as the life of the road. Although the road would be reclaimed following closure, the impacts would likely be permanent, as restoration to pre-construction conditions would not be possible.

Dust plumes from traffic would impact the viewshed for the life of the road, as long as there is traffic and it remains a gravel road. Dust plumes would be mitigated with the use of a dust palliative, such as calcium chloride, but even the best palliatives are not completely successful in mitigating traffic-related dust on a gravel road. At a minimum, there would be an estimated 80 trucks per day (40 round trips) on the proposed Ambler road during initial mine development activities, and at a maximum, there would be approximately 168 round trips per day year-round (BLM 2019). Dust plumes would also be present at material sites, as rock would be collected, crushed, and transported from these areas. Both alignments have material sites associated with them (Figures 4 and 5). On the southern alignment, the material site would be located adjacent to the Kobuk River and would have a construction camp and long-term maintenance facility associated with it, which would likely have higher vehicles traffic, as well as an airstrip, which would result in additional visual intrusions. The northern alignment would have a material site west of the Kobuk River. There would also be a material site located outside of the Preserve adjacent to the Reed River with a construction camp, long-term maintenance facility, and airstrip associated with it. The concentration of vehicle and air traffic and dust plumes during construction activities at these material sites and associated facilities would serve as a more intrusive reminder of human development and activity in the Preserve. Further, particles from the dust plumes would settle on the surrounding landscape, creating additional visual impacts from altered vegetation communities and plant health. Dust plumes, fugitive dust that settles on surrounding vegetation, and vehicle traffic and lights would impact viewsheds during construction and during operation and maintenance of the road; therefore, impacts would vary depending on the amount of activity on the roads, but would be present for the life of the road (approximately 50 years). If the applicant were to locate these support facilities outside of the Preserve, the visual impacts from dust plumes, increased traffic, and aircraft would not occur within the Preserve; however, the impacts may still be visible from the Preserve depending on where the facilities are located, similar to the facilities located adjacent to the Reed River along the northern alignment. Even if the facilities are located outside of the viewshed of Preserve visitors, these impacts would occur wherever the facilities are sited.

Soundscape Impacts. An environmental sound analysis modeled and analyzed the impacts on the soundscape at GAAR from haul trucks on the proposed Ambler road (BSA 2015). Of the 25 sound modeling locations, haul trucks would be audible at 10 locations along each alignment, and where audible, the sound levels would be moderate to very faint. When average truck noise levels (sound heard by a hypothetical visitor over an hour) were examined, the truck noise would be heard above ambient noise levels (natural and anthropogenic sounds) at five locations on the northern alignment and four locations on the southern alignment. The sound analysis determined the potential for impacts from human-caused sounds on the soundscape in the Preserve; however, the analysis considered only traffic noise during the post-construction operational phase of the road project with an average of 40 round trips per day. Overall, the results of this analysis show that the northern and southern alignments would have similar impacts on the soundscape for the activities that were analyzed. Additional vehicle noise impacts would be expected during the construction phase, during maximum use of the road, and during the course of maintenance activities. Further, the sound analysis did not consider the impacts on soundscapes from material sites along the alignments (both northern and southern) where rock would be mined and crushed or from the airstrip associated with the material site on the southern alignment.

It should be noted that the noise generated by a haul truck is not substantially different from the noise of aircraft used to transport visitors to the Preserve and Walker Lake areas. The difference would be the increase in frequency of human-made noise from the haul trucks. Another difference between the use of aircraft and haul trucks is engine brake noise; this low-frequency noise is more audible above ambient sound levels. The sound analysis assumed 80 haul trucks per day, which is more than six times the number of aircraft noise events on the busiest day recorded in 2013 and 2014 (BSA 2015; Betchkal 2018). It is important to note that the assumption of 80 haul trucks per day is an estimate of the minimum number of vehicles that would use the proposed Ambler road per day; the maximum number per day could be closer to 168 trucks year-round (BLM 2019).

Wilderness. The enabling legislation for GAAR includes direction to maintain the wild and undeveloped character of the area, provide continued opportunities for wilderness recreational activities, protect park resources and values, and provide continued opportunities for subsistence uses by local residents where such uses are traditional (Pace et al. 2017). The Preserve, while bordered on the north by designated Wilderness within the national park, is not designated wilderness; however, the wild and undeveloped character of the area is one of the purposes for which the Preserve is managed. For the relatively small number of GAAR visitors, much of their experience stems from wild and undeveloped character of the area. In public comments for a recent General Management Plan and for this project, commenters emphasized the high value of the Park and Preserve's large, remote, and undeveloped character. Either alignment would continue to provide this experience in GAAR.

Comparative Analysis

The physical presence of a road with regular traffic would redefine many aspects of the current (relatively very small) visitor experience within the road's proximity. Either alignment would change the nature of experiences – some for the better, some for the worse. Given the extremely large size of GAAR (nearly 8 million acres), a relatively small area (a little over 1%) would be affected by the viewshed and soundscape changes brought about by the proposed Ambler road. However, the changes would occur near the primary access point for float planes for the southern part of GAAR (Walker Lake), so nearly all visitors flying into to this part of GAAR would be affected. As stated, the average known visitation to the Walker Lake area between 2013 and 2019 was approximately 65 people per year. Primary visitor use at Walker Lake occurs in the summer, which spans July and August. Assuming 65 people per year visit Walker Lake, approximately 8 people per week would be affected by the proposed Ambler road. It is important to note that these numbers underrepresent visitation at GAAR since visitors are not required to register before entering the park; however, due to the remoteness and difficulty to access all areas of GAAR, low visitor numbers are considered typical.

After construction, there would be auditory and visual impacts from operation of the proposed Ambler road. The visual resource inventory, the environmental sound analysis, and the wilderness character mapping results showed that there is little difference between the alignments when looking solely at the distance from the roads where impacts would occur for the activities analyzed (BSA 2015; Meyer and Sullivan 2016; DOWL 2014b; NPS 2017b). Dust plumes and construction/maintenance and traffic noise would be regular reminders of the presence of the road; even small changes in ambient dust or noise would have a large impact on an area where these factors are naturally absent. Construction activities and impacts from the road itself would be similar between the alignments; the differences occur with respect to the length and location of the alignments and the associated features. During construction and operation of the proposed Ambler road, the recreational opportunities of GAAR would persist, and visitor requirements would remain unchanged. The NPS would make information available to the public through the park website, through concessionaires, and at ranger stations about the activities associated with the road, including location, duration, and expected conditions.

The two primary points of float plane access near the NPS project area are Walker Lake and Nutuvukti Lake. Both are near the northern alignment at 1.5 miles and less than 0.25 mile, respectively. For some visitors, float plane access, while expensive, is probably an additive to the remote and wilderness aspects of the experience. Noise from regular traffic on the road would intrude on a soundscape currently defined by natural sounds that are punctuated by sounds of aircraft 5 to 7 times per day and averaging 5 minutes in duration (Betchkal 2014). Although Walker Lake experiences a minor amount of day use, most visitors dropped off at the lake stay for one or more days before getting picked up or moving on to a river trip or some other adventure. Primary visitor use at Walker Lake occurs in the summer, and the primary use and activity on the proposed Ambler road would also be in the summer. Given that it is daylight 24 hours per day in this location most of the summer, there may be traffic and activity on the road 24 hours per day, providing visual and auditory reminders of its presence. Although located outside of the Preserve, the sights and noise associated with the material site, airstrip, and long-term maintenance facility east of the Reed River could impact visitors to Walker and Nutuvukti lakes. The proposed Ambler road along the northern alignment could potentially displace the estimated 65 annual Walker Lake area visitors to another location in the nearly 8-million-acre park and Preserve.

Conversely, distance and topography combine to make visual and auditory reminders along the southern alignment indiscernible to visitors to Walker Lake. Viewshed modelling indicates that some minor portions of the southern alignment would be visible from higher elevations in the mountains surrounding Walker Lake. However, the Walker Lake visitor experience would be essentially unchanged from what it was before the construction of the road. The southern alignment would be approximately 4 miles away from the southern end of Nutuvukti Lake. Park visitors traveling to Nutuvukti Lake by float plane would be able to see the proposed Ambler road from the higher elevations surrounding the lake, particularly near the southern end. Given the topography around Nutuvukti Lake, it is probable that vehicle noise from traffic on the road could be heard from the southern half of the lake. The sights and sounds of the proposed Ambler road from these two lakes are important as Walker and Nutuvukti lakes are popular visitor destinations. For visitors near the southern alignment, including those that float the Kobuk River, the construction camp and long-term maintenance facility would present another adverse impact on the wilderness experience. This camp/facility would require a crew that would likely permanently reside at the material site location within the Preserve. Encountering a permanent camp with residents would adversely affect the feeling of solitude or primitive and unconfined recreation for GAAR visitors.

Walker Lake is also the starting point for a remote wilderness float trip that can range from as short as 86 miles to the Pah River or as long as 300 miles to the community of Noorvik or beyond. As visitors approach the proposed Ambler road from Walker Lake, the road and the dust plume from traffic on the northern alignment would be visible to park visitors from certain locations. The northern alignment would be visible from approximately 3.9 miles of the Kobuk River (Meyer and Sullivan 2016). Visitors that float the Kobuk River would approach and pass under the bridge, but after passing it, indications of the proposed Ambler road would be gone, and the visitor experience would be comparable to what it was before the road was built. After passing under the bridge, the northern alignment would provide visitors with 73 miles of undeveloped river within the Preserve. The southern alignment would cross the Kobuk River and the Reed River within the boundaries of the Preserve, requiring bridges at both locations.

While the northern alignment is closer the area of floatplane disturbance and the starting point for float trips down the Kobuk River, the southern alignment would interrupt the visitor experience about 20 miles further down river. Visitors floating the Kobuk River would be exposed to the sights and sounds of the road, material site, and associated facilities as they approached the bridge, but similar to the northern alignment, these indicators of development would soon be left behind, and the river experience would remain much the same as it was prior to construction of the road. The same would be true for visitors floating the Reed River. If the material site and associated facilities could be located outside of the Preserve, the intrusion on a visitor's river experience under the southern alignment scenario would be further protected, as the impacts would be limited to the bridge crossing and the potential dust plume from use of haul trucks on the road. The southern alignment would be visible from approximately 3.7 miles of the Kobuk River; a visual analysis was not completed for the Reed River (Meyer and Sullivan 2016). The southern alignment would allow for 52 miles of undeveloped river within the Preserve once visitors pass under the bridge.

Sport hunting and fishing are the two primary activities for visitors using Nutuvukti Lake as a point of access. The immediate proximity of the proposed Ambler road along the northern alignment ensures that visitors to Nutuvukti Lake would see the road and hear traffic on it. The proposed road would become part of the experience at Nutuvukti Lake. The character of the location and the experience would change dramatically with the northern alignment. To the degree the presence of, or activity on, the road influences wildlife behavior or has adverse effects on fish and other aquatic species in the lake, the proposed Ambler road along the northern alignment has the potential to adversely affect the primary reasons for visiting this location in GAAR. Similarly, as the southern alignment is surrounded by Preserve lands, the presence of the road and the activity on it may affect wildlife presence and movement, creating measurable impacts to sport hunting opportunities. Another impact of the southern alignment would be the construction/maintenance crew that would be living at the facility associated with the material site. If these workers were to fish or hunt in the Preserve, this could affect fishing and hunting opportunities for visitors. However, if these facilities were to be located outside of the Preserve, there would be no additional impacts on hunting and fishing pressures within the Preserve from construction/maintenance crews.

Conclusion

Walker Lake and Nutuvukti Lake are the primary points of float plane access to the Preserve and surrounding areas. The northern alignment would provide visitors flying into to these lakes with audio and visual signs of human development while they remain in that area. The southern alignment would not have as great an impact on the current floatplane-based visitor experience but would have a greater impact on Kobuk River travelers and some visual and auditory effects that may be experienced from portions of Nutuvukti Lake. Visitors floating the Kobuk River would have their trip interrupted on the second day of their experience, first encountering the road and airstrip that is adjacent to the river, cross under the bridge, then pass the material site that is also adjacent to the river. However, if the material site and associated facilities could be located outside of the Preserve, visitors would only encounter the road and bridge across the Kobuk River, similar to the northern alignment. In total, the southern alignment would result in a float trip interrupted with approximately 3.7 miles affected by development, while the northern alignment would affect float trips near the Walker Lake entry point. For visitors who travel elsewhere in GAAR from Walker Lake or who limit their activities to the vicinity of Walker Lake or Nutuvukti Lake the experience would be essentially unchanged from what is available currently under the southern alignment. Both the northern and southern road alignments would have substantial but differing impacts to the visitor experience; however, ample opportunity for current experiences exist elsewhere within GAAR to experience a remote arctic landscape with minimal human intrusion.

WILD AND SCENIC RIVERS

Within GAAR, the Kobuk River is designated as a wild river under the Wild and Scenic Rivers Act. From its headwaters in the Brooks Range, the river courses south and west through a wide valley to Kotzebue

Sound. This analysis addresses impacts to the wild-designated portion of the Kobuk River, including a 0.25-mile boundary on either side of the river, which is entirely inside the Preserve (Appendix A, Figure 14). The analysis of impacts on the wild-designated Kobuk River was based on a qualitative assessment of how the proposed alignments would affect the free-flowing character, water quality, the *wild* classification of the river, and the five Outstandingly Remarkable Values (ORVs) for which the river was designated. In addition, this analysis considers the protection and enhancement of the Kobuk River for the benefit and enjoyment of the public, as called for under the Wild and Scenic Rivers Act. The Kobuk River is an important subsistence resource used by surrounding communities and impacts to this river could have impacts on these communities.

In 1968, Congress passed the Wild and Scenic Rivers Act to establish a policy of the United States to preserve the free-flowing condition, water quality, and ORVs of certain selected rivers and their immediate environments for the enjoyment of present and future generations (16 USC 1271 et seq., Section 1(b)). In mandating issuance of a ROW across the Preserve, Congress specified that the ROW would be issued in accordance with the provisions of ANILCA 1107. ANILCA 1107(b) is specific to wild and scenic rivers, and it provides that any transportation system unit traversing a designated wild and scenic river shall be subject to such conditions as may be necessary to ensure that the stream flow of and transportation on the river are not interfered with or impeded and the road is located and constructed in an environmentally sound manner. For purposes of this analysis, the NPS identified a 0.25-mile boundary on either side of the river as the immediate environment of the Kobuk River. This 0.25-mile boundary equates to approximately 320 acres per mile on both sides of the river.

Impacts

The construction of the proposed Ambler road across the Kobuk River means that a portion of this designated wild river would no longer be free from human development. Figure 15 in Appendix A presents the northern and southern alignments and the road features associated with each alignment within the Preserve and specifically the bridge crossings of the Kobuk River and its boundary (Appendix A, Figure 15 insets).

Wild Classification. The lack of development, as well as the free-flowing condition and exceptional water quality of the upper Kobuk River are integral to its designation and classification as a *wild* river. Wild rivers are defined in Section 2(b) of the Wild and Scenic Rivers Act as: “Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.”

Under both the northern and southern alignments, the proposed Ambler road would cross the Kobuk River with a multi-span bridge that would have three sets of piers in the river. The piers would likely be constructed of steel piles with concrete caps. The bridge abutments would likely be protected with riprap mats placed along the riverbanks. The Kobuk River design would consider aesthetics and include design measures that would minimize impacts, such as incorporating brush and willows into riprap areas (AIDEA 2020). The application proposes that both alignments would include an access road leading from the proposed Ambler road to the bank of the Kobuk River for water extraction. ANILCA allows for the bridge across the Kobuk River; therefore, there would be no change in the river’s *wild* designation.

Free Flow. The free-flowing condition of the upper Kobuk River remains untouched by human intervention. It moves and flows according to natural processes. Flow characteristics of the upper Kobuk River are similar to those of other large arctic rivers in Alaska. Between late October and late May, the river is frozen, and the flow is relatively low. Spring break-up brings increased flow as snowpack begins melting, and by June, water from the snowmelt and runoff from the basin enter the river. Studies on the Kobuk and other rivers along the proposed Ambler road indicate that ice jams during breakup can lead to more than bankfull conditions at the proposed bridge locations (Kane et al. 2015). Between the months of July and September, precipitation drives flow rates, which can vary with each storm.

An option to construct a full span bridge without piers in the river channel was evaluated at a conceptual level but was deemed to be not economically feasible. A multi-span bridge with piers in the river and abutments within the floodplain was ultimately considered in this analysis. Such a design stands to alter natural channel migration and the free-flowing sinuosity, possibly causing impacts such as decreased water quality, habitat degradation and destruction, and changes to the visitor experience, as discussed in previous sections. Abutments affect the velocity across the channel by confining the river to a defined width in high-water events and preventing the lateral spread of the river in the flood plain. Piers reduce the cross-sectional area which affects the velocity across the channel and may act as barriers to floating ice or debris. The Kobuk River freezes from late fall through late spring (Durand et al. 2009); however, piers alter flow conditions and can initiate ice jams and increase the probability of ice jam flooding (Wang et al. 2015). Piers affect streamflow, channel geometry, and hydraulic efficiency. Piers and abutments also cause bridge scour as sediment is removed from around the piers due to increased turbulence and general scour related to flow constriction (Blodgett 1984). Constructing a multi-span bridge across the Kobuk River with piers in the river channel and abutments in the floodplain would require alteration of the bed and banks of the Kobuk River, resulting in long-term adverse impacts on the natural state of the river but would not interfere or impede the stream flow of or transportation on the Kobuk River.

The applicant has proposed water extraction sites along each alignment at the Kobuk River bridge sites. The applicant has also proposed water extraction sites at the Kobuk River, three unnamed streams, and one unnamed pond along the northern alignment and at the Kobuk River, the Reed River and one unnamed pond along the southern alignment (Appendix A, Figure 15). With the exception of the ponds, water extractions could have impacts on the Kobuk River, as water would be extracted from the river itself as well as tributaries to the Kobuk River. These extractions would result in short-term, adverse impacts, because the extractions would not be permanent diversions; however, impacts could include changes in flow and water levels, temperature, dissolved oxygen, and turbidity, which could adversely impact aquatic life. Because the frequency and volume of the extractions are unknown, the magnitude and intensity of the impact cannot be estimated at this time.

Tributaries to the Kobuk River that would be crossed by the proposed Ambler road along both alignments would have culverts installed to convey water under the road. Culverts can affect longitudinal connectivity of a waterbody, which, in turn, would affect the free flow of the wild-designated Kobuk River, resulting in long-term adverse impacts. However, proper drainage design can mitigate such impacts. To maintain hydrologic connectivity, the applicant proposes to use State of Washington stream stipulation culvert width standards (1.2 times bankfull width plus 2 feet), consider the use of bridges instead of multiple culverts at braided stream crossings, and create an adaptive monitoring plan for monitoring, maintain, and repairing culverts, (AIDEA 2020). The NPS would work with the applicant to monitor drainages and identify and correct any connectivity issues in a timely manner.

Water Quality. The water quality of the upper Kobuk River is pristine and has no known contaminants or known pollution sources aside from possible trace amounts of fuel from float planes and motorized boats. A high standard of water quality exists in the upper Kobuk River and due to its wild river designation, keeping the water in its pure and natural state is a major priority and standard of management.

The water quality of the Kobuk River would be affected by erosion and sedimentation, fugitive dust, spills, flow reduction, and permafrost degradation. These same impacts could also occur in tributaries to the Kobuk River, indirectly impacting the river. In the absence of proper mitigation, the impacts to water quality would be long-term and adverse; however, due to lack of information on the characteristics of the Kobuk River at the proposed crossings (e.g., depth, flow), the intensity of the impacts cannot be determined at this time. The impacts to water quality are discussed in detail in the "Water Quality" section.

This assessment assumes that subwatersheds that contain a portion of the Kobuk River or the river's 0.25-mile boundary are considered to have direct impacts to the Kobuk River, and subwatersheds that drain into other watersheds prior to flowing into the Kobuk River are considered to have indirect impacts. Some subwatersheds within the NPS project area would not have an impact on the Kobuk River (Appendix A, Figure 14).

Outstandingly Remarkable Values. The NPS has determined that five ORVs are present on the upper Kobuk River. The proposed Ambler road would likely have impacts on the Kobuk River's ORVs under both the northern and southern alignment. A brief list of impacts to the ORVs is presented below. Impacts associated with the river's ORVs are analyzed further in the "Fish," "Archeological Resources," and "Visitor Experience" sections in this chapter. The ORVs of the upper Kobuk River follow (NPS 2013):

- **Cultural Resources –** The designated Kobuk River and its boundary contain rich historic and prehistoric archeological resources that document the river as a convergence zone for inland and coastal cultures. The river contains evidence of human activity that spans at least 10,000 years. Construction of the bridge, the access road to the river for water extraction, and any associated features within the Kobuk River boundary could impact archeological sites or areas significant to traditional cultures. Impacts from construction would be localized and would not extend beyond the construction footprint of the features and construction daylight limits of the alignment; however, impacts from unauthorized collection of artifacts from workers could extend beyond the footprint. Construction activities would result in direct and adverse impacts due to surface and subsurface construction activities (Baltensperger et al. 2019). The Kobuk River is culturally important as a travel corridor for historic and current human activity, as is evidenced by the archeological resources present along the river corridor. Types of archeological resources that could be affected along both alignments include lithic scatters, artifact scatters, cabins, cache pits, cairns, camps, faunal remains, rock features, hearths, and other features.

- **Fisheries –** The designated Kobuk River protects crucial spawning habitat for the Kobuk/Selawik sheefish population; this population is only known to spawn in one other location. The Kobuk River provides habitat for at least nine species of resident and anadromous fish and the tributaries are likely to provide habitat for additional fish species. Grayling, Arctic char, whitefish, chum salmon, and lake trout inhabit the Kobuk River and support a major commercial chum salmon fishery. The Kobuk River provides several communities with subsistence fishing for sheefish, whitefish, and chum salmon, which all spawn in the upper portion of the river. Impacts on fisheries of the Kobuk River could stem from hindrances to fish passage, changes to fish habitat, and changes to water quality. The proposed Ambler road project could decrease water quality from sedimentation, erosion, fugitive dust, and potential spills could impact fish habitat, fishery health, and subsistence fish populations.

- **Geologic Values –** The designated Kobuk River includes geologic features, such as Walker Lake (a National Natural Landmark), the Endicott Mountains, the Arrigetch Peaks, and a series of canyons made of near vertical sheets of shale within the lower canyon. The proposed Ambler road project would not impact geologic values associated with the designated Kobuk River because the project would not alter significant geologic features of the river.

- **Recreational Opportunities –** The designated Kobuk River is the setting for an internationally renowned sheefish sport fishery, as well as other fishing opportunities. The Kobuk River provides for an interesting and ever-changing float experience from arctic mountains to lowland boreal forest. The river provides a range of unique conditions, including class I to class V rapids. The proposed Ambler road project would affect the experience of recreational users, including hikers, backpackers, rafters, and anglers. Viewshed impacts from bridges and the road, fishery impacts from decreased water quality, and construction and traffic noise could diminish the quality of the wild river experience of these users. Most travelers on the Kobuk River start directly from Walker Lake and float the outlet stream to the confluence with the mainstem of the Kobuk River just outside the national park boundary. The visibility of the road or the dust plume from traffic on the proposed Ambler road, as well as the noise generated from vehicles and equipment, would affect the viewshed, soundscape, and the recreation experience for visitors that float the Kobuk River. The impacts on the visitor experience are described in detail in the "Visitor Experience" section.

- **Scenery –** The designated Kobuk River provides a diverse range of scenery, from the dramatic headwaters at Walker Lake to the interior forested lowlands and uplands. The upper and lower Kobuk Canyons provide visitors with unique scenic opportunities, ranging from sheer bluffs to large sandstone boulders and narrow canyon walls. Viewsheds from the Kobuk River would be impacted by the bridge, as well as from vegetation removal and presence of the ROW and support facilities of the road (material sites, airstrips, construction camps, and long-term maintenance facilities) adjacent to the river in areas.

The stream flow of and transportation on the Kobuk River would not be significantly interfered with or impeded by either the northern or southern alignments; therefore, this factor is not discussed further. The water quality and the ORVs that may be affected differently under the northern and southern alignments and are discussed in more detail below.

Comparative Analysis

Mitigation measures proposed by the applicant would help protect water quality and fisheries; however, construction, operation, and maintenance of the proposed Ambler road would have adverse impacts on water quality, fish and wildlife habitat, and visitor experience under both alignments. Impacts described for wild and scenic rivers could affect the subsistence communities because the Kobuk River is an important subsistence resource. The analysis of subsistence impacts (the Section 810 evaluation and findings) is available as Appendix M to the BLM EIS.

The following paragraphs summarize the impacts of the northern and southern alignments on the ORVs of the wild-designated Kobuk River.

- **Cultural Resources.** The northern and southern alignments of the proposed Ambler road could have direct and adverse impacts on archeological resources due to surface and subsurface construction activities (Baltensperger et al. 2019). The northern and southern alignments would pass through areas that show a high potential for archeological resources adjacent to the Kobuk River. The archeological resources along the southern alignment could be impacted to a greater degree if the construction of the airstrip, material site, construction camp, and maintenance facility cannot be feasibly located away from the river corridor. Locating these facilities outside of the Preserve would eliminate the impacts on cultural resources from construction and operation of the facilities, as no other Wild and Scenic River would be affected by the proposed Ambler road. Neither alignment would impact the ability for members of the community to use the river to travel for subsistence purposes, as explained in the "Subsistence" section.

- **Water Quality and Fisheries.** The northern alignment passes through nine subwatersheds within the NPS project area; seven of these subwatersheds drain directly into the Kobuk River and two subwatersheds are connected to the river indirectly through tributaries. Additionally, the northern alignment transverses one watershed outside the NPS project area, which indirectly impacts the Kobuk River. Within the NPS project area, the northern alignment transverses approximately 22 road miles with direct impacts and 4 road miles traverse watersheds with indirect impacts (Appendix A, Figure 14). Under the southern alignment, approximately 18 road miles traverse four watersheds with direct impacts within the NPS project area and an additional 8 road miles travel through watersheds located outside the NPS project area that would directly impact the Kobuk River. The flow pattern of these watersheds with direct and indirect impacts would cross the road and lead to the Kobuk River or its tributaries. Road support facilities that would be present within the watersheds that could contribute to the impacts on the water quality of the Kobuk River, including material sites, long-term maintenance facilities, construction camps, airstrips, culverts and bridges for stream crossings, water extraction sites, and access roads.

- Fisheries could be impacted from construction features due to erosion, altered hydrology, interrupted flow, and contamination. Impacts from the southern alternative would be reduced if the material site and associated features were located outside of the Preserve and there would be no additional impacts on water quality or fisheries outside of the Preserve from relocating them, as no other Wild and Scenic Rivers would be affected by the proposed Ambler road. Impacts are discussed in detail in the "Hydrology, Floodplains, and Permafrost," "Water Quality," and "Fish" sections (see the "Fish" section of this analysis and Appendix C for recommended mitigation measures).

- **Recreational Opportunities and Scenery.** Most travelers on the Kobuk River start directly from Walker Lake and float the outlet stream to the confluence with the main stem of the Kobuk River just outside the national park boundary. The northern alignment crosses the Kobuk River just below this confluence, so most river travelers would not be exposed to the proposed Ambler road or the bridge until shortly before they come upon it and would pass the bridge quickly. The Kobuk River is somewhat incised into the landscape at the proposed crossing of the southern alignment, so travelers on the river would be more likely to hear activity on the road before they see the road or the bridge that crosses the river. The nature of the river at the southern alignment crossing is such that travelers on the river would not likely see the bridge until they are almost immediately upon it and would no longer see it shortly after passing under it, although visitors would hear vehicle traffic and construction and maintenance activities even after passing the bridge. The northern alignment allows for a longer stretch of undeveloped river, stretching from the crossing to the western boundary of the Preserve (approximately 73 river miles), whereas the southern alignment allows for a shorter stretch of undeveloped river (approximately 52 river miles) from the southern alignment to the western boundary of the Preserve. Additionally, in the vicinity of the crossing the southern alignment bridge, visitors would encounter the airstrip, the material site, and the access road to the river associated with this alignment. Visitors would experience increased human-caused noise and visual intrusions when near the southern alignment from airplanes and construction equipment in the material site (e.g., drilling equipment, crushers). Impacts on the recreational opportunities and scenery of the southern alignment would be short-term and adverse; however, due to the presence of the material site, long-term maintenance facility, and airstrip adjacent to the Kobuk River, the impacts from the southern alignment would be greater than those for the northern alignment. However, if the material site and associated features were located outside of the Preserve, impacts of the southern alignment would be reduced, and there would be no additional impacts on recreational opportunities and scenery outside of the Preserve from relocating them, as no other Wild and Scenic Rivers would be affected by the proposed Ambler road.

In commenting on the Draft EEA, the applicant indicated they would consider removing the material sites and associated facilities from within the Preserve. If so, the impacts described above from these support facilities would not occur.

Conclusion

Given the larger footprint of permanent development along the southern alignment of the Kobuk River inside the Preserve, and the fact that those impacts occur further downstream from the proposed northern alignments crossing, negative impacts to Wild and Scenic River values are greater in the southern alignment than those of the northern route. However, if the applicant could relocate the material sites and associated facilities outside of the Preserve, the footprint of the southern alignment would be reduced. This would also reduce impacts on Wild and Scenic Rivers overall, as relocation of the facilities would not affect the ORVs of another Wild and Scenic River. While adverse impacts from construction, operation, and maintenance of the proposed Ambler road have the potential to impact areas downstream of the alignments, these impacts can be appropriately mitigated under either alignment. The northern alignment would have less impact on the designated wild river and its ORVs, as the northern alignment would cross the river valley near its confluence with Walker Lake thus providing visitors with approximately 20 more river miles for their wild river experience.

SOCIOECONOMICS

This section describes economic factors and socioeconomic impacts of construction of the proposed Ambler road and is focused on park lands.

Impacts

The proposed Ambler road has the potential to affect local businesses and the economies of individuals and communities in both a positive and negative manner. The patterns and level of visitor use are likely to be altered by the presence of a road. Development of an industrial road along the northern alignment, which is closer than the southern route to the lakes used for float plane access, has the potential to deter wilderness-focused recreational users and could adversely impact local guides and outfitters who presently emphasize wilderness recreation in this area. There is insufficient data available to quantitatively compare the economic effects of the road on recreational factors across alignments.

Native corporations have the potential to gain revenue from land leases, material sales, and mining-related revenues generated in the Ambler Mining District. Native corporations in the region could also benefit from providing goods and services to the mining companies conducting exploration and operations in the Ambler Mining District. These benefits are general in nature and unlikely to differ in a meaningful degree between the alignment alternatives across the Preserve.

An analysis of the social and economic impacts of the proposed Ambler road as a whole is contained in Section 3.4.5 of the BLM Final EIS (BLM 2020), which is incorporated herein by reference. According to that document, community services including health care, law enforcement and solid waste disposal would not differ between the alignments. Likewise, there is no data to suggest that state and local government revenues would be significantly different between the northern and southern alignments.

Due to the remoteness of communities in the project area, transportation of fuel and freight is expensive and poses a significant financial burden to area residents. A 2014 Preliminary Economic Impact Study by the McDowell Group classifies the potential economic transportation benefit of the proposed Ambler road into three categories: significant, moderate, or minimal (McDowell 2014). None of the communities in the ‘significant’ or ‘moderate’ benefit categories would be affected by a northern versus southern alignment decision due to their distance from NPS lands. Communities in the ‘minimal’ benefit category (Alatna, Allakaket, Hughes, and Huslia) are closer to the NPS southern alignment but are still approximately 40 to 95 miles away; far enough that it is unlikely they would have a spur road connection to the proposed Ambler road. As a result, there does not appear to be a significant economic difference between the alignments with regard to transportation benefits.

The design for the proposed Ambler road is still preliminary and the construction cost estimates reflect broad assumptions based on limited data and would be more fully resolved during the project’s design and construction phases. Appendix C of the BLM EIS contains construction and annual operations and maintenance cost information for the entire road and all associated project elements. The BLM EIS Alternative B, which includes the NPS southern alignment, has a higher overall 50-year total lifecycle cost than the BLM EIS Alternative A. The construction cost for Alternative A is estimated to be $1.537 billion; the costs for Alternative B are estimated to be $1.682 billion for the life of the road (a difference of over $144 million).

Comparative Analysis

The northern and southern alignments would both provide increased employment opportunities. Section 3.4.5 of the BLM Final EIS (BLM 2020) estimates that job creation directly related to road construction is expected to be approximately 7% greater on the southern alignment. For example, an estimated total of 680 jobs would be directly created annually by the construction of the entire proposed Ambler road under the northern alignment, while the southern alignment is estimated to directly support a total of 730 jobs annually. This translates into a cumulative total of 2,730 and 2,930 jobs respectively for the entire road over the estimated 4-year timeframe for Phase I and II construction (BLM 2020). The differences in construction and operation job creation numbers are directly related to the longer length and higher cost of the southern alignment. It is estimated that approximately 20% of the jobs for construction, operation, and maintenance would go to residents of the Northwest Arctic Borough and the Yukon Koyukuk Census Area, which are the two areas most affected by the proposed Ambler road (UA 2019). Approximately 81% of the jobs will go to local and non-local Alaska residents and approximately 19% of the jobs will be filled by non-residents (UA 2019).

Conclusion

The southern alignment—due to its greater length within the scope of the overall project—would have higher construction and overall life-cycle costs and would afford greater opportunities for job creation than the northern alignment. Total life-cycle differential cost is estimated at $144 million, with the southern alignment being more expensive. Development of the northern alignment could have a greater negative impact on the currently minimal float plane-based guiding businesses that emphasize remote and undeveloped wilderness recreation. Otherwise, the economic effects of the proposed Ambler road on businesses, communities, and individuals would not substantially differ between the northern and southern alignments. Positive and negative impacts of the project accrue primarily at a regional scale and do also affect nearby communities. The impacts, however, hinge to the greatest degree on the presence of a road and to a much lesser degree on the route alternative through the Preserve.

CHAPTER 4: CONSULTATION AND COORDINATION

This chapter summarizes the process undertaken by the NPS to contact individuals, communities, agencies, and organizations for information or that assisted in identifying important issues, analyzing impacts, or that will review and comment on the EEA. Throughout the planning process, NPS staff encouraged elected officials, culturally associated groups, partners in other agencies, park visitors, and private citizens to participate in this planning effort, as summarized below.

INTERNAL REVIEW

An NPS interdisciplinary team of GAAR and regional NPS staff was formed in May 2013 to prepare for review of AIDEA's application for a ROW. The interdisciplinary team determined NPS responsibilities in responding to the application. FHWA has provided extensive technical expertise on road design and ROW stipulations.

Formal internal discussions for the proposed Ambler road project started in Fall 2017 between NPS staff from GAAR and the Alaska Regional Office, the NPS Denver Service Center, FHWA, Western Federal Lands Division Office, and contractors. Internal discussions included the differences between the EEA and a NEPA document, the roles of NPS and BLM, the potential for public access, and resources that would be included or dismissed from detailed analysis in the EEA.

PUBLIC INVOLVEMENT

Public Scoping

The NPS sought public comment on the two alignments proposed by the applicant through the Preserve. The NPS was also interested in seeking public input in identifying issues relevant to analyzing the consequences of the two alignments.

The public comment period was open from September 27, 2017, through January 31, 2018. The Bureau of Land Management held 10 public meetings between November 13 and December 8, 2017, in communities that could be affected by the project; the NPS participated in these meetings. These meetings were held in the following communities or locations: Allakaket, Anaktuvuk, Alatna, Fairbanks, Wiseman, Anchorage, Ambler, Kotzebue, and Shungnak. The NPS distributed a project summary at these meetings and made the summary available online. Additionally, the NPS distributed postcards and newsletters and issued a press release. The NPS accepted comments on the project electronically through the NPS Planning, Environment and Public Comment (PEPC) website, by email, by fax, and by mail. The NPS welcomed comments from the public, as well as federal, state, and local agencies with jurisdiction by law or special expertise; non-governmental entities; and other interested and affected parties.

Nearly 15,600 pieces of correspondence from 29 states, the District of Columbia, and 2 other countries were received during the public comment period; however, more than 15,400 pieces of correspondence were form letters submitted by the National Parks Conservation Association and Wilderness Watch. Approximately 200 unique correspondences were entered into PEPC during the public comment period.

Interested parties will continue to be notified of the project's progress and are encouraged to visit the GAAR website at https://www.nps.gov/gaar/learn/management/ambler-row.htm to view information about this project.

Public Comments on the Draft

On August 23, 2019, the draft EEA and the DEIS were released, beginning the comment period that originally extended through October 7, 2019. Based on feedback from the public, the agencies extended the comment period to October 29, 2019, resulting in a 67-day comment period, 22 days longer than the required 45-day comment period for EISs.

BLM held 12 public meetings that the NPS also attended between Thursday, September 12 and Thursday, October 3, 2019. One meeting was held in Fairbanks, one was held in Washington, DC, and the remaining ten meetings were held in the following communities: in the following locations: Kotzebue, Ambler, Kobuk, Shungnak, Hughes, Bettles/Evansville, Allakaket, Alatna, Anaktuvuk Pass, and Coldfoot/Wiseman.

The public was encouraged to submit their comments on the draft EEA. The NPS received 2,958 pieces of correspondence from all 50 states, the District of Columbia, Puerto Rico, and Canada. Topics that rose to importance for many commenters included caribou, fish, subsistence hunters/fishers, water quality, permafrost, and Wild and Scenic Rivers. The NPS analyzed all pieces of correspondence received during the comment period when revising the final EEA. Substantive comments were coded to relevant topics, including natural and cultural resources, permafrost, hydrology, water quality, subsistence, and socioeconomics. This comment analysis assisted the team in identifying sections of the draft EEA, including proposed terms and conditions, that required refinement and revision. It also aided in organizing, clarifying, and addressing technical information within the final EEA.

AGENCY CONSULTATION

Coordination with the BLM EIS Process

BLM is the lead agency for permitting for the entire Ambler Mining District Industrial Access Project and is preparing an EIS to determine the impacts from the applicant-proposed 211-mile alignment, as well as other alternatives, for the construction and operation of a road to the Ambler mining district. The USACE and the USCG are cooperating agencies helping to prepare the EIS. The NPS is not a cooperating agency but is working closely with BLM, USACE, and USCG through the NEPA and EEA processes.

Endangered Species Act Section 7 Consultation

In accordance with federal and state requirements for special-status species, the NPS contacted the US Fish and Wildlife Service (USFWS) regarding listed species under USFWS jurisdiction via phone on July 10, 2018 and followed up with an email. The NPS and USFWS discussed the proposed Ambler road project, the project location, and the NPS conclusion that the proposed Ambler road project through NPS lands would not have an effect on any listed species. The USFWS responded via email, stating that they concur that the proposed Ambler road project would have no effect on listed species or designated critical habitat.

Similarly, the NPS contacted the National Oceanic and Atmospheric Association (NOAA) regarding listed species under NOAA jurisdiction via phone on July 9, 2018 and followed up with an email. NOAA responded in an email on July 9, 2018, stating NOAA concurrence is not necessary since the NPS has determined that the proposed Ambler road project would have no effect on listed species. Section 7 consultation is complete.

Section 106 of the National Historic Preservation Act Consultation and ANILCA Section 810 Analysis

BLM is conducting consultation for Section 106 of the National Historic Preservation Act and completing a Section 810 analysis for the entire proposed Ambler road, as required by ANILCA. The NPS is not required to do a separate Section 810 analysis for the portion of the road through NPS lands. The NPS and USACE are working closely with BLM to coordinate the Section 106 and Section 810 processes.

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APPENDIX A: FIGURES

List of Figures

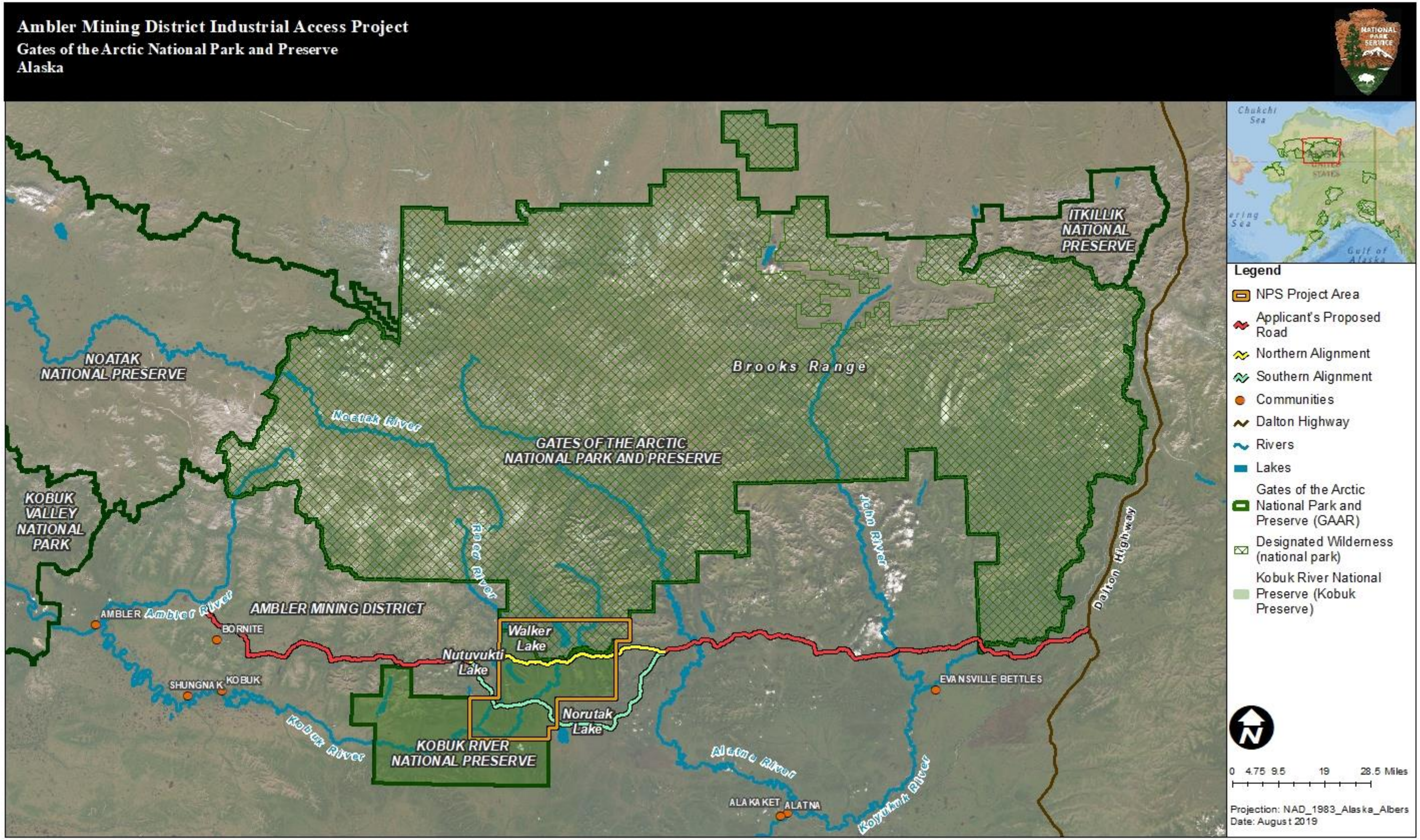


Figure 1. Gates of the Arctic National Park and Preserve and NPS Project Location

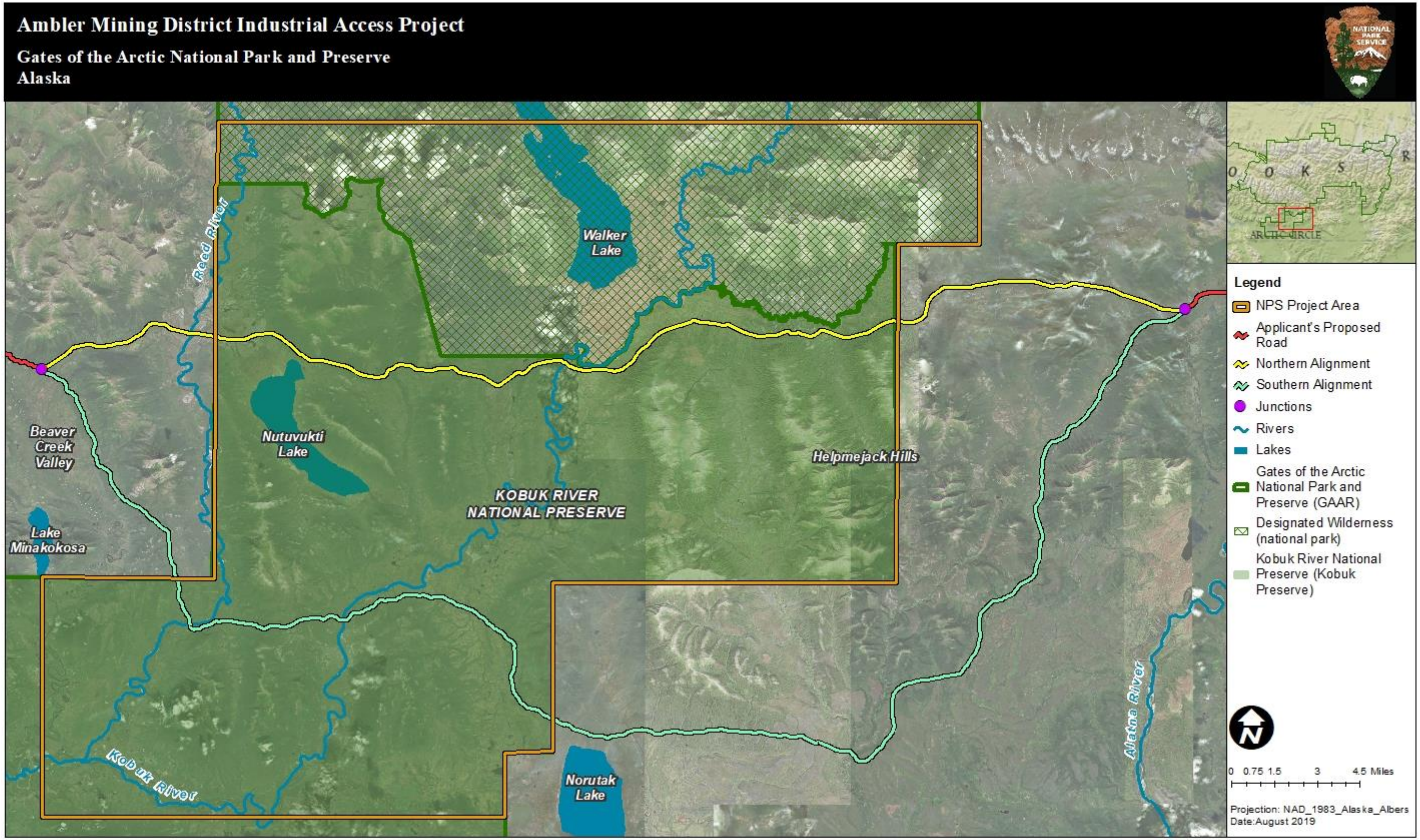
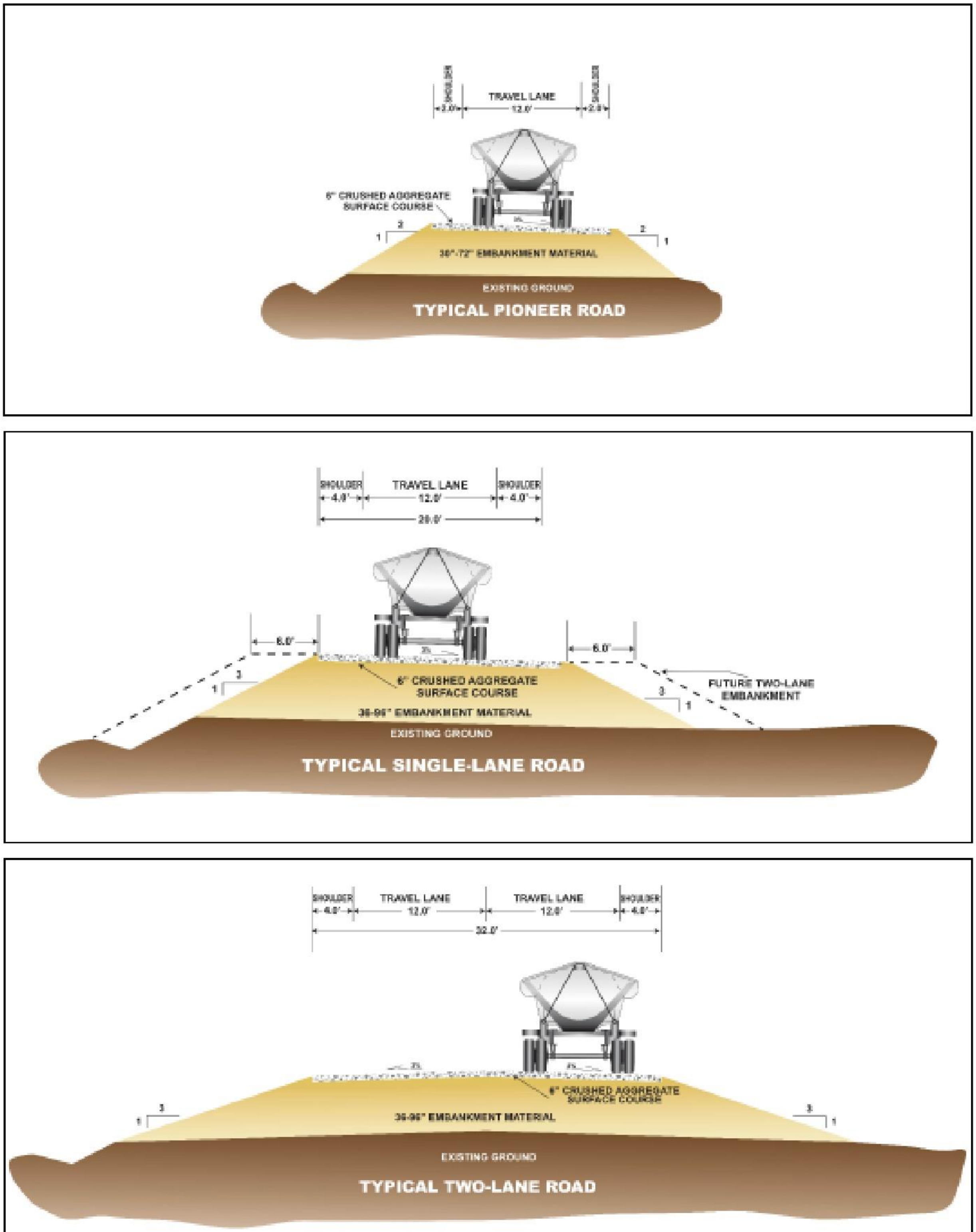


Figure 2. NPS Project Area Depicting the Northern Alignment and the Southern Alignment



Source: AIDEA 2016; The slopes presented in this figure provided by the applicant do not match the applicant's specifications in the SF299 narrative

Figure 3. Typical Sections for Phase I Pioneer Road, Phase II Single-Lane Road, and Phase III Two-Lane Road

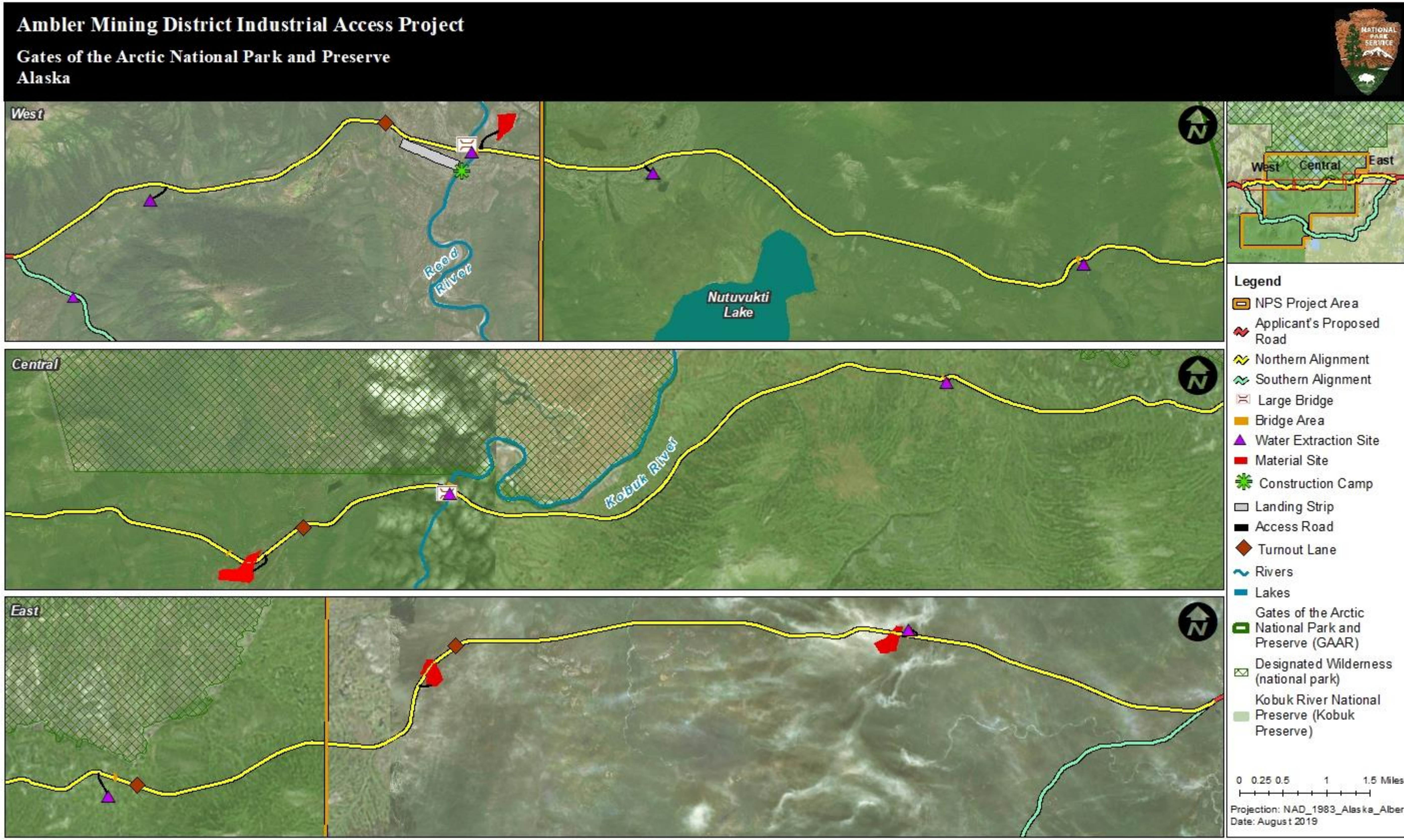
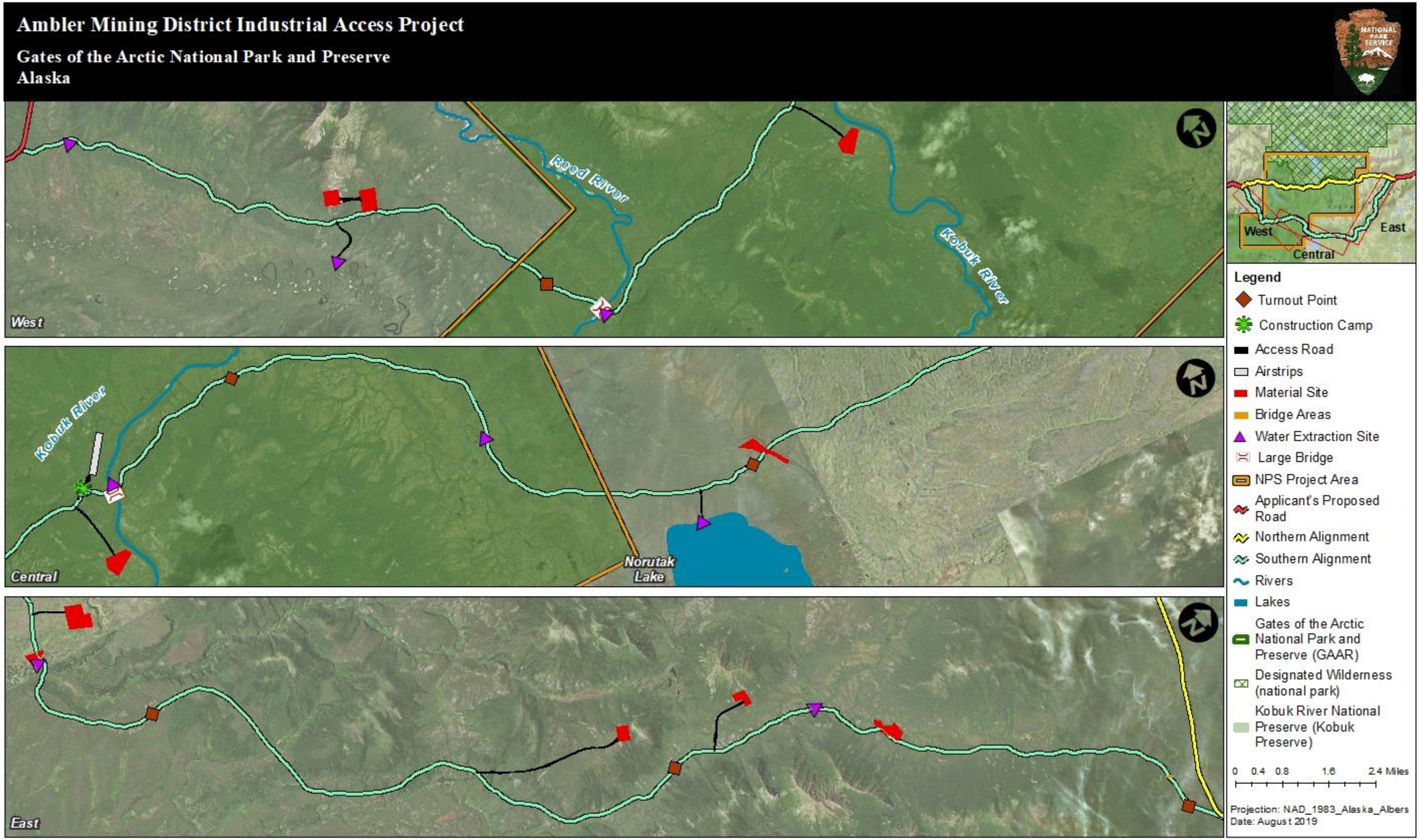


Figure 4. Northern Alignment with Road Support Features



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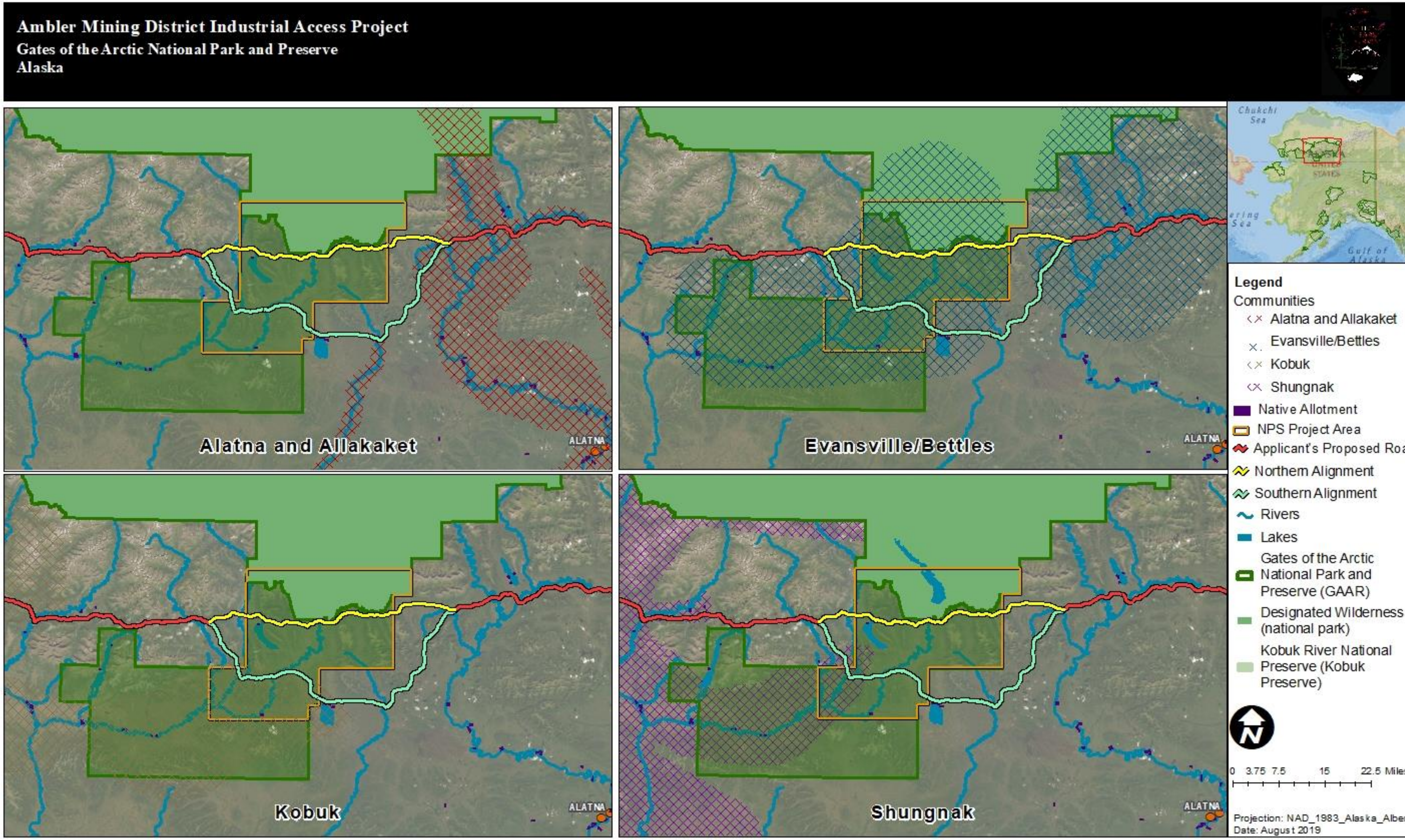

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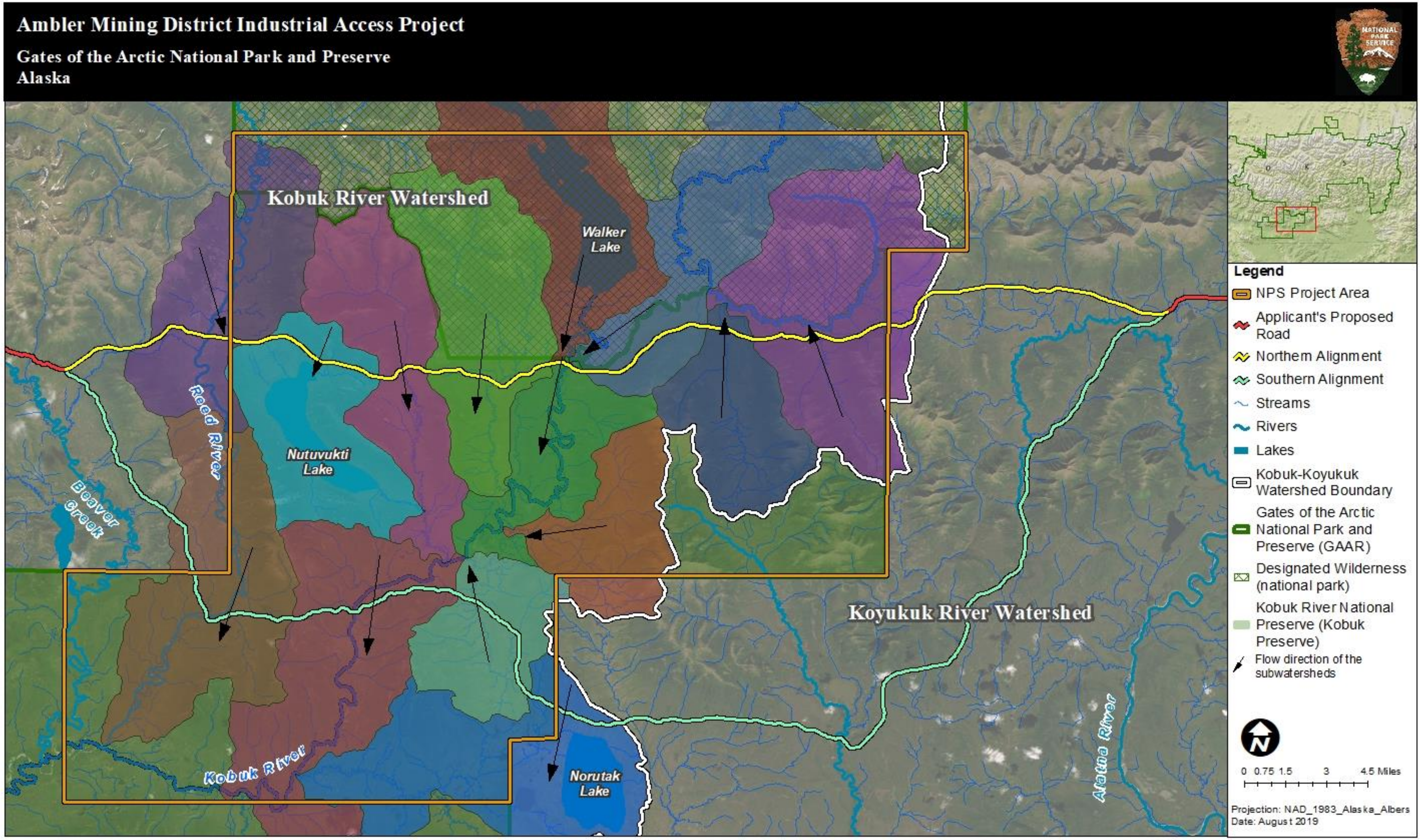
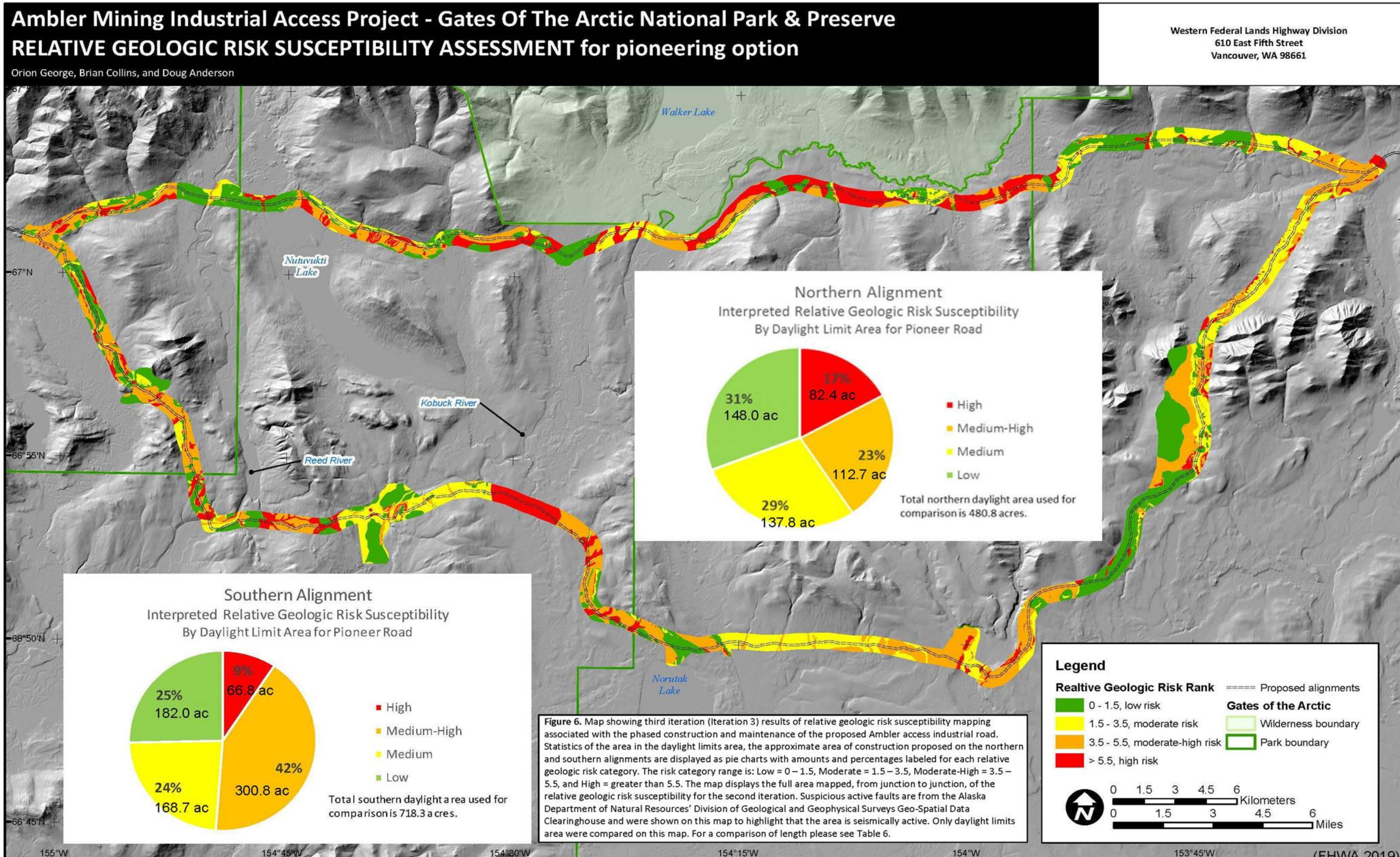


Figure 7. Direction of Flow of the Subwatersheds within the NPS Project Area



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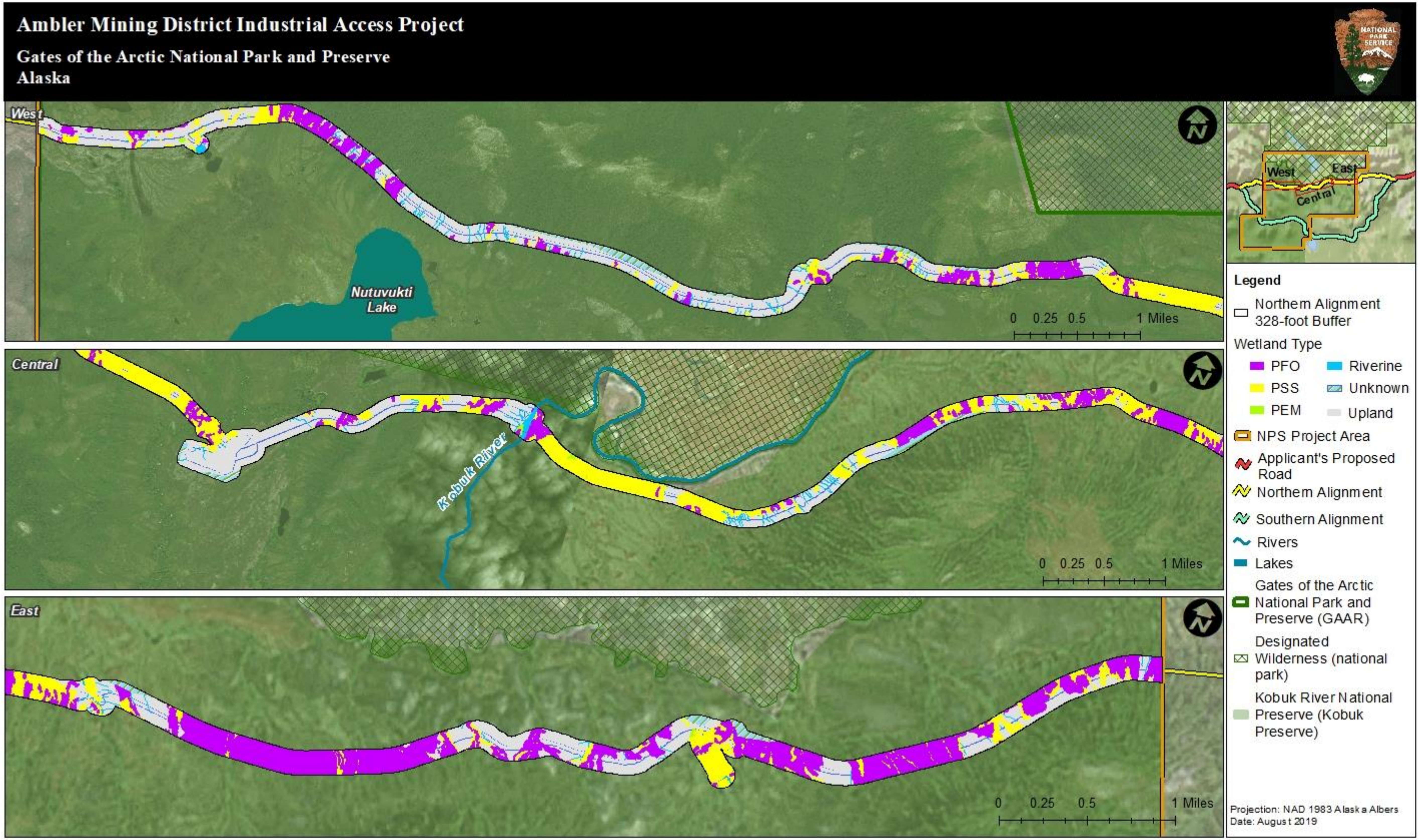

Figure 9. Wetlands Present along the Northern Alignment

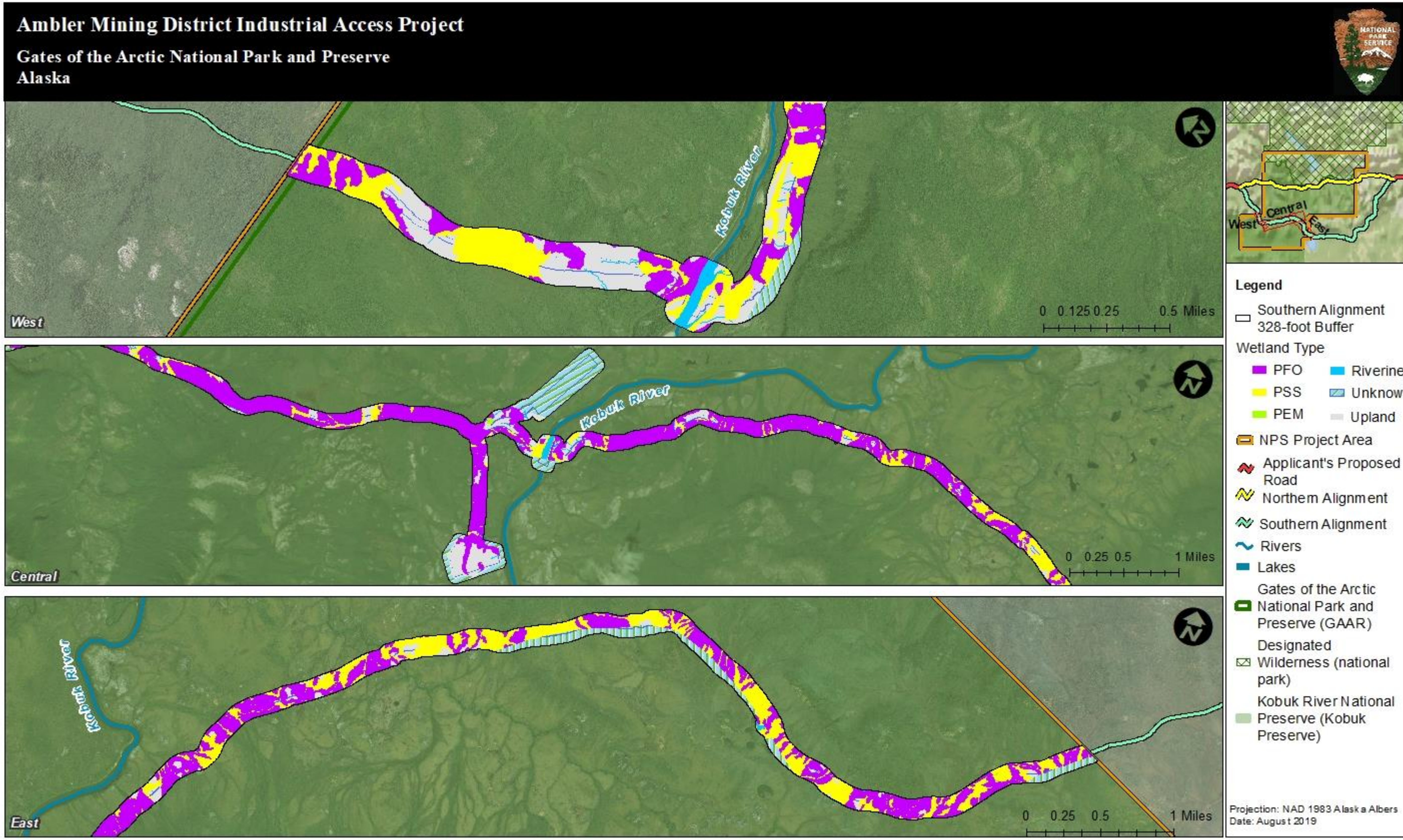

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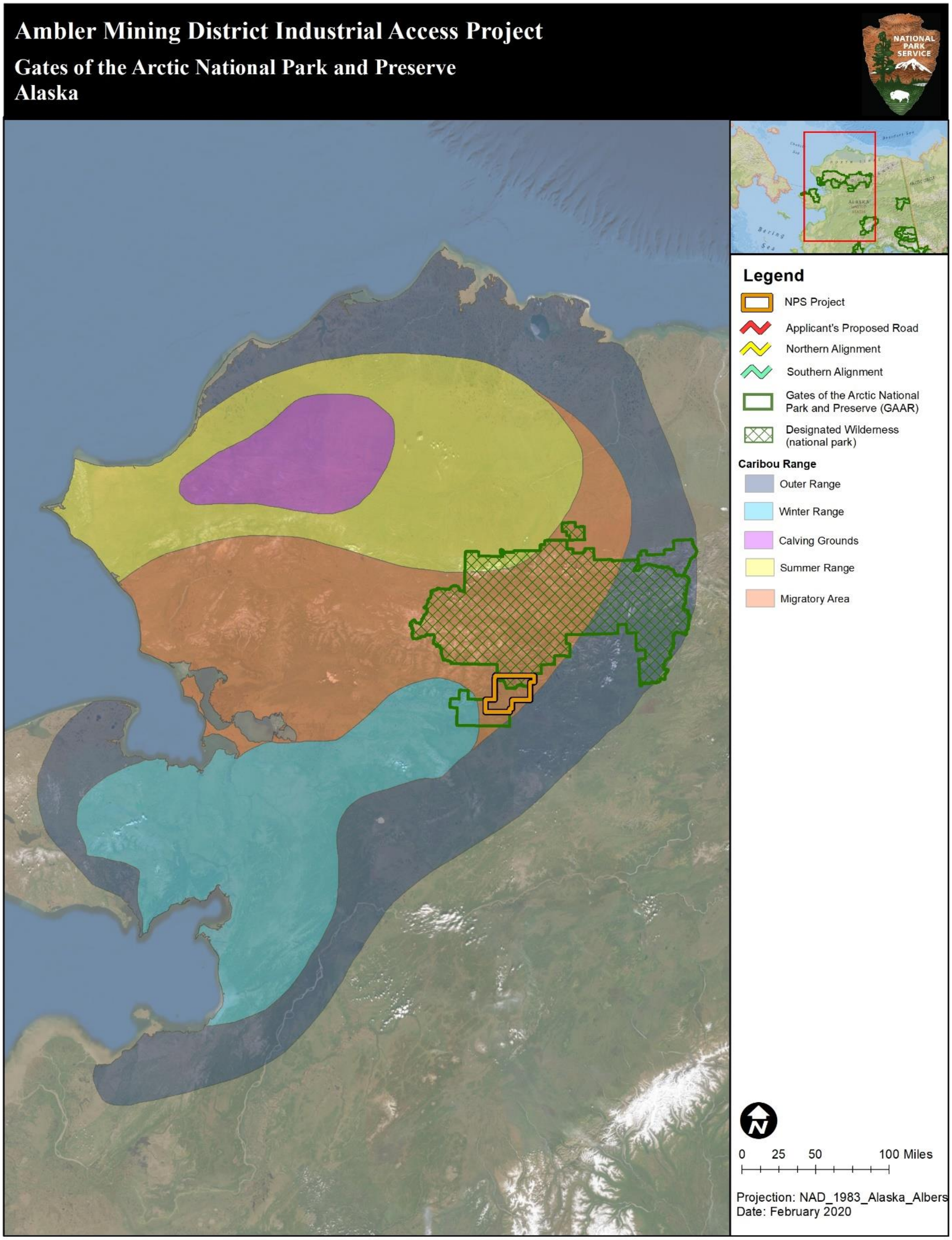
Figure



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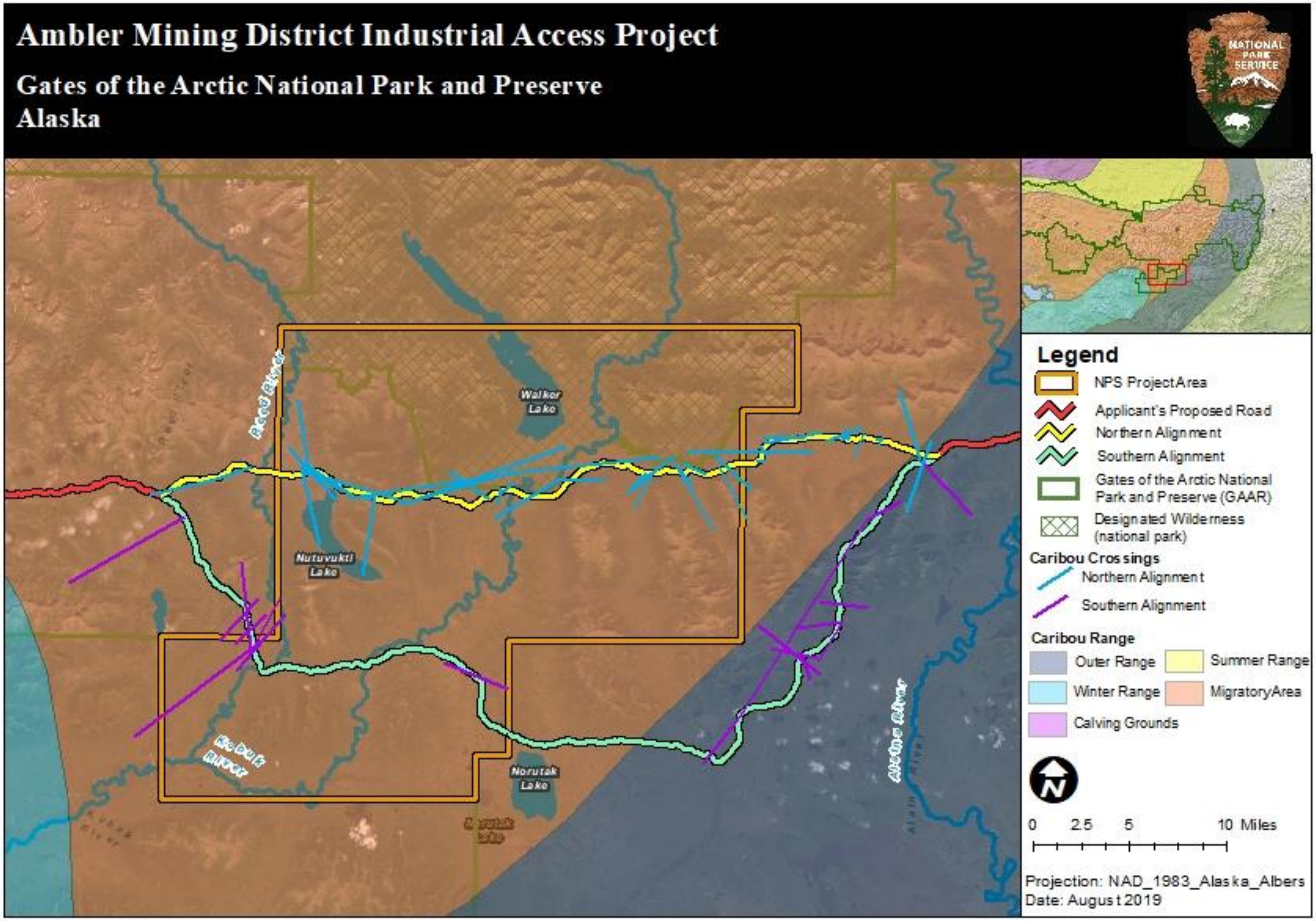

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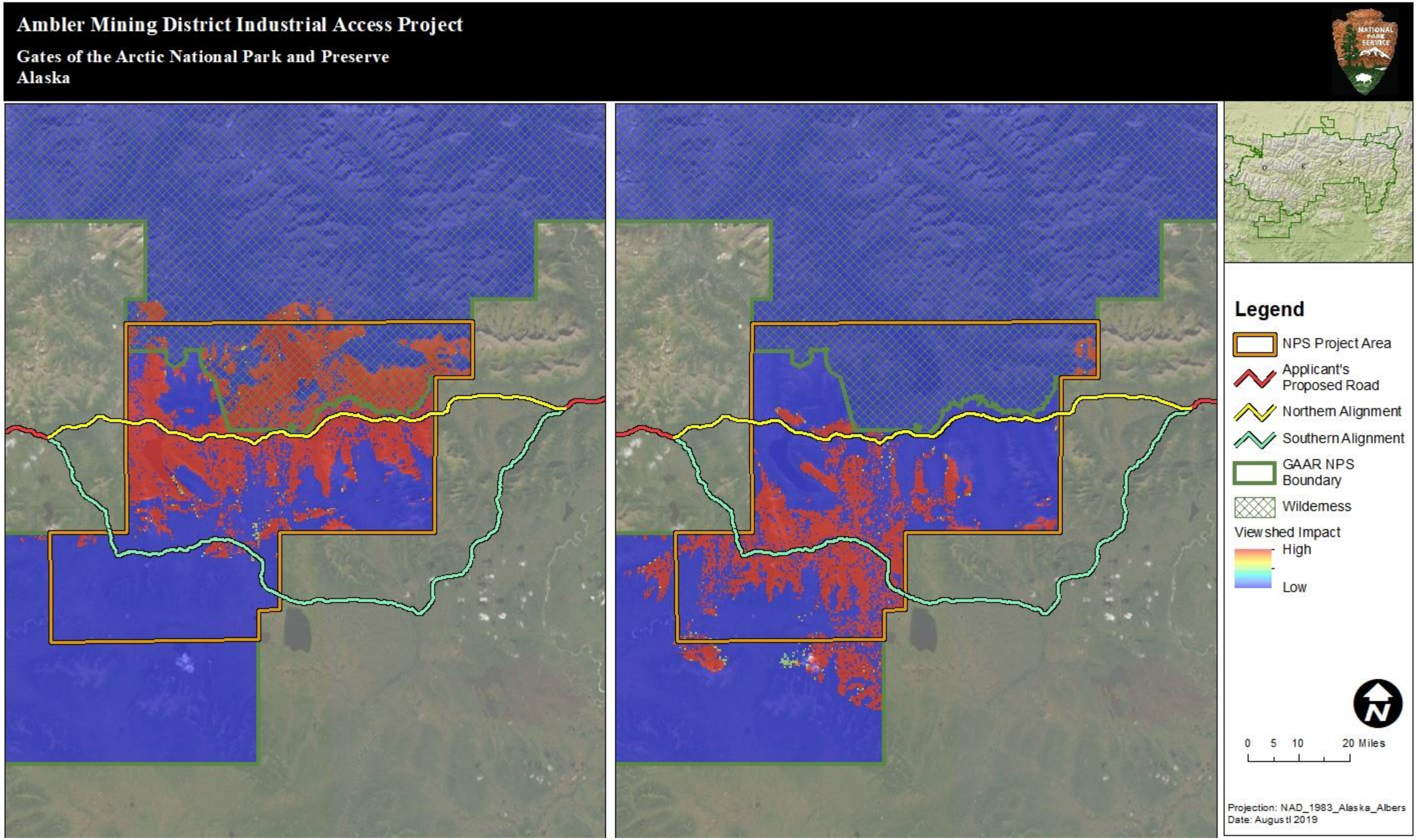

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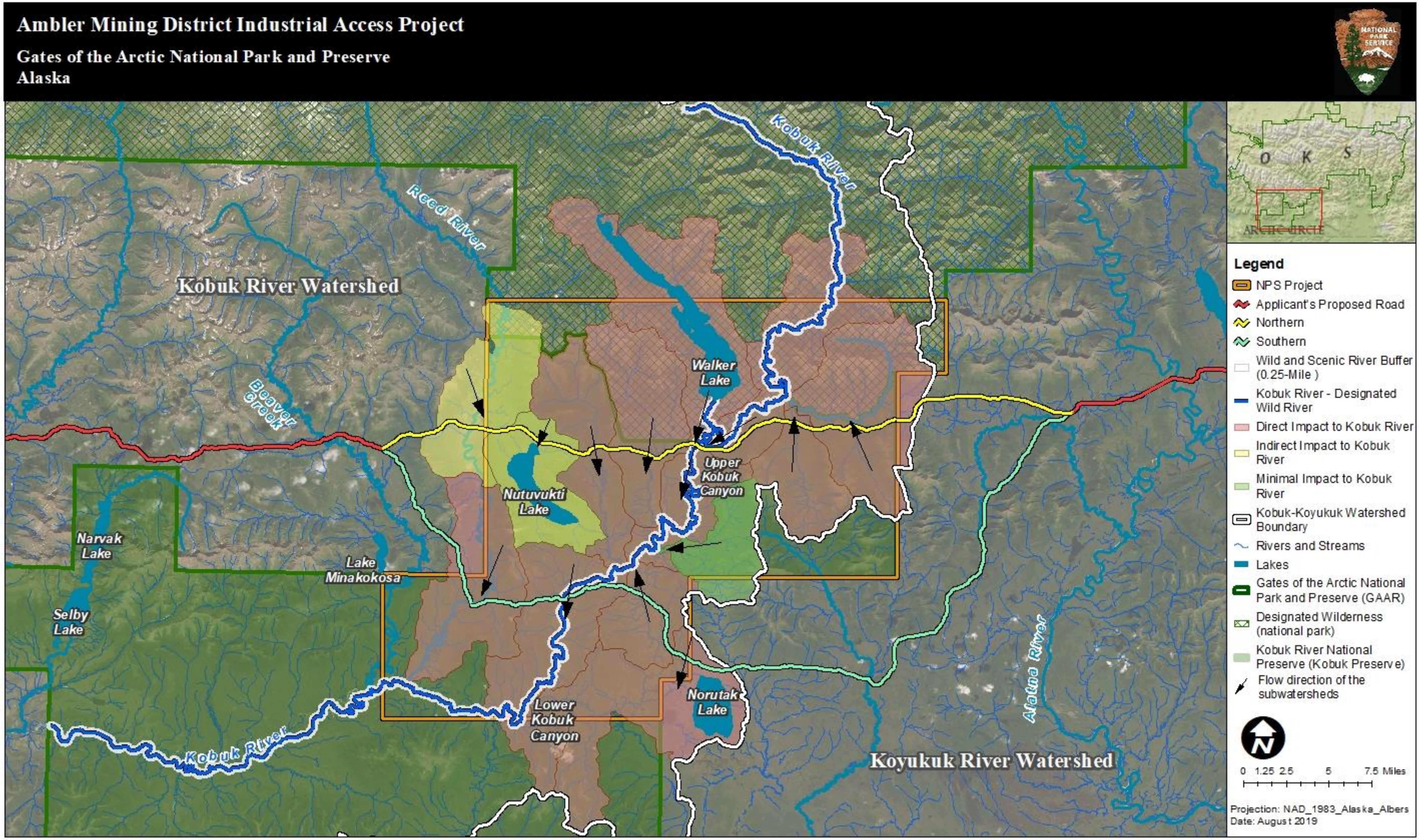

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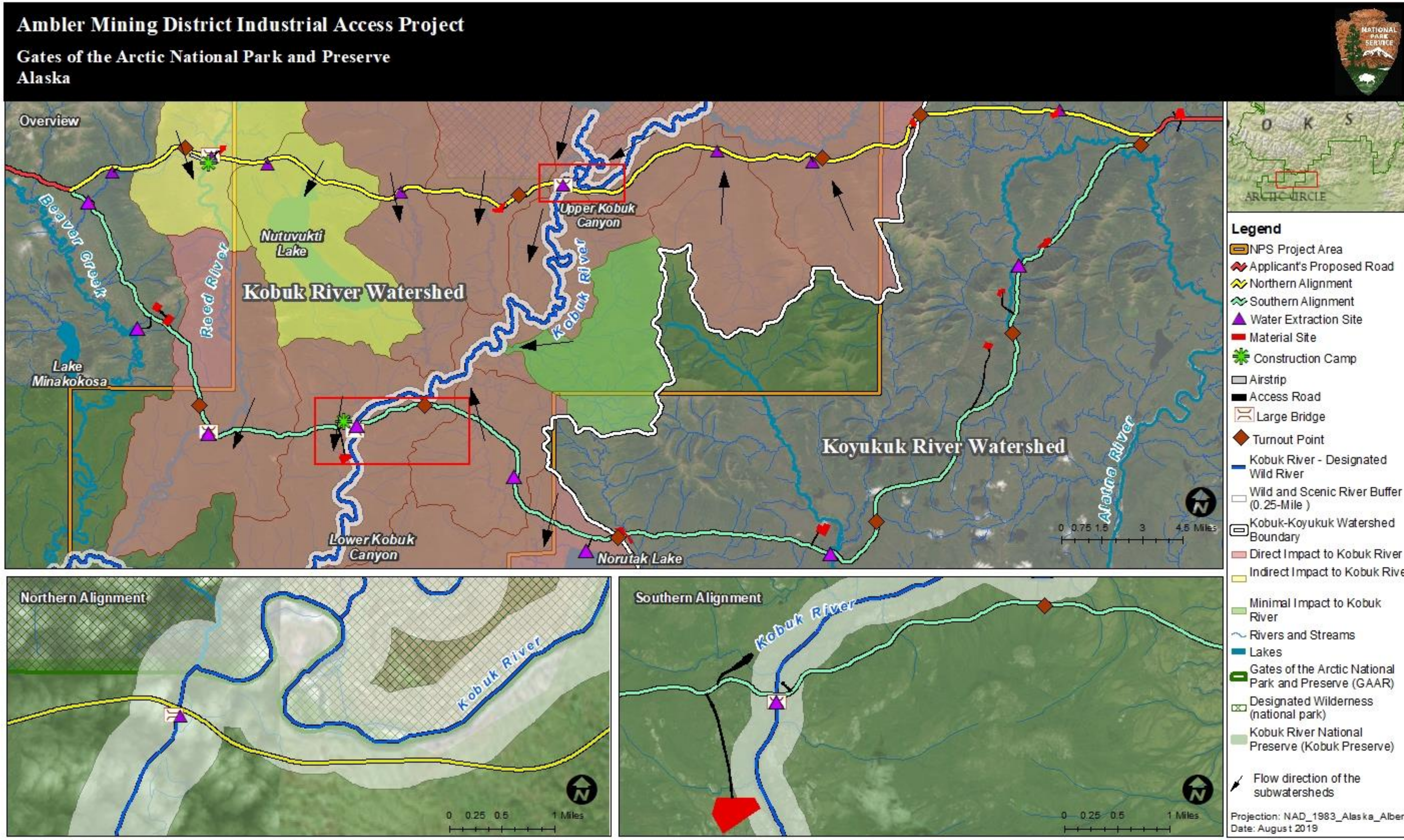

Figure 15. Details of the Proposed Bridge to Cross the Wild Designated Kobuk River for the Northern and Southern Alignments

APPENDIX B: REFERENCES

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APPENDIX C: RECOMMENDED MITIGATION MEASURES

RECOMMENDED MITIGATION MEASURES

As a part of the decision selecting a route through the Western Preserve Unit (Kobuk River, hereinafter "Preserve") of Gates of the Arctic National Park and Preserve (GAAR), the Secretary of the Interior and the Secretary of Transportation will identify the terms and conditions that may be required for the issuance of a right-of-way permit. This document identifies measures to avoid or minimize negative impacts and enhance positive impacts. The Bureau of Land Management (BLM) Final Environmental Impact Statement (EIS) (BLM 2020) presented Appendix N: Potential Mitigation, which identified and discussed the effectiveness of potential measures to avoid or minimize adverse impacts from the construction, operation, and maintenance of the proposed Ambler Mining District Industrial Access Project across its full length. The BLM has since refined this list, and the Army Corps of Engineers (ACOE) has added to it through their Ambler Road Joint Record of Decision (JROD).

The measures adopted in the JROD (Appendices C, D1, D2 and G [inclusive of Alaska Industrial Development and Export Authority's (AIDEA's) proposed design features]), are well-founded and could be modified for implementation by the National Park Service (NPS). For example, where a BLM mitigation measure requires authorization or some other action by the "Authorizing Officer," that measure would require authorization by the GAAR Authorized Officer, which in most cases would be the GAAR Superintendent or his/her designee. Adopting these measures modified for application within the Preserve would meet the standards established in Section 1107 of the Alaska National Interest Lands Conservation Act.

The following additional measures would further avoid or minimize impacts to Preserve resources:

1. Timely notification for the following types of incidents occurring within the Preserve: incidents that resulted in exceeding state water quality standards; incidents that altered stream banks, resulting in the stream leaving its normal channel; and fish kills. The purpose of timely notification of impacts to GAAR resources is to allow GAAR staff to participate in developing appropriate remedies.

2. The changes caused by construction and operation of the road and the passage of time (road life expected to be 50 years) likely will have altered original condition such that the restoration objective of returning to "original condition" may not best protect Preserve resources; in such cases, restoration within the Preserve should consider the best measures for the habitat as it exists at that time and include consultation with the NPS.

3. Construction activities (e.g., bridge construction over the Kobuk River) may pose risk to Preserve visitors and require short-term closures to protect visitor safety. The applicant will work with NPS staff to manage visitor safety and communicate information about potential closures with as much advanced notice as is feasible.

4. Constructed features within the 0.25-mile boundary of the Kobuk River will be minimized to the extent possible.

5. Activities in and constructed features within the 0.25-mile boundary of the Kobuk River may not interfere or impede stream flow of or transportation on the river. In addition to measures already included as design features or JROD mitigation, the need for riprap should be minimized by locating abutments out of the flood zone, or where possible, riprap should be placed above the ordinary high water mark. Where riprap cannot be eliminated, local material (from sources near GAAR) will be used to blend more closely with local rock substrate.

It was considered whether it would be beneficial if AIDEA immediately constructed the road to full depth embankment (Phase 2) throughout all of the Preserve, as opposed to requiring such construction only in areas containing thaw sensitive permafrost soils and emergent wetlands, as required by Corps of Engineers Special Conditions. Given the broad extent of thaw sensitive permafrost soils and emergent wetlands within the Preserve, any additional mitigating effects from remaining areas would be nominal, and therefore this design determination is appropriately left to the applicant.