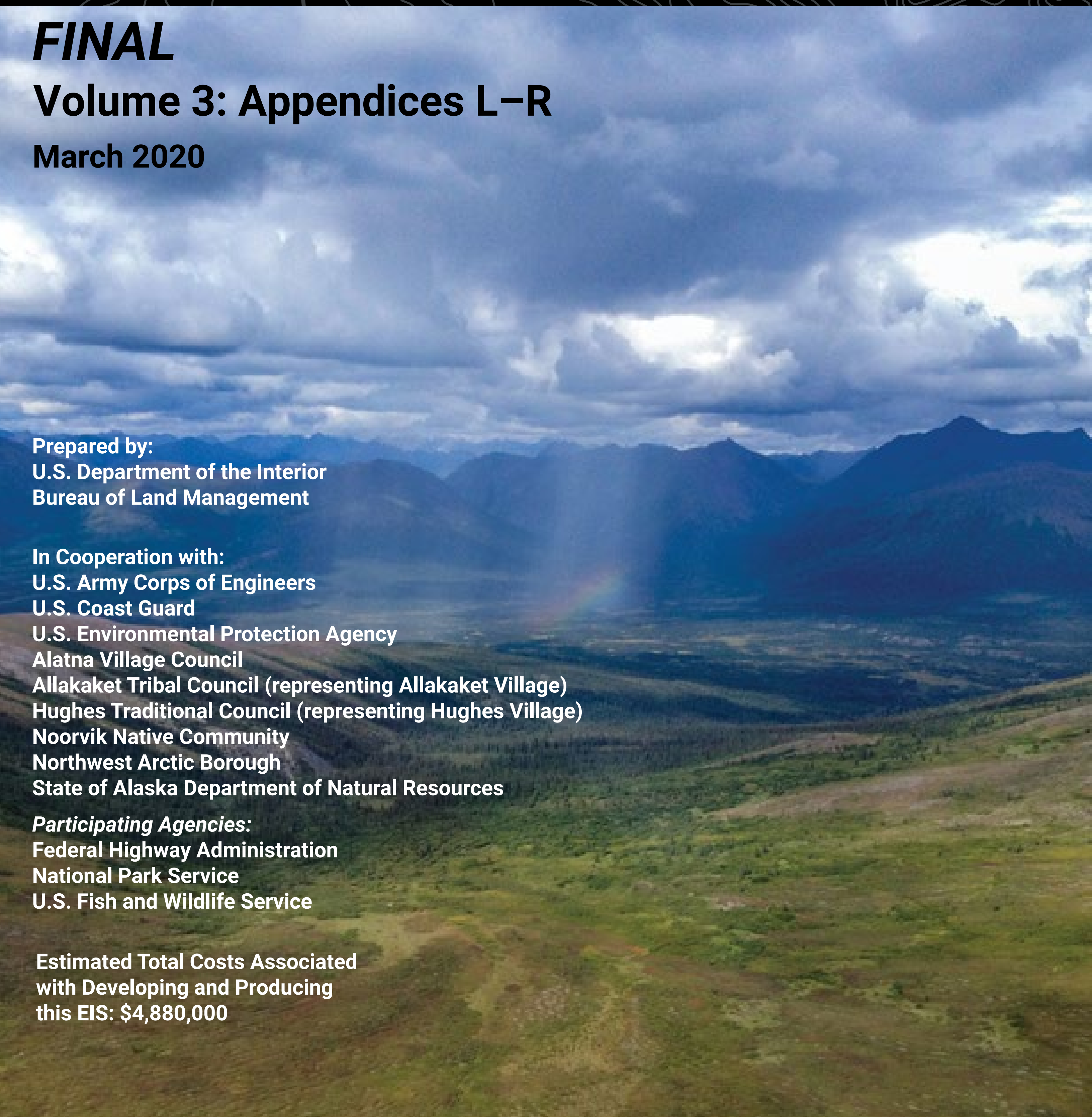
U.S. Department of the Interior
Bureau of Land Management

Ambler Road

Environmental Impact Statement



FINAL

Volume 3: Appendices L–R

March 2020

Prepared by:
U.S. Department of the Interior
Bureau of Land Management

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Environmental Protection Agency
Alatna Village Council
Allakaket Tribal Council (representing Allakaket Village)
Hughes Traditional Council (representing Hughes Village)
Noorvik Native Community
Northwest Arctic Borough
State of Alaska Department of Natural Resources

Participating Agencies:
Federal Highway Administration
National Park Service
U.S. Fish and Wildlife Service

Estimated Total Costs Associated with Developing and Producing this EIS: $4,880,000

Mission

Sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Cover Photo: Looking north at the Brooks Range from the Alatna Hills. Photo by Crystal Glassburn (BLM).

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Appendix L:

Subsistence Technical Report

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List of Acronyms

AAC	Alaska Administrative Code
ADF&G	Alaska Department of Fish and Game
AIDEA	Alaska Industrial Development and Export Authority
AMDIAR	Ambler Mining District Industrial Access Road
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ATV	All-terrain vehicle
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DMTS	Delong Mountain Transportation System
DOI	Department of the Interior
EIS	Environmental Impact Statement
FWS	U.S. Fish and Wildlife Service
GAAR	Gates of the Arctic National Park and Preserve
GMU	Game Management Unit
GPS	Global positioning system
HHH	Hodzana Hills Caribou Herd
NPS	National Park Service
ROW	Right-of-way
SLM	Small Land Mammals
SRB&A	Stephen R. Braund & Associates
TH	Teshekpuk Herd
WAH	Western Arctic Caribou Herd
WG	Working Group

1. Introduction

The Alaska Industrial Development and Export Authority (AIDEA) is proposing to construct an all-season industrial access transportation corridor extending from the Dalton Highway to the Ambler Mining District in Northwest Alaska. The road would provide access for exploration and development of the Ambler Mining District and is referred to as the Ambler Mining District Industrial Access Road (AMDIAR). The U.S. Bureau of Land Management (BLM) is developing an Environmental Impact Statement (EIS) in response to a right-of-way (ROW) application from AIDEA. The EIS will analyze the potential impacts of the road on physical characteristics, biological resources, and social systems, including subsistence uses and resources. This Subsistence Technical Report has been prepared to inform the affected environment and environmental consequences section of the Ambler Road EIS. The report provides an overview of subsistence uses in potentially affected communities and regions, in addition to a discussion of the potential impacts of the AMDIAR on subsistence resources and uses.

2. Study Area

The subsistence study area for the Ambler Road EIS includes communities that harvest subsistence resources within or near the project area, use project area to access subsistence use areas, or harvest resources that migrate through the project area and are later harvested elsewhere. For the purposes of the subsistence analysis, to capture the above study communities, the study team included any community located within 50 miles of one more of the project alternatives, and any community with documented subsistence use areas within 30 miles of one or more of the project alternatives. These criteria aim to capture communities that may experience direct or indirect impacts on their subsistence uses resulting from construction and operation of the AMDIAR. Based on the criteria, there are 27 primary subsistence study communities (see Table 1 and Map 1). The study team grouped these subsistence study communities into five primary regions based on their location. These regions include Kobuk River region, Kotzebue Sound region, Koyukuk River region, Tanana River region, and Yukon River region. In addition, the project is within the range of the Western Arctic Caribou Herd (WAH), a highly migratory and important subsistence resource to communities in Western and Northwestern Alaska. This section includes a separate subset of the 42 members of the WAH working group (WG) (Map 1); these caribou subsistence study communities are referred to as the WAH study communities and include 16 of the subsistence study communities listed in Table 1. Inclusion of the WAH study communities captures potential indirect or cumulative impacts to communities who use caribou that migrate through the project area and are later harvested elsewhere.

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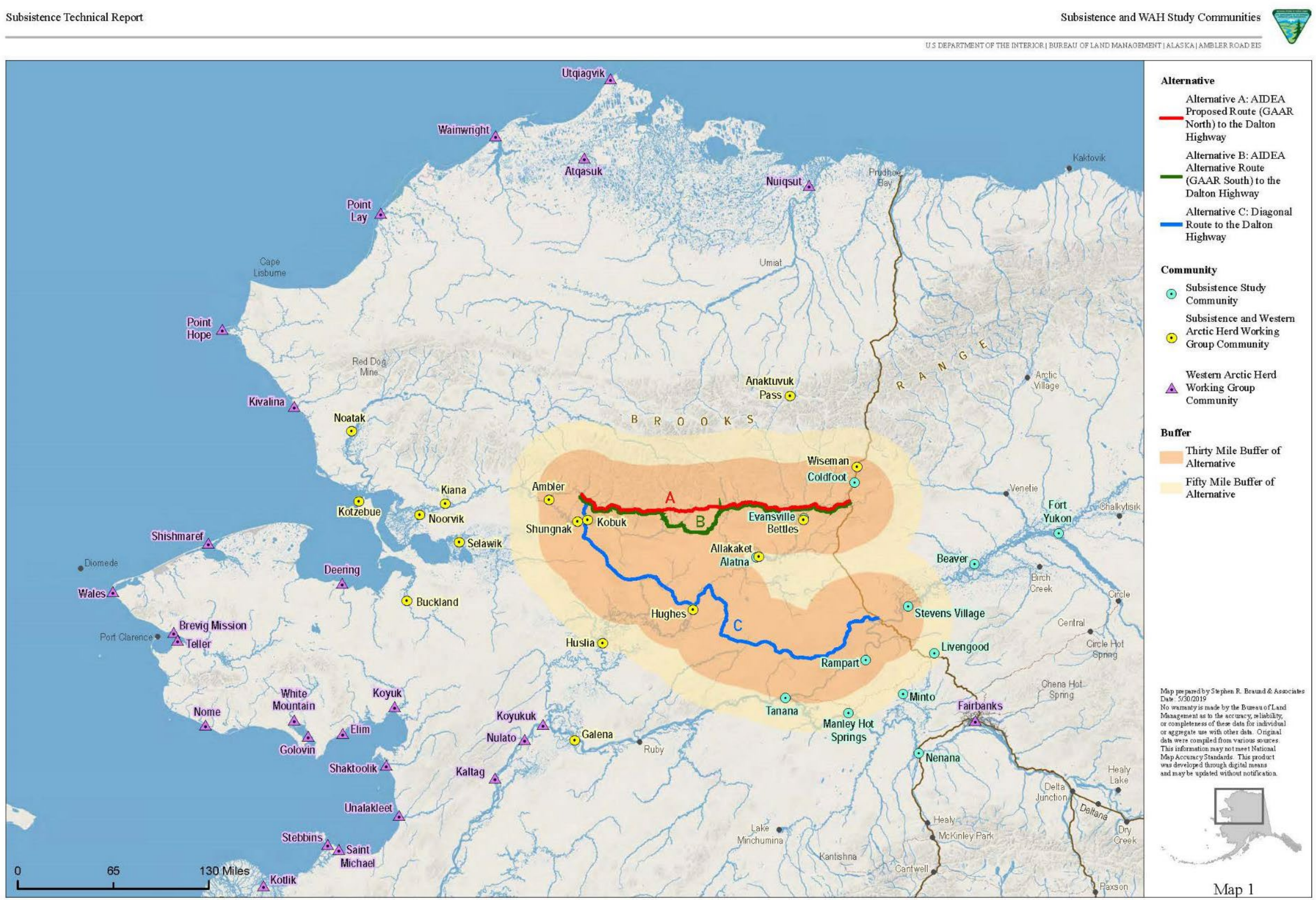

Map 1. Subsistence and Western Arctic Caribou Herd study communities

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Table 1. Ambler Road EIS subsistence and WAHWG study communities

Study community number	Study community	Study community type	Community within 50 miles	Community use areas overlap the project	Community use areas within 30 miles	Member of WAHWG	Subsistence study community study region
1	Alatna	SUB	Yes	Yes	Yes	Yes	Koyukuk River
2	Allakaket	SUB/WAH	Yes	Yes	Yes	Yes	Koyukuk River
3	Ambler	SUB/WAH	Yes	Yes	Yes	Yes	Kobuk River
4	Anaktuvuk Pass	SUB/WAH	No	Yes	Yes	Yes	Koyukuk River
5	Atqasuk	WAH	No	No	No	Yes	N/A
6	Beaver	SUB	No	No	Yes	No	Yukon River
7	Bettles	SUB/WAH	Yes	Yes	Yes	Yes	Koyukuk River
8	Brevig Mission	WAH	No	No	No	Yes	N/A
9	Buckland	SUB/WAH	No	No	Yes	Yes	Kotzebue Sound
10	Coldfoot	SUB	Yes	Yes	Yes	No	Koyukuk River
11	Deering	WAH	Yes	No	No	Yes	N/A
12	Elim	WAH	Yes	No	No	Yes	N/A
13	Evansville	SUB	Yes	Yes	Yes	No	Koyukuk River
14	Fairbanks	WAH	No	No	No	Yes	N/A
15	Galena	SUB/WAH	No	Yes	Yes	Yes	Yukon River
16	Golovin	WAH	Yes	No	No	Yes	N/A
17	Hughes	SUB/WAH	Yes	Yes	Yes	Yes	Koyukuk River
18	Huslia	SUB/WAH	Yes	No	No	Yes	Koyukuk River
19	Kaltag	WAH	No	No	No	Yes	N/A
20	Kiana	SUB/WAH	No	Yes	Yes	Yes	Kobuk River
21	Kivalina	WAH	Yes	No	No	Yes	N/A
22	Kobuk	SUB/WAH	Yes	Yes	Yes	Yes	Kobuk River
23	Kotlik	WAH	No	No	No	Yes	N/A
24	Kotzebue	SUB/WAH	No	No	Yes	Yes	Kotzebue Sound
25	Koyuk	WAH	Yes	No	No	Yes	N/A
26	Koyukuk	WAH	No	No	No	Yes	N/A
27	Livengood	SUB	Yes	No	No	No	Yukon River

Study community number	Study community	Study community type	Community within 50 miles	Community use areas overlap the project	Community use areas within 30 miles	Member of WAHWG	Subsistence study community study region
28	Manley Hot Springs	SUB	Yes	No	Yes	No	Tanana River
29	Minto	SUB	Yes	No	Yes	No	Tanana River
30	Nenana	SUB	No	No	Yes	No	Tanana River
31	Noatak	SUB/WAH	No	No	Yes	Yes	Kotzebue Sound
32	Nome	WAH	No	No	No	Yes	N/A
33	Noorvik	SUB/WAH	No	No	Yes	Yes	Kobuk River
34	Nuiqsut	WAH	No	No	No	Yes	N/A
35	Nulato	WAH	No	No	No	Yes	N/A
36	Point Hope	WAH	No	No	No	Yes	N/A
37	Point Lay	WAH	No	No	No	Yes	N/A
38	Rampart	SUB	Yes	Yes	Yes	No	Yukon River
39	Selawik	SUB/WAH	No	Yes	Yes	Yes	Kotzebue Sound
40	Shaktoolik	WAH	No	No	No	Yes	N/A
41	Shishmaref	WAH	No	No	No	Yes	N/A
42	Shungnak	SUB/WAH	Yes	Yes	Yes	Yes	Kobuk River
43	St. Michael	WAH	No	No	No	Yes	N/A
44	Stebbins	WAH	No	No	No	Yes	N/A
45	Stevens Village	SUB	Yes	Yes	Yes	No	Yukon River
46	Tanana	SUB	Yes	Yes	Yes	No	Tanana River
47	Teller	WAH	No	No	No	Yes	N/A
48	Unalakleet	WAH	No	No	No	Yes	N/A
49	Utqiagvik	WAH	No	No	No	Yes	N/A
50	Wainwright	WAH	No	No	No	Yes	N/A
51	Wales	WAH	No	No	No	Yes	N/A
52	White Mountain	WAH	Yes	No	No	Yes	N/A
53	Wiseman	SUB/WAH	Yes	Yes	Yes	Yes	Koyukuk River

Note: SUB = Subsistence Study Community; WAH = Western Arctic Caribou Herd Working Group Study Community; WAHWG = Western Arctic Caribou Herd Working Group

3. Subsistence Definition and Regulatory Setting

Subsistence uses are central to the customs and traditions of indigenous peoples in Alaska. Subsistence customs and traditions encompass processing, sharing networks, cooperative and individual hunting, fishing, gathering, and ceremonial activities. These activities are guided by traditional knowledge based on a long-standing relationship with the environment. Both federal and state regulations define subsistence uses to include the customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses (Alaska National Interest Lands Conservation Act [ANILCA], Title VIII, Section 803, and Alaska Statute 16.05.940[33]). The Alaska Federation of Natives views subsistence to not only encompass the practices of hunting, fishing, and gathering but as a way of life that has sustained Alaska Natives for thousands of years and a set of values associated with those practices (Alaska Federation of Natives 2012).

Subsistence fishing and hunting are traditional activities that include transmission of traditional knowledge between generations, maintain the connection of people to their land and environment, and support healthy diet and nutrition in rural communities in Alaska. The Alaska Department of Fish and Game (ADF&G) estimates that the annual wild food harvest in rural areas Interior Alaska is approximately 6.4 million pounds or 613 pounds per person per year, and in the Arctic it is approximately 10.5 million pounds or 516 pounds per person per year (Wolfe 2000). Subsistence harvest levels vary widely among individuals in a community, from one community to the next, and from year to year. Sharing of subsistence foods is common in rural Alaska and can exceed 80 percent of households giving or receiving resources (ADF&G 2019). Sharing does not just occur between households within a community; sharing is based on social and kinship ties, which form complex social networks that connect communities and regions. Documentation of social networks for just three communities in the Upper Kobuk Region documented sharing ties that extended from Northwest Alaska to the major urban centers of Alaska, the North Slope, other Northwest communities, Southeast, Southwest, and Interior Alaska, during a single study year (Braem et al. 2015). Sharing activities strengthen and affirm kinship and social ties, and are integral to maintaining the cultural identity of subsistence users. The term harvest and its variants – harvesters and harvested – are used as the inclusive term to characterize the broad spectrum of subsistence activities, including hunting, fishing, trapping, and gathering.

Subsistence is part of a rural economic system called a “mixed, subsistence-market” economy, wherein families invest money into small-scale, efficient technologies to harvest wild foods (Wolfe 2000). According to Wolfe and Walker (1987), fishing and hunting for subsistence resources provides a reliable economic base for rural regions; these important activities are conducted by domestic family groups who have invested in subsistence equipment such as fish wheels, gillnets, motorized skiffs, rifles, traps, all-terrain vehicles (ATVs), and snowmachines. Subsistence is not oriented toward sales, profits, or capital accumulation (commercial market production) but is focused toward meeting the self-limiting needs of families and their extended kin and communities. Participants in this mixed economy in rural Alaska augment their subsistence production by cash employment. Cash (from activities such as commercial fishing, trapping, and/or wages from public sector employment, construction, firefighting, oil and gas industry, or other services) provides the means to purchase the equipment, supplies, and gas used in subsistence activities. The combination of subsistence and commercial-wage activities provides the economic basis for the way of life so highly valued in rural communities (Wolfe and Walker 1987). Data show that subsistence in rural Alaska has remained stable over time, with the exception of some regional variation, regardless of income levels (Burnsilver et al. 2016). Thus, while the mixed cash economy is an important feature of subsistence in Alaska, economic growth or decline is not necessarily associated with corresponding increases or decreases in subsistence harvests.

Participation in subsistence activities promotes transmission of traditional knowledge from generation to generation and serves to maintain peoples' connection to the physical and biological environment. The subsistence way of life encompasses cultural values such as sharing, respect for elders, respect for the environment, hard work, and humility. In addition to being culturally important, subsistence is a critical source of nutrition for residents in areas of Alaska where food prices are high. While some people earn income from employment, these and other residents rely on subsistence to sustain them throughout the year and, as noted above, use money from the cash economy to support subsistence activities. Furthermore, subsistence activities support a healthy diet and contribute to residents' and communities' social, spiritual, and physical well-being.

In the State of Alaska, subsistence is regulated in multiple ways including federal and state regulations and local traditions, norms, and values that guide subsistence hunting and fishing practices. The AMDIAR is located on state, federal (BLM, National Park Service [NPS], and U.S. Fish and Wildlife Service [FWS]), and private (including Native corporation) lands. The federal and state governments regulate subsistence hunting and fishing in the state under a dual-management system. The federal government recognizes subsistence priorities for rural residents on federal public lands, while Alaska considers all residents to have an equal right to hunt and fish when resource abundance and harvestable surpluses are sufficient to meet the demand for all subsistence and other uses.

The U.S. Congress adopted ANILCA recognizing that "the situation in Alaska is unique" regarding food supplies and subsistence practices. ANILCA specifies that any decision to withdraw, reserve, lease, or permit the use, occupancy, or disposition of public lands must evaluate the effects of such decisions on subsistence uses and needs (16 U.S. Code 3111–3126). In 1990, the U.S. Department of the Interior (DOI) and the U.S. Department of Agriculture established a Federal Subsistence Board to administer the Federal Subsistence Management Program (55 Federal Register 27114). The Federal Subsistence Board, under Title VIII of ANILCA and regulations at 36 Code of Federal Regulations (CFR) 242.1 and 50 CFR 100.1, recognizes and regulates subsistence practices for rural residents on federal lands. Federal regulations recognize subsistence activities based on a person's residence in Alaska, defined as either rural or nonrural. Only individuals who permanently reside outside federally designated nonrural areas are considered rural residents and qualify for subsistence harvesting on federal lands under federal subsistence regulations. Nonrural residents may harvest fish and game on most federal lands (unless these are closed to non-federally qualified subsistence uses), but these harvests occur under state regulations. The Fairbanks nonrural area is the closest nonrural area to the project area. All of the 27 subsistence study communities are located outside federal nonrural areas and therefore are qualified as subsistence users on most federal lands.

The Alaska Board of Fisheries and the Alaska Board of Game have adopted regulations enforced by the state for subsistence fishing and hunting on all state lands (except nonsubsistence areas) and waters, and private lands, including those lands conveyed to Alaska Native Claims Settlement Act (ANCSA) groups. State law is based on Alaska Statute 16 and Title 5 of the Alaska Administrative Code (AAC) (05 AAC 01, 02, 85, 92, and 99) and regulates state subsistence uses. Under Alaska law, when there is sufficient harvestable surplus to provide for all subsistence and other uses, all Alaskan residents qualify as eligible subsistence users.

The state distinguishes subsistence harvests from personal use, general hunting, sport, or commercial harvests based on where the harvest occurs and the resource being harvested, not where the harvester resides (as is the case under federal law). More specifically, state law provides for subsistence hunting and fishing regulations in areas outside the boundaries of "nonsubsistence areas," as defined in state regulations (5 AAC 99.015). According to these regulations, a nonsubsistence area is "an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community" (5 AAC 99.016).

Activities permitted in these nonsubsistence areas include general hunting and personal use, sport, guided sport, and commercial fishing. There is no subsistence priority in these areas; therefore, no subsistence hunting or fishing regulations manage the harvest of resources. The closest state nonsubsistence area to the project is the Fairbanks Nonsubsistence Area. The entire project lies outside state nonsubsistence areas and therefore hunting and fishing on state lands in the project area may qualify as subsistence under state regulations.

4. Data Sources

Sources of subsistence data for the study communities are provided in Table 2, which shows data that can be incorporated into subsistence use area maps, tables, and figures discussed in Section 5 "Overview of Subsistence Uses." Additional data on subsistence include ethnographic studies on harvest methods, traditional knowledge studies, or subsistence studies which are specific to a geographic area or season. These sources are not shown in Table 2 because they include data which are not comparable to other comprehensive data sources within the region or because they provide qualitative information and cannot be incorporated into study maps, tables, or figures.

4.1. Harvest Data

Harvest data for the study communities are available primarily through the ADF&G, Division of Subsistence, although other agencies or entities have periodically conducted subsistence harvest studies in the region. Harvest data provide quantitative estimates of the amount of fish and game harvested by each study community, by subsistence species, in addition to household-level harvest and participation rates. They are useful for analyzing community harvests and uses (e.g., household participation and sharing) over time, for determining community harvest levels by species, and for comparing subsistence resources to one another in terms of household uses and harvests. Harvest data accuracy depends on various factors, including survey sample sizes and the accuracy of harvester recall. However, they are generally the only source of information for quantitative community-wide harvests for all resources and are collected throughout Alaska. Subsistence harvests and uses can vary widely from year to year based on a variety of factors, including resource availability, harvest regulations, and environmental conditions. Thus, estimated harvest data may underestimate overall uses of subsistence resources by community households.

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Table 2. Subsistence data sources for Ambler Road EIS subsistence study communities

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Alatna	(ADF&G 2019)	ALL	1983	N/D	N/D	N/D	N/D
Alatna	(ADF&G 2019)	ALL	1984	N/D	N/D	N/D	N/D
Alatna	(Andersen, Brown, Walker, and Elkin 2004a)	NSF	2002	NSF	2002	N/D	N/D
Alatna	(Andersen, Brown, Walker, and Jennings 2004b)	LLM	2001-02	LLM	2001-02	N/D	N/D
Alatna	(Andersen, Utermohle, and Brown 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Alatna	(Andersen, Utermohle, and Brown 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Alatna	(Andersen, Utermohle, and Jennings 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Alatna	(Brown, Walker, and Vanek 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Alatna	(Clark and Clark 1978)	N/D	N/D	ALL	1961-62, 1968	N/D	N/D
Alatna	(Holen, Hazell, and Koster 2012)	ALL	2011	LLM	2011	Bears, SLM, Migratory Birds, Berries	2011
Alatna	(Jones, Arundale, Moses, Nictune, Simon, Williams, William, Henzie, William, Ambrose, Williams, and Beetus 1997)	N/D	N/D	N/D	N/D	ALL	Traditional
Alatna	(Marcotte and Haynes 1985)	ALL	1982	ALL	1982	ALL	1981-1982 1981-83
Alatna	(Ristroph, Allakaket Tribal Council, and Alatna Tribal Council 2019)	N/D	N/D	N/D	N/D	ALL	Traditional
Alatna	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Alatna	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2012
Alatna	(YRDFA 2008)	N/D	N/D	ALL	Historic	N/D	N/D
Allakaket	(ADF&G 2019)	ALL	1983	N/D	N/D	N/D	N/D
Allakaket	(ADF&G 2019)	ALL	1984	N/D	N/D	N/D	N/D
Allakaket	(Andersen et al. 2004a)	NSF	2002	NSF	2002	N/D	N/D
Allakaket	(Andersen et al. 2004b)	LLM	2001-02	LLM	2001-02	N/D	N/D
Allakaket	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Allakaket	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Allakaket	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Allakaket	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Allakaket	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Allakaket	(Jones et al. 1997)	N/D	N/D	N/D	N/D	ALL	Traditional
Allakaket	(Marcotte and Haynes 1985)	ALL	1982	ALL	1982	ALL	1981-1982 1981-83
Allakaket	(Ristroph et al. 2019)	N/D	N/D	N/D	N/D	ALL	Traditional
Allakaket	(SRB&A 2016a)	N/D	N/D	ALL	2006-2016	ALL	2006-2015
Allakaket	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2012
Allakaket	(YRDFA 2008)	N/D	N/D	ALL	Historic	N/D	N/D
Ambler	(ADF&G 2019)	LLM, SLM	2003	N/D	N/D	N/D	N/D
Ambler	(Anderson, Anderson, Bane, Nelson, and Towarak 1998)	N/D	N/D	ALL	1974-1975	N/D	N/D
Ambler	(Braem 2012a)	LLM, SLM	2009-10	Moose, Caribou	2009-10	N/D	N/D
Ambler	(Braem, Mikow, Wilson, and Kostick 2015)	ALL	2012	ALL	2012	ALL	2012
Ambler	(Braem, Godduhn, Mikow, Brenner, Trainor, Wilson, and Kostick 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Ambler	(Georgette 2000)	Birds	1997	N/D	N/D	N/D	N/D
Ambler	(Schroeder, Anderson, and Hildreth 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca 1925-1985
Ambler	(Watson 2018)	N/D	N/D	ALL	Post-1958	ALL	Lifetime to 2016
Anaktuvuk Pass	(Adams, Stephenson, Dale, Ahgook, and Demma 2008)	Wolves	1986-1991	N/D	N/D	N/D	N/D
Anaktuvuk Pass	(Bacon, Hepa, Brower, Pederson, Olemaun, George, and Corrigan 2009)	ALL	1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03	ALL	1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03	N/D	N/D
Anaktuvuk Pass	(Brower and Opie 1996)	ALL	1994-95	ALL	1994-95	N/D	N/D
Anaktuvuk Pass	(Brown, Braem, Mikow, Trainor, Slayton, Runfola, Ikuta, Kostick, McDevitt, Park, and Simon 2016)	ALL	2014	LLM, SLM, Birds	2014	ALL	2014
Anaktuvuk Pass	(Fuller and George 1999)	ALL	1992	ALL	1992	N/D	N/D
Anaktuvuk Pass	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Anaktuvuk Pass	(Pedersen 1979)	N/D	N/D	N/D	N/D	ALL	Lifetime Pre-1979
Anaktuvuk Pass	(Pedersen and Hugo 2005)	Fish	2001-02, 2002-03	Fish	2001-02, 2002-03	Fish	2001-02, 2002-03
Anaktuvuk Pass	(Pedersen and Nageak 2009)	Caribou	2006-07	Caribou	2006-07	Caribou	2006-07
Anaktuvuk Pass	(Pedersen and Opie 1991)	Caribou	1990-91	N/D	N/D	N/D	N/D
Anaktuvuk Pass	(Pedersen and Opie 1992)	Caribou	1991-92	N/D	N/D	N/D	N/D
Anaktuvuk Pass	(Pedersen and Opie 1994)	Caribou	1993-94	N/D	N/D	N/D	N/D
Anaktuvuk Pass	(Spearman, Pedersen, and Brown 1979)	N/D	N/D	ALL	General	N/D	N/D
Anaktuvuk Pass	(SRB&A 2013)	N/D	N/D	ALL	2001-2010	ALL	2001-2010

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Beaver	(Andersen and Jennings 2001)	Birds	2000	Bird	2000	N/D	N/D
Beaver	(Brown and Godduhn 2015)	N/D	N/D	N/D	N/D	Salmon[a]	2010
Beaver	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Beaver	(Koskey and Mull 2011)	NSF	2005	NSF	2005	N/D	N/D
Beaver	(SRB&A 2007)	N/D	N/D	ALL	1997-2006	ALL	1997-2006
Beaver	(Stevens and Maracle n.d.)	LLM, SLM	2010-11	LLM, SLM	2010-11	N/D	N/D
Beaver	(Sumida 1989)	ALL	1984-85	ALL	1985	ALL	1930-86
Beaver	(Van Lanen, Stevens, Brown, Maracle, and Koster 2012)	LLM, SLM	2008-09, 2009-10	LLM, SLM	2008-09, 2009-10	N/D	N/D
Bettles	(ADF&G 2019)	ALL	1983	N/D	N/D	N/D	N/D
Bettles	(ADF&G 2019)	ALL	1984	N/D	N/D	N/D	N/D
Bettles	(Andersen et al. 2004a)	NSF	2002	NSF	2002	N/D	N/D
Bettles	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Bettles	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Bettles	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Bettles	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Bettles	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Bettles	(Marcotte and Haynes 1985)	ALL	1982	ALL	1982	ALL	1981-82 1981-83
Bettles	(SRB&A 2016a)	N/D	N/D	ALL	2006-2016	ALL	2006-2015
Bettles	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2016
Buckland	(Braem 2012a)	LLM, SLM	2009-10	LLM, SLM	2009-10	N/D	N/D
Buckland	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Buckland	(Georgette 2000)	Birds	1996	N/D	N/D	N/D	N/D
Buckland	(Gonzalez, Mikow, and Kostick 2018)	LLM, SLM	2016-17	LLM, SLM	2016-17	N/D	N/D
Buckland	(Kevin Waring Associates 1992)	N/D	N/D	Beluga, Caribou, Fish	c. 1980	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Buckland	(Magdanz, Smith, Braem, and Koster 2011a)	ALL	2003	N/D	N/D	N/D	N/D
Buckland	(Satterthwaite-Phillips, Christopher Krenz, Glenn Gray, and Dodd 2016)	N/D	N/D	N/D	N/D	ALL[a]	Lifetime to 2014
Buckland	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca 1925-1985
Coldfoot	(Holen et al. 2012)	ALL	2011	N/D	N/D	ALL	2011
Coldfoot	(SRB&A 2016a)	N/D	N/D	ALL	2005-2014	ALL	2005-2014
Evansville	(ADF&G 2019)	ALL	1983	N/D	N/D	N/D	N/D
Evansville	(ADF&G 2019)	ALL	1984	N/D	N/D	N/D	N/D
Evansville	(Andersen et al. 2004a)	NSF	2002	NSF	2002	N/D	N/D
Evansville	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Evansville	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Evansville	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Evansville	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Evansville	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Evansville	(Marcotte and Haynes 1985)	ALL	1982	ALL	1982	ALL	1981-1982 1981-83
Evansville	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015
Evansville	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2016
Galena	(ADF&G 2019)	LLM	1996 -97	N/D	N/D	N/D	N/D
Galena	(Andersen et al. 2004b)	LLM	2001-02	LLM	2001-02	N/D	N/D
Galena	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Galena	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Galena	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Galena	(Brown, Koester, and Koontz 2010)	NSF	2006	NSF	2006	NSF[a]	2006

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Galena	(Brown, Brenner, Ikuta, Mikow, Retherford, Slayton, Trainor, Park, Koster, and Kostick 2015)	All	2010	LLM, SLM, Birds	2010	ALL	2010
Galena	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Galena	(Marcotte 1988)	ALL	1985-1986	N/D	N/D	Fish	1986
Galena	(Robert and Andrews 1984)	N/D	N/D	Furbearers	1981-82	N/D	N/D
Hughes	(Andersen et al. 2004a)	NSF	2002	NSF	2002	N/D	N/D
Hughes	(Marcotte and Haynes 1985)	ALL	1982	ALL	1982	ALL	1981-1982; 1981-83
Hughes	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2016
Hughes	(Webb 1999)	Migratory Birds	1998	N/D	N/D	N/D	N/D
Hughes	(Webb and Koyukuk/Nowitna Refuge Complex (U.S.) 2000)	Migratory Birds	1998-99	N/D	N/D	N/D	N/D
Hughes	(Wilson and Kostick 2016)	ALL	2014	LLM, SLM, Birds	2014	ALL	2014
Hughes	(YRDFA 2008)	N/D	N/D	ALL	Historic	N/D	N/D
Huslia	(Andersen et al. 2004a)	NSF	2002	NSF	2002	N/D	N/D
Huslia	(Andersen et al. 2004b)	LLM	2001-02	LLM	2001-02	N/D	N/D
Huslia	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Huslia	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Huslia	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Huslia	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Huslia	(Marcotte 1986)	ALL	1983	ALL	1983	ALL	1981-83
Huslia	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2016
Kiana	(ADF&G 2019)	LLM, SLM	1999	N/D	N/D	N/D	N/D
Kiana	(Anderson et al. 1998)	N/D	N/D	ALL	1974-1975	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Kiana	(Braem 2012a)	LLM, SLM	2009-10	Moose, Caribou	2009-10	N/D	N/D
Kiana	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Kiana	(Georgette 2000)	Birds	1996	N/D	N/D	N/D	N/D
Kiana	(Magdanz, Koster, Naves, and Fox 2011b)	ALL	2006	N/D	N/D	N/D	N/D
Kiana	(Magdanz et al. 2011a)	Fish	1994-2004	N/D	N/D	N/D	N/D
Kiana	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca. 1925-1986
Kiana	(Wolfe and Paige 1995)	Birds	1993	N/D	N/D	N/D	N/D
Kobuk	(ADF&G 2019)	LLM, SLM	2004	N/D	N/D	N/D	N/D
Kobuk	(Anderson et al. 1998)	N/D	N/D	ALL	1974-1975	N/D	N/D
Kobuk	(Braem 2012a)	LLM, SLM	2009-10	Moose, Caribou	2009-10	N/D	N/D
Kobuk	(Braem et al. 2015)	ALL	2012	ALL	ca. 2012	ALL	2012
Kobuk	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Kobuk	(Georgette 2000)	Birds	1996-1997	N/D	N/D	N/D	N/D
Kobuk	(Magdanz et al. 2011a)	Fish	1994-2004	N/D	N/D	N/D	N/D
Kobuk	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca. 1925-1985
Kobuk	(Watson 2018)	N/D	N/D	N/D	N/D	ALL	Lifetime to 2016
Kotzebue	(Braem, Mikow, Brenner, Godduhn, Retherford, and Kostick 2017)	ALL	2014	LLM, SLM, Birds	2014	ALL	2014
Kotzebue	(Georgette and Loon 1993)	ALL	1986	ALL	1986	N/D	N/D
Kotzebue	(Georgette 2000)	Birds	1997	N/D	N/D	N/D	N/D
Kotzebue	(Godduhn, Braem, and Kostick 2014)	LLM, SLM	2012 - 2013	N/D	N/D	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Kotzebue	(Magdanz, Georgette, and Evak 1995)	ALL	1991	N/D	N/D	N/D	N/D
Kotzebue	(Mikow and Kostick 2016)	LLM, SLM	2013 - 2014	N/D	N/D	N/D	N/D
Kotzebue	(Naves and Braem 2014)	Birds	2012	N/D	N/D	N/D	N/D
Kotzebue	(Satterthwaite-Phillips et al. 2016)	N/D	N/D	N/D	N/D	ALL[a]	Lifetime to 2014
Kotzebue	(Whiting 2006)	ALL	2002-2004	N/D	N/D	N/D	N/D
Manley Hot Springs	(ADF&G 2019)	LLM, Fish	2004	N/D	N/D	N/D	N/D
Manley Hot Springs	(Betts 1997)	N/D	N/D	ALL	General	ALL	1975-1995
Manley Hot Springs	(Brown, Slayton, Trainor, Koster, and Kostick 2014)	ALL	2012	N/D	N/D	ALL	2012
Minto	(ADF&G 2019)	LLM, SLM, NSF	2004	N/D	N/D	N/D	N/D
Minto	(Andrews 1988)	ALL	1983-84	ALL	1960-84	ALL	1960-84
Minto	(Andrews and Napoleon 1985)	N/D	N/D	N/D	N/D	Moose	1960-85
Minto	(Brown et al. 2014)	ALL	2012	N/D	N/D	ALL	2012
Minto	(Marcotte and Haynes 1985)	NSF	1994	N/D	N/D	N/D	N/D
Minto	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015
Nenana	(ADF&G 2019)	NSF, LLM, SLM	2004	N/D	N/D	N/D	N/D
Nenana	(Brown and Kostick 2017)	ALL	2015	N/D	N/D	ALL	2015
Nenana	(Shinkwin and Case 1984)	N/D	N/D	N/D	N/D	ALL	1981-1982
Nenana	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015
Noatak	(ADF&G 2019)	ALL	1994	N/D	N/D	N/D	N/D
Noatak	(ADF&G 2019)	LLM, SLM	1999	N/D	N/D	N/D	N/D
Noatak	(ADF&G 2019)	LLM, SLM	2002	N/D	N/D	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Noatak	(Braem and Kostick 2014)	LLM, SLM	2010-11	Caribou	2010-11	N/D	N/D
Noatak	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Noatak	(Georgette 2000)	Birds	1997	N/D	N/D	N/D	N/D
Noatak	(Magdanz, Braem, Robbins, and Koster 2010)	ALL	2007	N/D	N/D	ALL	2007
Noatak	(Mikow, Braem, and Kostick 2014)	LLM, SLM	2011-12	Caribou	2011-12	N/D	N/D
Noatak	(Satterthwaite-Phillips et al. 2016)	N/D	N/D	N/D	N/D	ALL[a]	Lifetime to 2014
Noatak	(SRB&A 2009)	N/D	N/D	ALL	1998-2007	ALL	1998-2007
Noatak	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca 1925-1985
Noorvik	(ADF&G 2019)	LLM, SLM	2002	N/D	N/D	N/D	N/D
Noorvik	(Anderson et al. 1998)			ALL	1974-1975	N/D	N/D
Noorvik	(Braem 2012b)	LLM, SLM	2008-09	LLM, SLM	2008-09	N/D	N/D
Noorvik	(Braem et al. 2017)	ALL	2012	LLM, SLM, Birds	2012	ALL	2012
Noorvik	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Noorvik	(Georgette 2000)	Birds	1996	N/D	N/D	N/D	N/D
Noorvik	(Satterthwaite-Phillips et al. 2016)	N/D	N/D	N/D	N/D	ALL[a]	Lifetime to 2014
Noorvik	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca 1925-1985
Rampart	(ADF&G 2019)	LLM, SLM, NSF	1999	N/D	N/D	N/D	N/D
Rampart	(Andersen and Jennings 2001)	Birds	2000	Birds	N/D	N/D	N/D
Rampart	(Betts 1997)	N/D	N/D	ALL	General	ALL	1975-1995

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Rampart	(Brown et al. 2016)	ALL	2014	LLM, SLM, Birds	2014	ALL	2014
Selawik	(ADF&G 2019)	LLM, SLM, NSF	2006	N/D	N/D	N/D	N/D
Selawik	(ADF&G 2019)	LLM, SLM	1998	N/D	N/D	N/D	N/D
Selawik	(Braem, Fox, Magdanz, and Koster 2013)	ALL	2010-11	LLM, SLM, Birds	2010-11	ALL	2010-11
Selawik	(Braem et al. 2018)	Salmon, NSF	2013-2014	N/D	N/D	N/D	N/D
Selawik	(Georgette 2000)	Birds	1997-1998	N/D	N/D	N/D	N/D
Selawik	(Satterthwaite-Phillips et al. 2016)	N/D	N/D	N/D	N/D	ALL[a]	Lifetime to 2014
Selawik	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime (ca. 1925-1985)
Selawik	(Wolfe and Paige 2002)	Birds	1993	N/D	N/D	N/D	N/D
Shungnak	(Andersen and Jennings 2001)	Birds	2000	Birds	2000	N/D	N/D
Shungnak	(Braem 2012b)	LLM, SLM	2008-09	Caribou	2008-09	N/D	N/D
Shungnak	(Braem et al. 2015)	ALL	2012	ALL	ca. 2012	ALL	2012
Shungnak	(Braem et al. 2018)	Salmon, NSF	2012-2014	N/D	N/D	N/D	N/D
Shungnak	(Magdanz, Walker, and Paciorek 2004)	ALL	2002	N/D	N/D	N/D	N/D
Shungnak	(Schroeder et al. 1987)	N/D	N/D	N/D	N/D	ALL	Lifetime ca 1925-1985
Shungnak	(Watson 2018)	N/D	N/D	ALL	pre-1958	ALL	Lifetime to 2016
Shungnak	(Wolfe and Paige 1995)	Birds	1993	N/D	N/D	N/D	N/D
Stevens Village	(ADF&G 2019)	LLM	1996	N/D	N/D	N/D	N/D
Stevens Village	(Brown et al. 2016)	ALL	2014	SLM, Birds	2014	N/D	N/D
Stevens Village	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015
Stevens Village	(Stevens and Maracle n.d.)	LLM, SLM	2010-11	LLM, SLM	2010-11	N/D	N/D

Community	Source	Harvest data - resources addressed	Harvest data - study period	Timing of subsistence – resources addressed	Timing of subsistence - study period	Use areas – resources addressed	Use area - study period
Stevens Village	(Sumida 1988)	ALL	1983-84	ALL	N/D	ALL	1974-1984
Stevens Village	(Sumida and Alexander 1985)	N/D	N/D	Selected	1984	Moose, Furbearers	1974-1984
Stevens Village	(Van Lanen et al. 2012)	LLM, SLM	2008-09, 2009-10	LLM, SLM	2008-09, 2009-10	N/D	N/D
Stevens Village	(Wolfe and Scott 2010)	LLM, Fish	2008	N/D	N/D	N/D	N/D
Tanana	(Andersen et al. 1998)	LLM	1997-98	LLM	1997-98	N/D	N/D
Tanana	(Andersen et al. 2000)	LLM	1998-99	LLM	1998-99	N/D	N/D
Tanana	(Andersen et al. 2001)	LLM	1999-00	LLM	1999-00	N/D	N/D
Tanana	(Brown et al. 2010)	NSF	2006	NSF	2006	NSF	2006
Tanana	(Brown et al. 2016)	ALL	2014	LLM, SLM, Birds	2014	ALL	2014
Tanana	(Brown et al. 2004)	LLM	2002-03	LLM	2002-03	N/D	N/D
Tanana	(Case and Halpin 1990)	ALL	1987	ALL	1987	ALL	1968-1988
Tanana	(Wolfe and Scott 2010)	ALL	2008	N/D	N/D	N/D	N/D
Wiseman	(Holen et al. 2012)	ALL	2011	LLM	2011	ALL	2011
Wiseman	(Scott 1998)	ALL	1991	ALL		ALL	1992
Wiseman	(SRB&A 2016a)	N/D	N/D	ALL	2006-2015	ALL	2006-2015

Notes: ca = circa; LLM = Large land mammals; N/D = No data; ALL = All resources/comprehensive; NSF = Non-salmon fish; SLM = Small land mammals
This table lists the primary publications associated with the harvest data for each time period; however, where available, the data are downloaded from the Alaska Department of Fish and Game's Community Subsistence Information System (CSIS), which is available at: www.adfg.alaska.gov/sb/CSIS/. The CSIS often includes more updated harvest estimates than those provided in the original publications reporting the data.
[a]Stephen R. Braund & Associates (SRB&A) requested this use area data for use in the Ambler Road Environmental Impact Statement (EIS), but the data were either unavailable or not provided to SRB&A.

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4.1.1 Subsistence Use Area and Travel Method Data

Subsistence use area data primarily measure the geographic extent of residents' use of their environment to harvest subsistence resources. There are various methods of representing subsistence use area data. The most common method is to show the outline of the extent of a community's use area during a certain time period. This method does not differentiate between areas used periodically or by one harvester and areas used by multiple harvesters on a regular basis. Another method is to track harvesters' activities using global positioning system (GPS) units and are the most accurate method for documenting residents' travel during a specific time period; however, such studies are not available for the study region and may underrepresent a community's traditional use areas due to the narrow temporal and spatial focus. A third method maps subsistence use areas on separate overlays during individual interviews with active harvesters and creates subsistence use area maps differentiating between areas where a small number of individuals reported using the area and areas where a higher number of individuals reported using the area. Alternatively, the maps may differentiate between areas where a high number of subsistence use areas or target resources were reported, versus areas where a low number of subsistence use areas or target resources were reported. This method provides a measure of harvest effort in terms of the number of respondents reporting subsistence activities within geographic areas and, in the case of multiple resource maps, includes the number of species targeted. The overlapping use area method does not represent harvest success or intensity of use in terms of frequency or duration of trips. Subsistence mapping studies are also the most common source of information for characterizing travel methods used to access subsistence use areas; however, this type of information not always documented for all studies.

In general, subsistence use areas are documented for a subset of harvesters within a community, as it is usually not possible to interview every single hunter or harvester of a given resource. Even household harvest surveys do not necessarily document the use areas of every harvester in a community, as interviews are generally conducted with household heads, and these individuals are not necessarily the only or primary harvesters in a household. Thus, the subsistence use areas shown on the maps in this report likely do not represent the extent of all subsistence uses for a community, and other areas may be used.

In addition, subsistence use areas are documented for varying time periods, including lifetime, 10-year, or 1-year time periods. Lifetime use areas are useful for capturing long-term trends in subsistence use patterns and the extent of traditional land use areas. Shorter time periods are useful for capturing "current" subsistence use patterns and revealing recent trends in subsistence use. It is important to include all time periods when establishing a baseline of subsistence uses, as residents may return to previously used traditional areas in the event of environmental or regulatory changes, or changes in resource distribution or migration. Even if a community shows a change in traditional uses over time (e.g., constricted use areas), traditional land use areas are still important to the cultural identity, and protection of traditional land use areas ensures the ability of communities to adapt to future changes.

4.2. Timing of Subsistence Activities Data

Data on the timing of subsistence activities are available through various types of research including harvest studies (i.e., number harvested by month), subsistence mapping studies (i.e., months by use area, number of trips by month), and ethnographic studies (e.g., generalized depictions or narrative descriptions of subsistence activities by month or season). Data on the timing of subsistence activities are useful for characterizing a community's seasonal round, their use of the land, and for analyzing potential impacts based on the timing of subsistence activities in the context of the timing of development activities.

4.3. Resource Importance Data

Subsistence has both material/economic significance as well as cultural importance. This technical report chose several key subsistence indicators as measures of "Resource Importance" including harvest amount, sharing, and participation. The study team chose these indicators because they are available in a majority of subsistence harvest studies to allow for the measuring of change over time and/or they encompass a broad range of subsistence characteristics including material harvest, effort, and sharing. Measures of material and cultural importance are established through the use of available quantitative measures. While all subsistence activities and resources are of high importance to a community, the importance of individual resources relative to one another varies according to material and cultural measures. The ADF&G Division of Subsistence and Stephen R. Braund & Associates (SRB&A) subsistence studies have systematically collected community harvest and use data in Alaska since the 1980s. These data allow for the quantitative measurement of certain aspects of cultural and material importance of subsistence resources used in this analysis.

Resource Importance, as discussed in this report, is organized around 14 resource categories rather than at a species level, which number in the hundreds. Resource categories are based on species groupings such as salmon, non-salmon fish, berries, and small land mammals/furbearers; in some cases, single species represent their own resource category (e.g., caribou). The list of 14 resource categories is provided in Table 3.

Table 3. Resource categories for subsistence impact analysis

Resource category number	Resource	Example species
1	Moose	N/A
2	Caribou	N/A
3	Dall sheep	N/A
4	Bear	Black and brown bear
5	Other large land mammals	Goat, elk, bison, deer
6	Small land mammals furbearers	Hare, fox, porcupine, wolf
7	Marine mammals	Bowhead, bearded seal, walrus
8	Migratory birds	Ducks, geese, crane
9	Upland birds	Grouse, ptarmigan
10	Bird eggs	Gull eggs, duck eggs
11	Salmon	Chinook, sockeye, coho
12	Non-salmon fish	Grayling, trout, sheefish, whitefish
13	Marine invertebrates	Clams, cockles, shrimp
14	Vegetation	Blueberries, cranberries, tundra tea, firewood

Note: N/A = Not applicable

In this analysis, material importance is quantitatively measured in terms of a resource's contribution toward each community's total subsistence harvest (i.e., edible pounds for each resource divided by the total edible pounds for all resources [percent of total harvest]). ADF&G data that can be used to quantitatively measure the cultural importance of subsistence resources include data related to participation (percent of households attempting harvests of each resource) and sharing (percent of households receiving each resource). These measures were chosen as informing the cultural importance of subsistence resources because participation in subsistence activities promotes the transmission of skills from generation to generation, and sharing of subsistence resources between households strengthens community cohesion in the region. Furthermore, both participation and sharing are key to the cultural identity of community members.

The ranges for material importance were developed based on the fact that all resource categories contribute to a cumulative 100 percent of harvest. Because many subsistence communities rely on a diverse resource base from which they harvest, it is not unusual for the top contributing resource categories to only contribute in the teens to lower 20 percent of harvest. Thus, the ranges for material importance below in Table 4 allow for all study communities to have a high, moderate, and low resources, and they reflect the nature of subsistence harvests across an often diverse resource base where few resource categories represent a high percentage of the total community harvest.

The ranges for cultural importance are specific to each community's unique behavior of attempting to harvest and receiving. This community-centric approach, where every community's ranges are defined based on that community's unique set of data, takes into account cultural variation between communities and between the ways certain resources are harvested. Whereas, a community's harvest (material importance) will always total 100 percent, the cultural measures of importance are unique to each community and may exhibit a wide range of variation depending on the community's cultural and environmental setting (e.g., proximity to urban areas, regulatory restrictions, proximity to resources). For each variable by community, a range is determined by subtracting the lowest percentage of households within each variable (e.g., attempting to harvest) from the highest percentage of the same variable (e.g., 100-40 = 60). That range (e.g., 60) is then divided into thirds in order to determine the high, moderate, and low ranges (e.g., Low = 40–60; Moderate = 60–80; High = 80–100). As an example, in one community, the range of households trying to harvest different resources may be 20–50 percent, whereas in a second community it may be as high as 40–100 percent. Reasons for these differences may include work commitments, geographic and climatic restraints, urban disruption, or regulatory environment which limit or facilitate the opportunities for attempting to harvest. A community-centric approach takes into account the unique community range in both examples above, standardizing the high range to 40–50 percent for the first community and 80-100 percent for the second community.

Table 4. List of quantitative measures for material importance

Importance category / Quantitative measure	High (H)	Moderate (M)	Low (L)
Material importance % of total harvest (in pounds)	H $\geq$20%	20%> M $\geq$2%	L <2%

For the final determination as a high, moderate, or low resource of importance the top value from the three variables of percent of total harvest, percent of households attempting to harvest, and percent of households receiving is selected as the final classification of importance. For example, moose may represent 15 percent of total harvest (moderate), top third of households attempting to harvest (high), and bottom third in receiving (low). The final selection ranks moose overall as a resource of high importance in this example due to the cultural importance of participation and attempting to harvest. Lastly, if no harvest data exist for a particular resource, the final selection ranks that resource importance as "Indeterminate."

This analysis, while reflecting one method of quantitatively measuring the importance of subsistence resources, does not take into account a multitude of factors for which quantitative data do not exist (e.g., spirituality, ethics and values, ideologies, identities, celebration and ceremonies). Rankings of resources under high, moderate, and low importance should be viewed only in terms of the indicators presented here and not in terms of overall importance. Subsistence harvesters in the study communities routinely view all of the resources they harvest during their seasonal cycle of availability as important to their community and/or individual health and cultural identity. To take into account the aspects of subsistence such as spirituality, values, and identity that could be impacted and which are not easily characterized by quantitative data, the Project relies on the traditional knowledge and concerns identified in the scoping comments for this Project in both assessing impacts and providing potential mitigation measures and other potential strategies to minimize construction and operational impacts on resources and subsistence harvesters.

5. Overview of Subsistence Uses

5.1. Kobuk River

The Kobuk River region includes the communities of Ambler, Kiana, Kobuk, Noorvik, and Shungnak. Of these communities, Kobuk and Shungnak are closest to the proposed road corridors, followed by Ambler, Kiana, and Noorvik, which are located on the Kobuk River at varying distances downstream from the project corridors.

5.1.1 Subsistence Use Areas

Subsistence use areas for the Kobuk River region study communities are focused around the Kobuk River, but extending both south toward the Koyukuk River drainage and north into the Brooks Range and as far as the North Slope of Alaska. Residents' subsistence uses also extend downriver and into the marine waters of Kotzebue Sound and the Chukchi Sea. More recently documented subsistence use areas (Watson 2018; Satterthwaite-Phillips et al. 2016) indicate a smaller extent of overland travel. In particular, recent studies show less extensive travel to the north of the study communities into the Brooks Range and onto the North Slope. Watson (2018) discusses that some of the shifts in use areas may reflect changes in migratory routes of the WAH; changes in traditional hunting methods to avoid diverting caribou during their fall migration (thereby hunting them farther south); decreased need for extensive overland travel (e.g., less reliance on furbearer trapping); and increased reliance on fish resources (thus greater focus on riverine use areas). Except for Noorvik, subsistence use areas for Kobuk River region study communities overlap with the western portion of the project alternatives.

As shown on Map 2, Ambler subsistence use areas for all available time periods (Lifetime ca. 1925-1985; 2012; and Lifetime to 2016) extend west to the Chukchi Sea and Kotzebue Sound; north through the Brooks Range onto the North Slope surrounding the headwaters of the Colville River; east to the headwaters of the Kobuk River; and south toward Buckland and Huslia. Recent subsistence use areas documented for Ambler (Watson 2018) indicate that the contemporary subsistence use area of Ambler is somewhat smaller in that use areas do not extend as far north into the Brooks Range. As noted above (Section 4.1.1), even if certain traditional land use areas are not depicted on contemporary subsistence use area maps, communities maintain cultural ties to traditional use areas, and the protection of these areas is key to maintaining cultural identity and the ability to adapt to future changes. Contemporary use areas are focused around the Kobuk and Ambler rivers, north into the southern foothills of the Brooks Range, and south toward the Selawik and Koyukuk rivers. Based on Watson (2018), contemporary caribou hunting generally occurs along the Kobuk and Ambler rivers and in a large overland area south of the community toward Selawik River and Huslia. Moose hunting occurs in a similar area but with less extensive overland use. Furbearer trapping 2occurs in an overland area focused along the mid- to upper-Kobuk River and south toward Huslia and the Selawik River. Contemporary fishing occurs in a more extensive area than historic fishing and indicates a shift away from lakes toward rivers. Salmon and non-salmon fishing areas extend from Kotzebue Sound to the headwaters of the Kobuk River, along the Selawik area, and in the Koyukuk River drainage. Waterfowl hunting occurs over a similar area as fishing, focused along the entirety of the Kobuk River and in some overland areas both north and south of the river. Marine mammal hunting occurs downriver from Ambler into Kotzebue Sound. Contemporary berry harvesting areas extend along the Kobuk River and in a large overland area to the east, northeast, and southeast of the community, although respondents indicated that their primary berry harvesting areas are located closer to the community of Ambler.

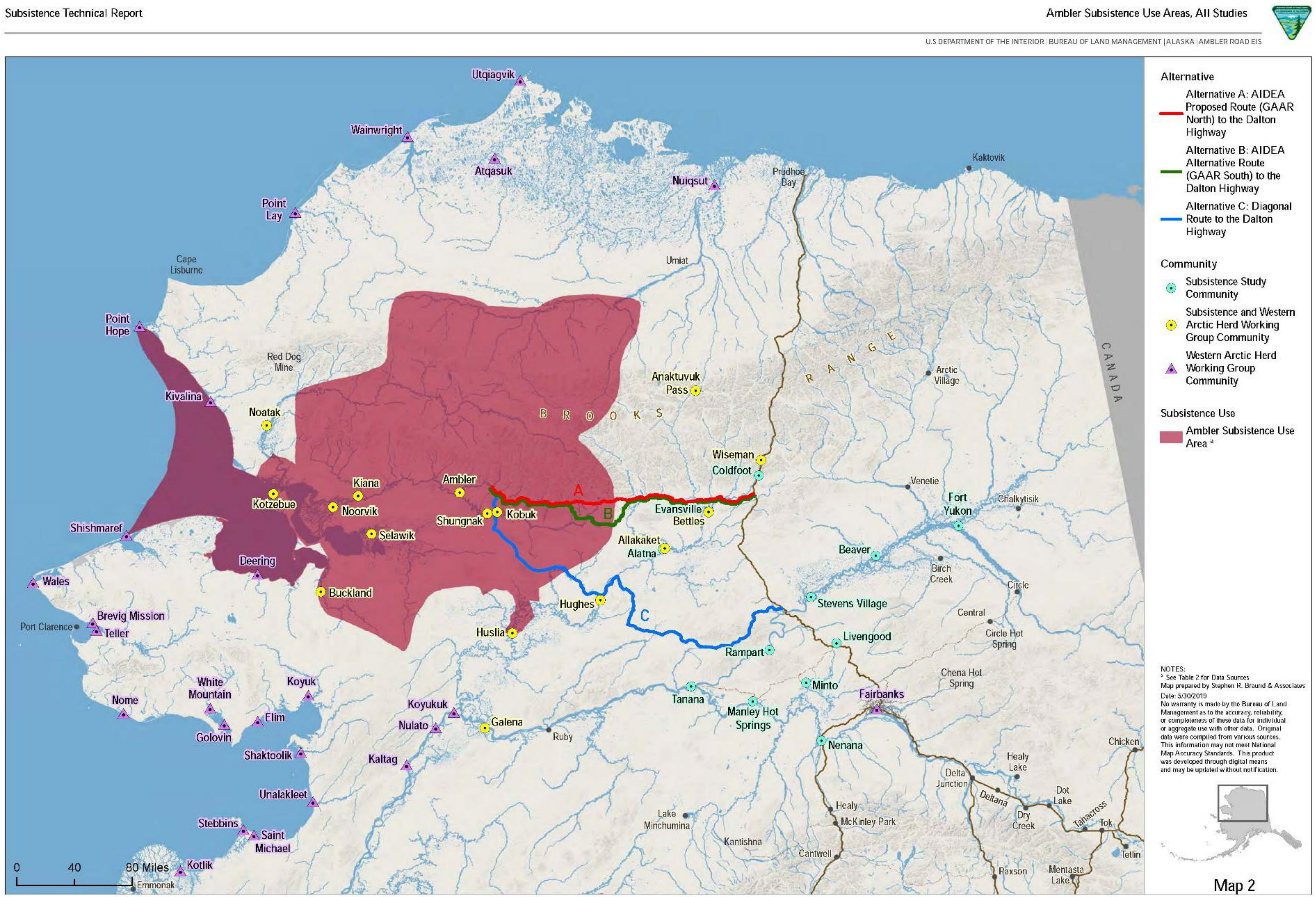
As shown on Map 3, Kiana use areas occur in a large area extending along the Kobuk River, north into the Brooks Range and the headwaters of the Colville River, south toward Buckland, and west into Kotzebue Sound and along the Chukchi Sea coast. Kiana use areas are only available from Schroeder et al. (1987), which depict lifetime use areas for the period circa 1925–1986. More recent use areas are not available.

Kobuk subsistence use areas (Map 4) extend along the entire Kobuk River drainage to Norutak Lake, north into the Brooks Range, west into Kotzebue Sound, and south to an area surrounding Selawik Lake and River. Use areas have been documented for the Lifetime ca. 1925-1985; Lifetime to 2016; and 2012 time periods. Contemporary subsistence use areas as shown in Watson (2018) occur over a similar area but with lesser use to the north of the community into the Brooks Range and a greater focus along river drainages rather than large overland areas. Contemporary caribou hunting occurs in the upper Kobuk River, southern Brooks Range, and overland toward Buckland and the Dakli River. Moose hunting is focused solely long the Kobuk River upriver from Shungnak, in addition to a small overland area extending toward the Ambler River. Contemporary trapping is focused in a smaller area than historic trapping areas and occurs in an area near the Kobuk River and north toward the Ambler River. Fishing and waterfowl hunting both occur in a similar area which is focused along the Kobuk River upriver from Shungnak to Pah River. Contemporary marine mammal use areas occur within Kotzebue Sound, with the entire Kobuk River used for travel to those hunting areas. Finally, contemporary vegetation harvesting areas for Kobuk occur along the entire Kobuk River drainage downriver to the Kotzebue area.

Shungnak use areas (Map 6) for all available time periods (Lifetime ca. 1925-1985; Lifetime to 2016; and 2012) occur over a large area extending from the Colville River in the north to Buckland and Huslia in the south, west into Kotzebue Sound, and east to the headwaters of the Kobuk River. Contemporary use areas for Buckland as shown in Watson (2018) continue to occur in a large overland area which extends north into the Brooks Range although not as far as the North Slope. Contemporary use areas extend south to Buckland and Huslia but are primarily focused on the Kobuk River, Brooks Range to Noatak River, and south to Selawik River. Unlike other Kobuk River study communities, contemporary Shungnak use areas do not extend to marine areas in Kotzebue Sound. Caribou hunting generally occurs over a larger area than other resource pursuits, extending to the Noatak River in the north and the Buckland and Huslia areas in the south in addition to the mid- to upper-Kobuk River drainage. Moose hunting focuses along river drainages including the Ambler and Kobuk rivers. Sheep hunting extends north of the community of Shungnak into the Brooks Range as far as the Noatak River while trapping occurs in overland areas both north and south of the Kobuk River. Waterfowl hunting occurs along the Kobuk River and tributaries in addition to lakes and overland areas south of the community toward the Selawik and Dakli rivers. Similar to Ambler and Kobuk, Shungnak fishing areas have shifted from lake-focused fishing to fishing along the Kobuk River. Vegetation harvesting occurs relatively close to the community of Shungnak along the Kobuk River between Shungnak and Kobuk.

Noorvik is the only study community in the Kobuk River region whose use areas do not overlap directly with the project area; however, use areas for this community occur directly downriver from the project area on the Kobuk River and near Shungnak. As shown on Map 5, Noorvik subsistence use areas for all available time periods (Lifetime ca. 1925-1985; Lifetime to 2014; and 2012) extend from the Chukchi Sea as far as Point Hope and throughout Kotzebue Sound; north into the Brooks Range and as far as the upper

Colville River; south toward Buckland and surrounding Selawik River, and east to Shungnak. According to Satterthwaite-Phillips et al. (2016), more recently documented subsistence use areas for the community of Noorvik indicate a shift to the south, with use areas focused along the Kobuk River, Kotzebue Sound, and south in overland areas near Buckland and Deering. Noorvik use areas for small game and large game extend along the Kobuk River near Ambler but with more intensive focus around the mouth of the Kobuk River and to the southwest of the community toward Deering and Buckland. Other resource pursuits, including plant gathering, bird hunting, and fishing, also focus around the lower Kobuk River and to the southwest of the community near Buckland and Deering. Fishing also occurs with great intensity in Kotzebue Sound and near the mouth of Selawik Lake (Satterthwaite-Phillips et al. 2016).



Map 2. Ambler subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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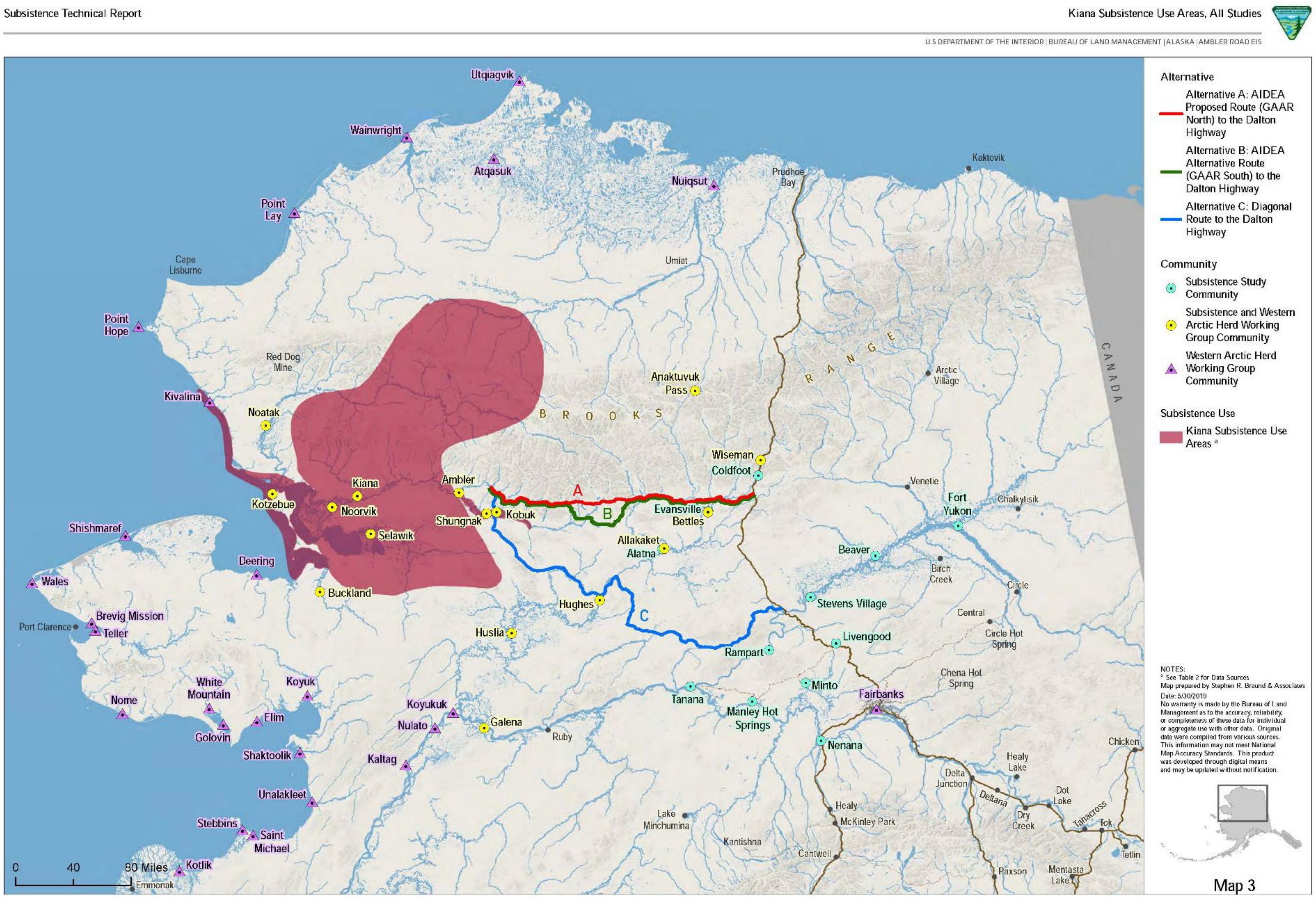

Map 3. Kiana subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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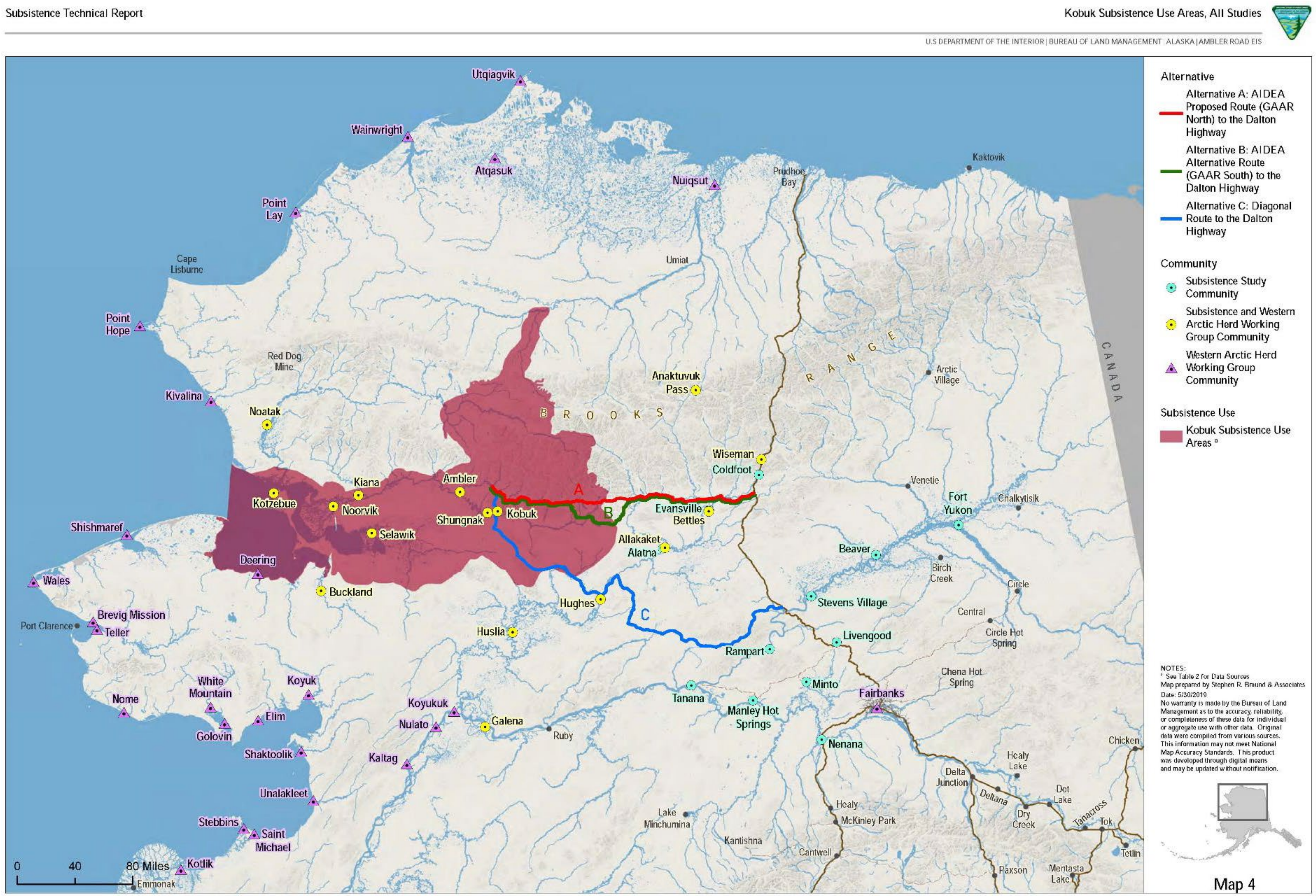

Map 4. Kobuk subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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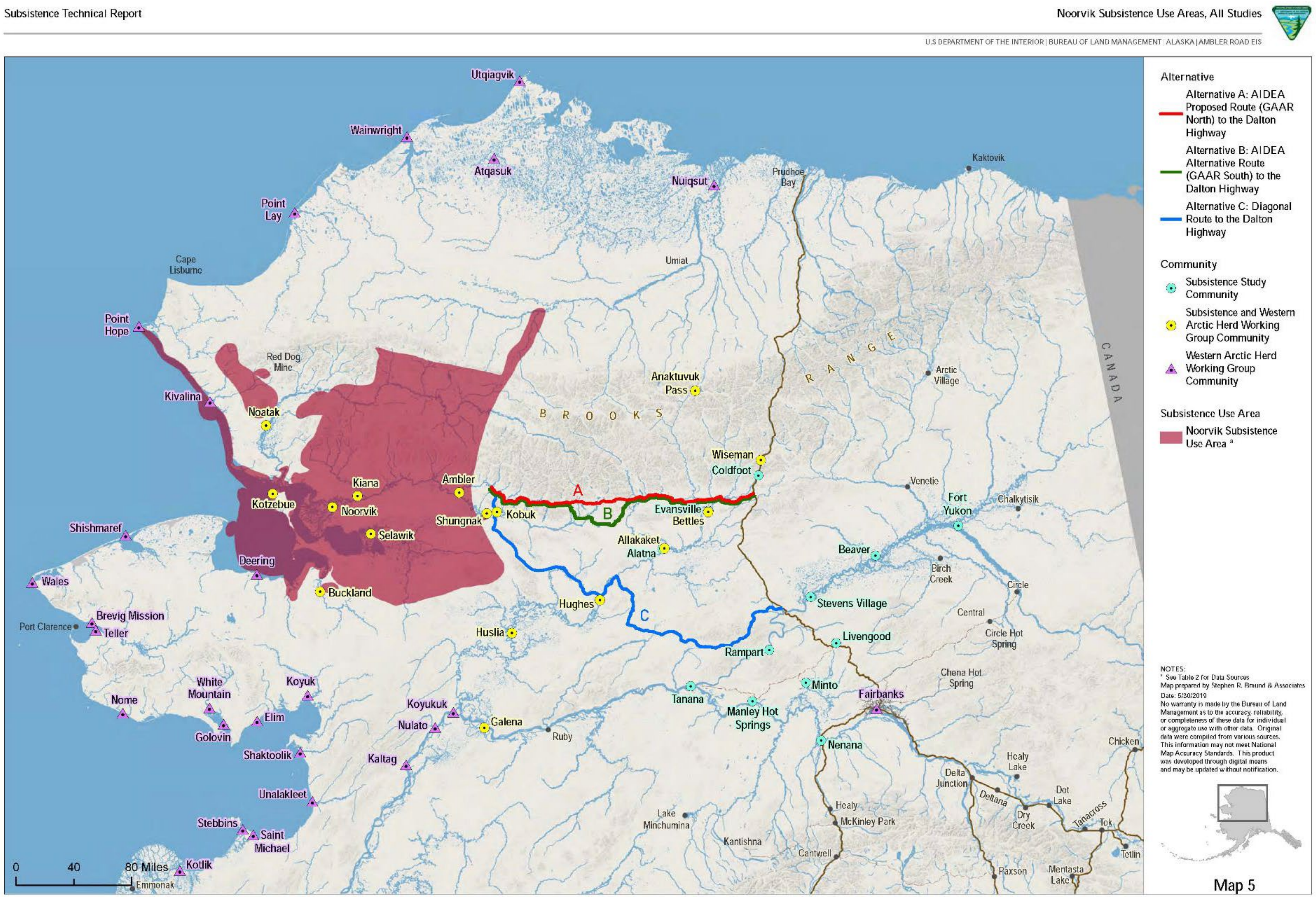

Map 5. Noorvik subsistence use areas, all studies
Note: where the use overlays water, the shade is darker.

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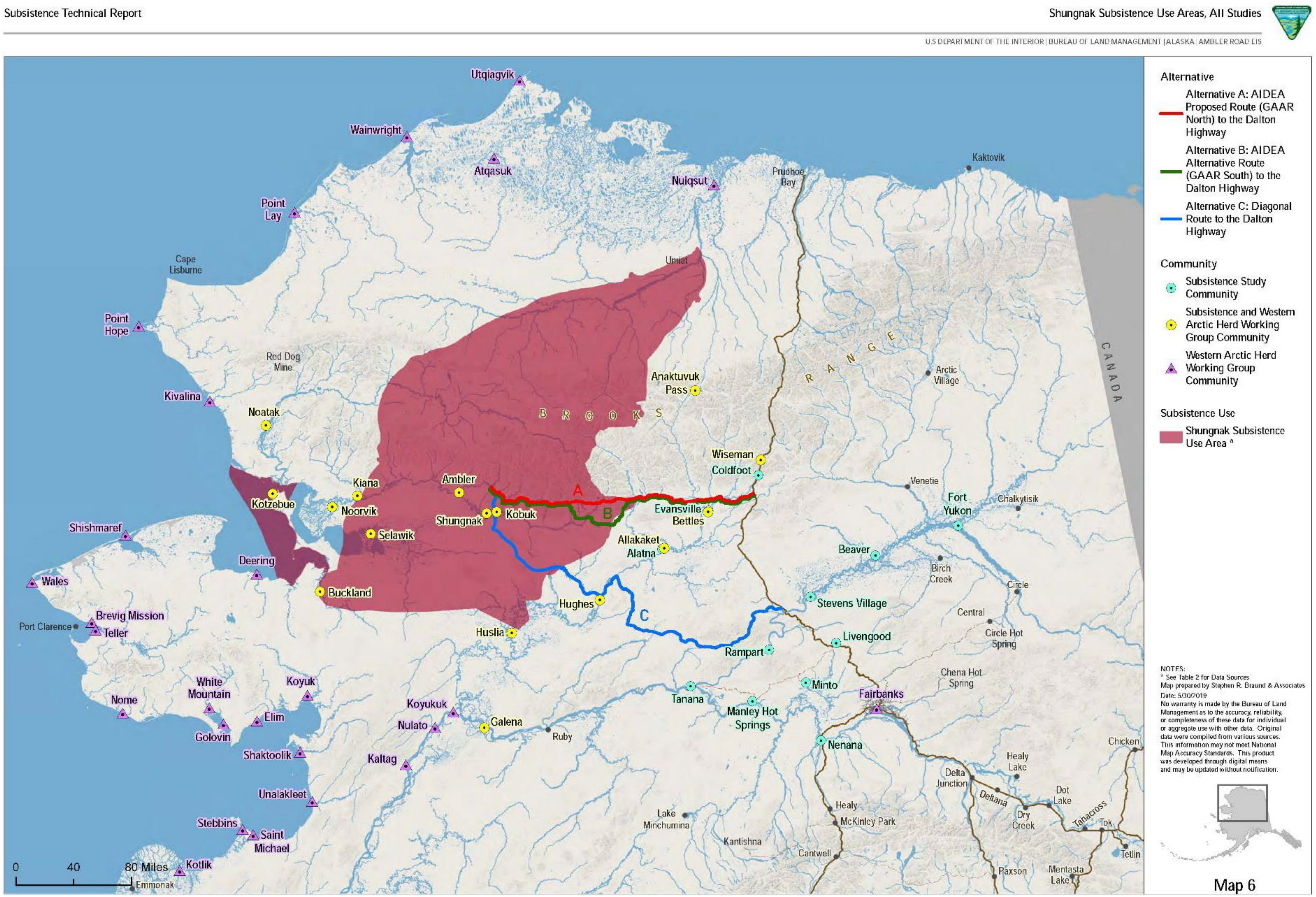

Map 6. Shungnak subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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5.1.2 Harvest Data

Harvest data for the Kobuk River study communities are provided on Figure 1 through Figure 3 and in Table 5. As shown on Figure 1, based on an average of available data, caribou is the primary resource harvested among the study communities in terms of percentage of usable pounds (39 percent), followed by non-salmon fish (31 percent), and salmon (18 percent). Other resources which contribute smaller amounts in terms of pounds include moose, vegetation, migratory birds, small land mammals/furbearers, and marine mammals. Resource contribution varies by study community. Communities located farther downriver (Kiana and Noorvik) and closer to Kotzebue Sound show a higher reliance on marine mammals. In addition, the community of Ambler shows a higher reliance on caribou than some other communities and a lower reliance on salmon, although recent fish-only studies show higher per capita harvests of salmon for Ambler.

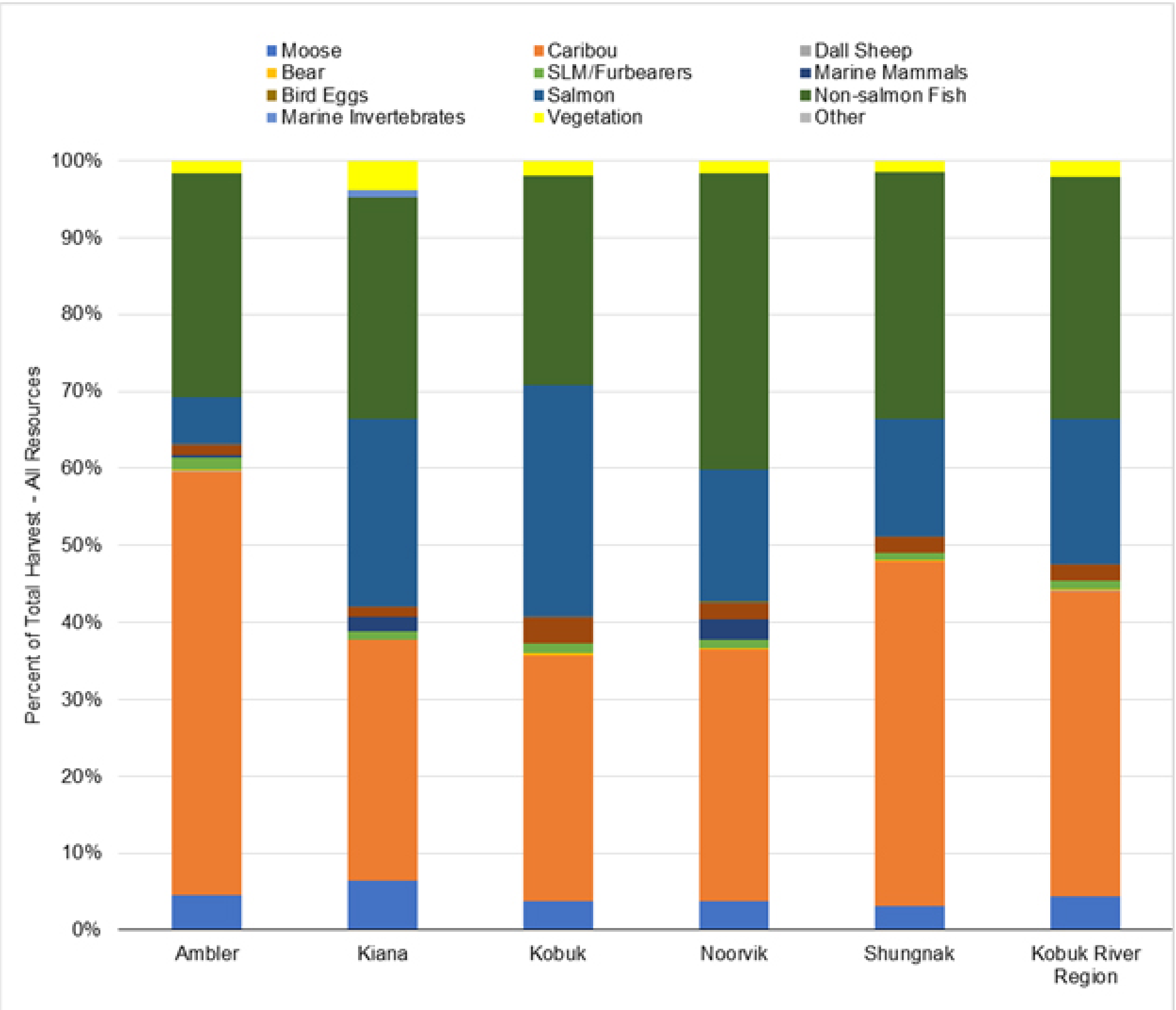

Figure 1. All resources percent of total harvest by Kobuk River region communities

Source: See Table 2 for citations, time period, and resources addressed.
Notes: Data represent the average percent of harvest across all available study years for comprehensive (i.e., all resources) household harvest surveys. In many cases, averages represent only a single study year. Available study years for each community are as follows: Ambler (2012); Kiana (2006); Kobuk (2012); Noorvik (2012); Shungnak (2002, 2012).

Average participation rates among Kobuk River communities, in terms of the average percentage of households attempting harvests by resource during individual study years, are shown on Figure 2. These data are based on averages across available study years; it is likely that in some years (or across all years) a higher percentage of households participates in each resource activity. Across all Kobuk River study communities, households most commonly participate in harvests of vegetation (85 percent of households), followed by non-salmon fish (74 percent), caribou (71 percent), and salmon (57 percent). Fewer households participate in harvests of Dall sheep, marine mammals, and small land mammals/furbearers. The average percentage of households receiving different resources is shown on Figure 3. This figure shows that while certain resources are not commonly harvested within a community, they may still be highly consumed through sharing. For example, while few Kobuk River region households participate in marine mammal hunting (less than 10 percent; Figure 2), an average of over 60 percent of households receive marine mammals. Other resources which are widely shared among Kobuk River region communities include non-salmon fish, salmon, caribou, vegetation, and migratory birds.

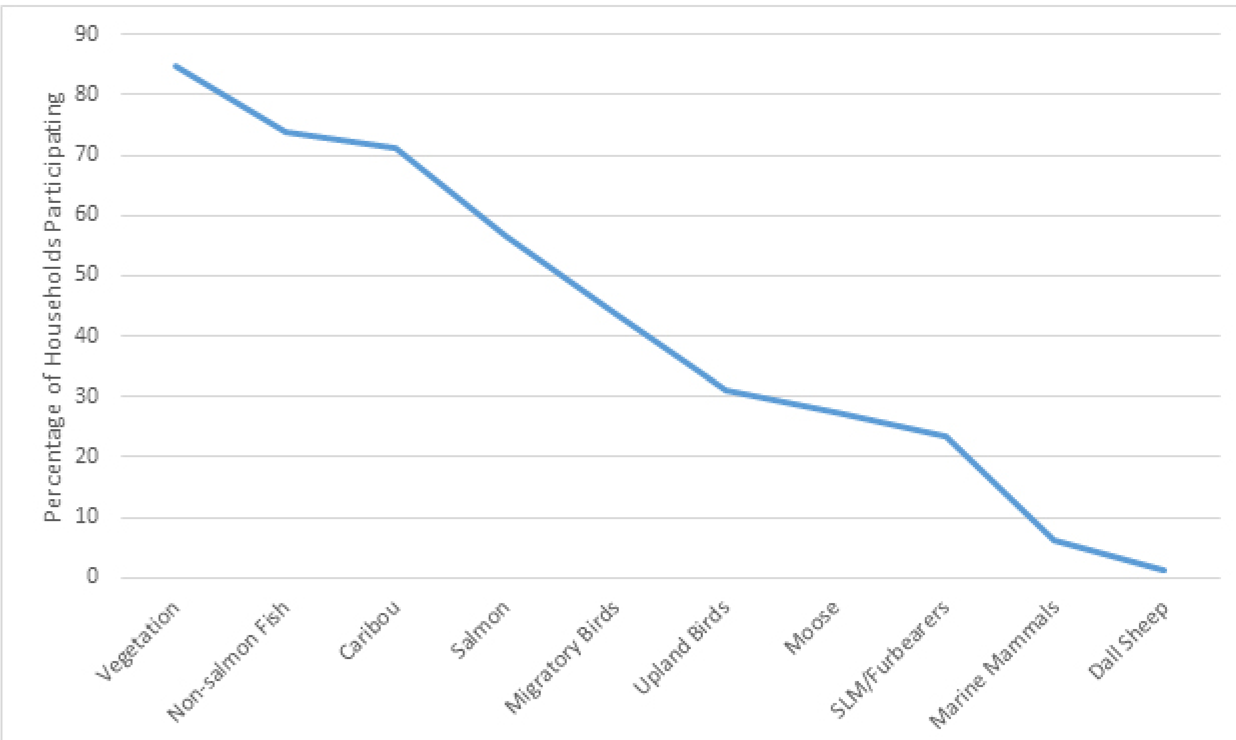

Figure 2. Percent of households attempting harvests of resources, Kobuk River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years Available study years for each community are as follows: Ambler (1997; 2003; 2009-10; 2012; 2012-2014); Kiana (1993; 1994-2004; 1996; 1999; 2009-10; 2012-2014); Kobuk (1994-2004; 1996-1997; 2004; 2009-10; 2012; 2012-2014); Noorvik (1996; 2002; 2008-09; 2012; 2012-2014); Shungnak (1996; 2000; 2002; 2008-09; 2012; 2012-2014).

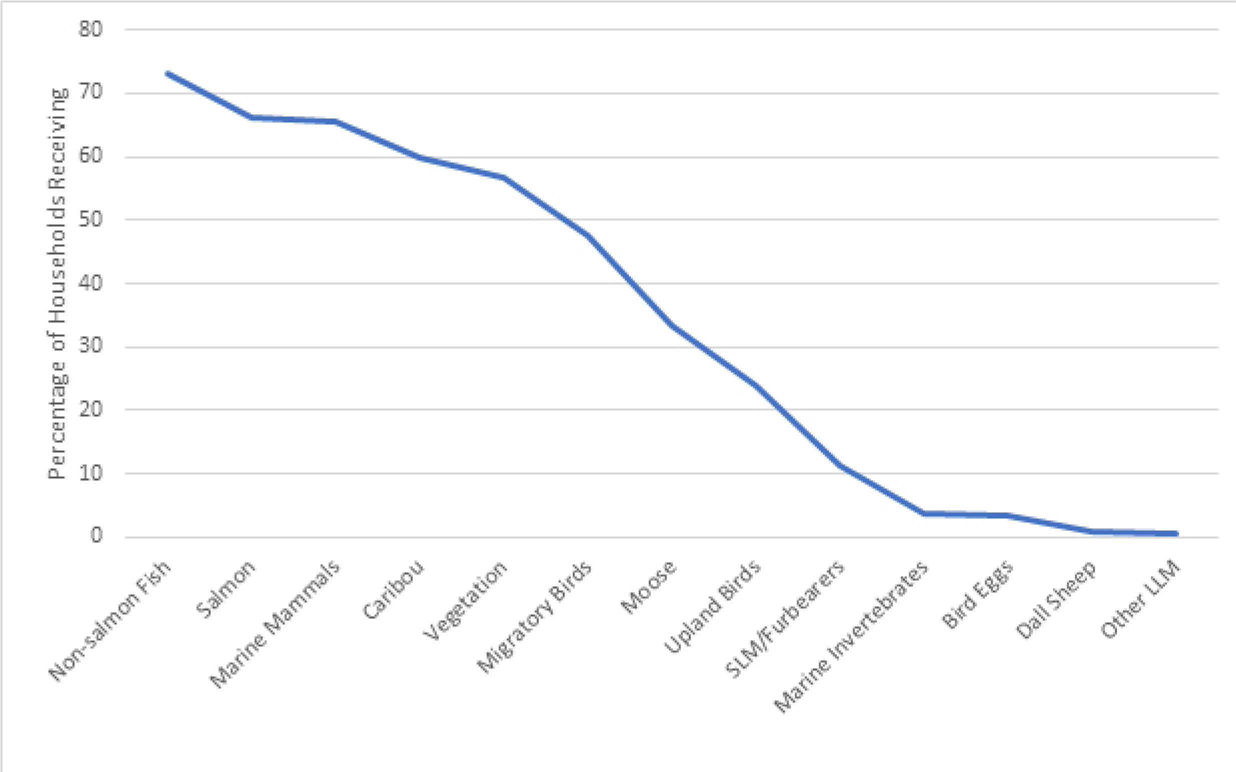

Figure 3. Percent of households receiving resources, Kobuk River region communities

Source: See Table 2 for citations, time period, and resources addressed
Notes: Data represent the average percent of households across all available study years Available study years for each community are as follows: Ambler (1997; 2003; 2009-10; 2012; 2012-2014); Kiana (1993; 1994-2004; 1996; 1999; 2009-10; 2012-2014); Kobuk (1994-2004; 1996-1997; 2004; 2009-10; 2012; 2012-2014); Noorvik (1996; 2002; 2008-09; 2012; 2012-2014); Shungnak (1996; 2000; 2002; 2008-09; 2012; 2012-2014).

Table 5 shows average harvest and use data for the top five species harvested (in terms of average contribution toward the total subsistence harvest) by each of the Kobuk River Region study communities. Caribou is the top species in each of the study communities, contributing between 31.2 (Kiana) and 54.6 percent (Ambler) of the total subsistence harvest. Non-salmon fish species are also among the top five species for all study communities and include sheefish and whitefish (broad and humpback). Salmon – specifically chum salmon – are also among the top five species harvested in the study communities. Moose is among the top species harvested in Ambler, Kiana, and Kobuk. In addition, northern pike is a top species in the community of Noorvik. Data on the percentage of households using subsistence resources illustrates the heavy reliance of Kobuk River communities on resources such as caribou and fish, with between 88 percent and 95 percent of households in the individual communities using caribou; and between 76 and 94 percent of households using sheefish (Table 5). Across all study years, the percentages are likely higher.

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Table 5. Average harvest and use data, top 5 species, Kobuk River region communities

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Ambler	Caribou	88	74	69	56	51	489	66,473	937	255	54.6
Ambler	Broad whitefish	62	38	37	25	48	9,321	23,473	317	88	17.1
Ambler	Sheefish	87	72	69	47	56	1,481	20,966	291	84	7.5
Ambler	Chum salmon	76	53	52	34	57	2,902	20,262	281	80	5.4
Ambler	Moose	36	21	13	14	26	10	5,231	74	20	4.5
Kiana	Caribou	89	70	66	53	65	403	54,755	559	144	31.2
Kiana	Chum salmon	86	62	58	37	79	3,298	19,199	199	48	20.7
Kiana	Whitefish	60	44	42	N/A	N/A	10,834	22,189	234	58	16.7
Kiana	Moose	29	16	13	9	14	13	7,054	72	19	6.5
Kiana	Sheefish	76	59	57	32	58	1,485	15,018	154	37	5.4
Kobuk	Caribou	89	78	66	57	63	154	20,976	655	147	31.8
Kobuk	Chum salmon	83	63	60	38	54	2,174	12,841	384	84	29.5
Kobuk	Sheefish	94	81	79	42	43	903	10,199	306	67	23.3
Kobuk	Moose	48	45	16	16	43	6	2,958	95	21	3.8
Kobuk	Broad whitefish	27	19	19	9	14	543	1,738	55	12	1.8
Noorvik	Caribou	95	67	67	48	60	869	118,140	818	184	32.8
Noorvik	Sheefish	82	56	54	36	54	4,054	45,697	348	80	19.0
Noorvik	Chum salmon	89	47	45	42	66	15,408	93,115	719	165	16.3
Noorvik	Broad whitefish	78	45	42	33	53	12,063	38,603	297	68	9.1
Noorvik	Northern pike	59	43	41	25	27	6,347	20,945	161	37	4.8
Shungnak	Caribou	97	66	64	48	60	441	60,044	1,055	237	44.7

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Shungnak	Chum salmon	78	52	50	30	58	4,691	28,070	452	105	14.8
Shungnak	Humpback whitefish	37	29	28	19	22	7,367	15,470	270	60	14.0
Shungnak	Sheefish	85	64	64	35	56	2,565	26,155	414	98	12.2
Shungnak	Broad whitefish	44	28	25	14	32	2,747	8,789	144	34	3.2

Source: See Table 2 for citations, time period, and resources addressed
Notes: HH = households; N/A = Not available
Data represent the average across all available study years. Available study years for each community are as follows: Ambler (1997; 2003; 2009-10; 2012; 2012-2014); Kiana (1993; 1994-2004; 1996; 1999; 2009-10; 2012-2014); Kobuk (1994-2004; 1996-1997; 2004; 2009-10; 2012; 2012-2014); Noorvik (1996; 2002; 2008-09; 2012; 2012-2014); Shungnak (1996; 2000; 2002; 2008-09; 2012; 2012-2014).

5.1.3 Timing of Subsistence Activities

Data on the timing of subsistence activities for Kobuk River study communities are provided in Table 6. This table shows the number of communities reporting subsistence activity or harvests within each month, based on the most recent data sources for each community. Overall, Kobuk River communities target the greatest number of resources during the month of October, with other periods of high activity also occurring in the earlier summer/fall months of August/September and in the spring months of April/May.

Early spring (March/April) is primarily spent on hunting and trapping of small land mammals, including hunting of upland birds. While residents no longer use spring muskrat camps regularly, some hunting of muskrats and beaver continues to occur. Geese and duck hunting peaks in April and May and remains an important spring activity with residents accessing harvest areas by boat and snowmachine depending on conditions (Braem et al. 2015). When available, residents may hunt WAH caribou during their spring migration north. Spring carnivals are important regional events, particularly for Kobuk and Koyukuk River communities, which center on the harvest and sharing of subsistence foods (Watson 2018).

Immediately after breakup, residents set nets for various non-salmon fish such as whitefish, graying, and northern pike (Braem et al. 2015). Harvesting of sheefish during their summer runs are a key summer activity for Kobuk River communities. Residents also harvest chum salmon and whitefish during the summer, sometimes staying at traditional fish camps, with harvesting of vegetation and hunting of large land mammals also occurring during this time. Hunting of large land mammals also occurs in summer but peaks during fall, when residents hunt for caribou, moose, and bear.

Fall is a major subsistence season for the Kobuk River region. Caribou hunting generally peaks in the fall months of September and October, and residents also resume hunting waterfowl as they migrate south. Residents also hunt other large land mammals such as moose and black bear. Residents continue to seine and set gillnets for fish into the fall, with whitefish replacing salmon and sheefish as the primary resource harvested during this time. Fall is also an important time for berry picking.

Hunting and fishing (through the ice) continues at somewhat lower levels into winter. Some individuals trap and hunt for beaver and other furbearers (e.g., wolf, wolverine, hare, and fox) in winter as well. When available during winter, hunters from the Kobuk River region may travel by snowmachine—sometimes great distances—to harvest caribou (Watson 2018). Residents also harvest ptarmigan during winter when they are available.

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Table 6. Kobuk River region timing of subsistence activities, number of communities reporting subsistence activities

Resources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon	2	2	2	5	5	5	5	5	5	5	5	5
Marine non-salmon fish	N/A	N/A	N/A	N/A	3	3	5	2	2	2	N/A	N/A
Caribou	5	5	5	5	5	3	3	5	5	5	5	5
Moose	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	5	3	N/A	N/A
Bear	N/A	N/A	N/A	3	5	N/A	N/A	5	5	3	N/A	N/A
Furbearers	3	3	3	3	3	N/A	N/A	N/A	N/A	3	3	3
Small land mammals	5	5	5	5	5	N/A	N/A	N/A	N/A	2	5	5
Upland birds	5	5	5	5	N/A	N/A	N/A	N/A	N/A	2	5	5
Waterfowl	N/A	N/A	N/A	3	5	5	5	5	5	5	N/A	N/A
Plants and berries	N/A	N/A	N/A	N/A	N/A	5	5	5	5	5	2	N/A
Wood	5	5	5	5	5	3	N/A	2	2	2	5	5
Total number of resources per month	**6**	**6**	**6**	**8**	**8**	**6**	**5**	**8**	**8**	**11**	**7**	**6**

Source: Anderson et al. 1998; Braem 2012a; Braem et al. 2017
Notes: Apr = April; Aug = August; Dec = December; Feb = February; Mar = March; Jan = January; Jul = July; Jun = June; N/A = Not applicable (no or limited subsistence activity); Nov = November; Oct = October; Sep = September
Kobuk River region communities = 5 (Ambler, Kiana, Kobuk, Noorvik, and Shungnak)
Each cell contains the number of communities reporting subsistence activity or harvests during each month, based on the most recent data source for each community. Months with only one community report harvests or activity are not included in the table. Resources with no subsistence activity data available are not included in the table.

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5.1.4 Travel Method

While systematic, quantitative data on travel methods are not available for Kobuk River subsistence study communities, several studies provide qualitative information on travel methods and routes in the Kobuk River region. Braem et al. (2015) note that boat and snowmachine are the primary used by residents to travel to subsistence harvesting areas and to and from other communities within the region. To a lesser extent, residents use ATVs to access overland areas during the snow-free season. However, while still not a primary mode of transportation, use of ATVs has increased over time. As stated in Braem et al. (2015), residents of Ambler use ATVs to "reach country that may be inaccessible by boat" and to save on gas by opting for short ATV trips over longer boating trips. Snowmachine travel can extend into mid-May assuming snow conditions allow. In recent years, residents have noted changes in snow conditions which affect certain subsistence activities generally carried out by snowmachine (e.g., furbearer harvesting, wood-gathering, and inter-community travel). Breakup generally occurs in mid- to late May when residents switch from snowmachine travel to boat travel along local rivers. Erosion has also affected river channels, and subsequently boat travel, for Kobuk River communities. Freeze-up generally occurs in mid-October and residents shortly thereafter begin traveling by snowmachine again which opens up larger overland areas for subsistence uses. For the study communities, the Kobuk River is a major transportation corridor throughout the year.

5.1.5 Resource Importance

While all subsistence activities and resources are of high importance to a community, the importance of individual resources relative to one another varies according to various material and cultural measures used in this analysis. This section provides an analysis of the relative importance of resources to each Kobuk River Region study community, based on selected measures of harvest (percentage of total harvest), harvest effort (percentage of households attempting harvests) and sharing (percentage of households receiving). The relative importance of subsistence resources to the individual Kobuk River study communities, based on selected variables, is provided in Table 7 through Table 11.

Based on this analysis, caribou, non-salmon fish, salmon, and vegetation are resources of high importance in all five Kobuk River Region study communities. In addition, marine mammals are a resource of high importance in four of the five study communities (Ambler, Kobuk, Noorvik, and Shungnak), and migratory birds are a resource of high importance in one study community (Shungnak). Resources of moderate importance in the study communities include moose (five study communities), small land mammals/furbearers (three study communities), migratory birds (four study communities), and upland birds (three study communities).

Table 7. Relative importance of subsistence resources based on selected variables, Ambler

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	21	26	5	M
2	Caribou	74	51	55	H
3	Dall sheep	2	2	0.1	L
4	Bear	N/A	N/A	0.2	L
5	Other large land mammals	N/A	1	N/A	L
6	Small land mammals/furbearers	19	9	2	M
7	Marine mammals	2	60	0.3	H

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
8	Migratory birds	40	30	1	M
9	Upland birds	40	26	0.2	M
10	Bird eggs	2	4	N/A	L
11	Salmon	55	62	6	H
12	Non-salmon fish	77	68	29	H
13	Marine invertebrates	2	2	0.1	L
14	Vegetation	85	51	2	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A = Not Available

Table 8. Relative importance of subsistence resources based on selected variables, Kiana

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	16	14	6	M
2	Caribou	70	65	31	H
3	Dall sheep	1	N/A	N/A	L
4	Bear	N/A	N/A	N/A	I
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/furbearers	16	2	1	L
7	Marine mammals	10	N/A	2	M
8	Migratory birds	38	N/A	1	M
9	Upland birds	8	N/A	0.03	L
10	Bird eggs	1	N/A	N/A	L
11	Salmon	64	82	24	H
12	Non-salmon fish	68	N/A	29	H
13	Marine invertebrates	4	N/A	1	L
14	Vegetation	73	N/A	4	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 9. Relative importance of subsistence resources based on selected variables, Kobuk

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	45	43	4	M
2	Caribou	78	63	32	H
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	0.2	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/furbearers	26	14	1	L

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
7	Marine mammals	N/A	63	N/A	H
8	Migratory birds	40	57	3	M
9	Upland birds	50	33	0.3	M
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	63	57	30	H
12	Non-salmon fish	85	71	27	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	87	80	2	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 10. Relative importance of subsistence resources based on selected variables, Noorvik

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	28	43	4	M
2	Caribou	67	60	33	H
3	Dall sheep	0.4	1	N/A	L
4	Bear	N/A	N/A	0.2	L
5	Other large land mammals	N/A	0.4	N/A	L
6	Small land mammals/furbearers	20	10	1	L
7	Marine mammals	11	67	3	H
8	Migratory birds	54	53	2	M
9	Upland birds	29	12	0.1	M
10	Bird eggs	20	5	0.1	L
11	Salmon	47	69	17	H
12	Non-salmon fish	70	81	38	H
13	Marine invertebrates	1	7	0.003	L
14	Vegetation	86	54	2	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A = Not Available

Table 11. Relative importance of subsistence resources based on selected variables, Shungnak

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	27	41	3	M
2	Caribou	66	60	45	H
3	Dall sheep	N/A	1	N/A	L
4	Bear	N/A	N/A	0.1	L
5	Other large land mammals	N/A	N/A	N/A	I

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
6	Small land mammals/furbearers	35	22	1	M
7	Marine mammals	2	71	0.1	H
8	Migratory birds	47	51	2	H
9	Upland birds	29	24	0.1	L
10	Bird eggs	N/A	2	N/A	L
11	Salmon	54	62	15	H
12	Non-salmon fish	69	72	32	H
13	Marine invertebrates	1	2	N/A	L
14	Vegetation	94	42	2	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

5.2. Kotzebue Sound

The Kotzebue Sound region includes the communities of Buckland, Kotzebue, Noatak, and Selawik. These communities are located to the west of the project corridors in Kotzebue Sound and along tributaries of Kotzebue Sound.

5.2.1 Subsistence Use Areas

Subsistence use areas for the Kotzebue Sound region study communities are focused around Kotzebue Sound, the Chukchi Sea coast, and lands and rivers surrounding Kotzebue Sound including the Brooks Range and the Noatak, Kobuk, Selawik, and Buckland rivers. More recently documented subsistence use areas for these study communities (Satterthwaite-Phillips et al. 2016) indicate a smaller extent of overland travel. Subsistence use areas for Kotzebue Sound region study communities do not overlap with the project alternatives but occur downriver from the alternatives or approach the project alternatives in overland areas from the west and north.

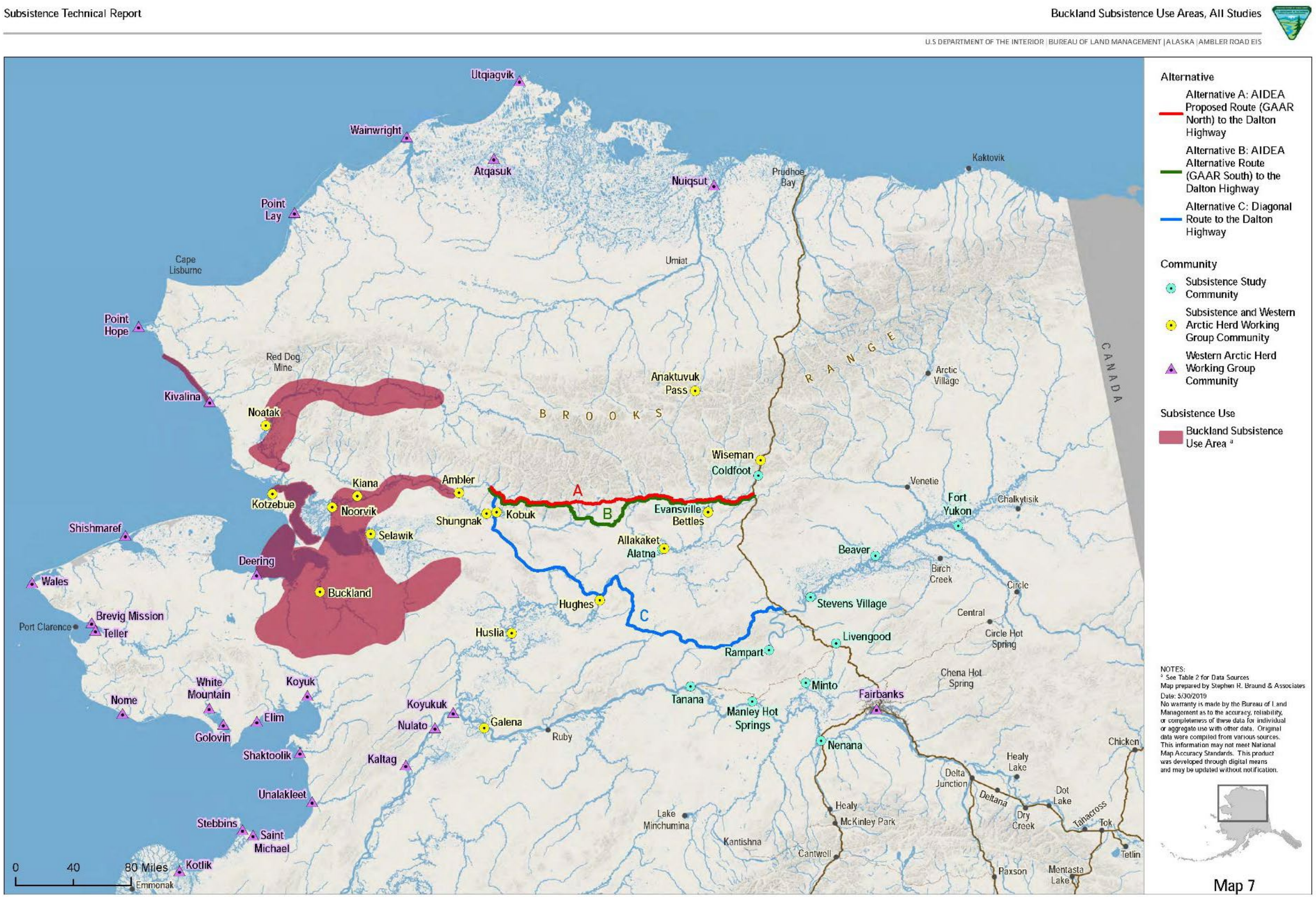
As shown on Map 7, Buckland subsistence use areas for all available time periods (Lifetime ca. 1925-1985; Lifetime to 2014) occur in a large overland area to the south and east of the community; along the Kobuk River to the community of Ambler; into Kotzebue Sound and along the coast near Kivalina; and north along the Noatak River. Recent subsistence use areas documented for Buckland (Satterthwaite-Phillips et al. 2016) indicate a shift in contemporary subsistence uses to the south. These use areas extend as far north as Kotzebue but do not occur along the Kobuk River or Noatak rivers. Instead, contemporary Buckland subsistence use areas are more focused along the Buckland River drainage and in overland areas to the south and east of Kotzebue Sound. Marine mammal hunting by Buckland residents occurs in Kotzebue Sound primarily near the mouth of the Buckland River and near Deering. Bird hunting and egg harvesting is also focused around the Buckland River with coastal hunting in Kotzebue Sound as well. Fishing occurs along the Buckland River, in Kotzebue Sound, and in Selawik Lake, with the greatest amount of overlap occurring In Kotzebue Sound near the mouth of Selawik Lake, in the southern portion of Selawik Lake, and near the community of Buckland on the Buckland River. Large game hunting focuses to the south and east of the community, both along the Buckland River and in larger overland areas that extend south and east paralleling the Selawik River, with small game hunting and trapping occurring in similar overland areas. Finally, plant gathering in Buckland occurs most commonly along the Buckland River and in coastal areas near the mouth of the river (Satterthwaite-Phillips et al. 2016). Map 8 shows Kotzebue subsistence use areas for all available time periods (Lifetime to 2014; 2014) occurring throughout Kotzebue Sound and along the Chukchi Sea coast, along the Kobuk and Noatak rivers, and in overland areas which extend to the southwest, north, east and southeast of the community. More recently documented subsistence use areas documented in Satterthwaite-Phillips et al. (2016) show Kotzebue residents using similar areas for subsistence throughout Kotzebue Sound and along the Noatak River and Kobuk River drainages. In addition, more recently documented use areas extend as far as Point Hope in the north and in areas surrounding the Kivalina and Wulik rivers. Based on the data in Satterthwaite-Phillips et al. (2016), contemporary marine mammal use areas occur throughout Kotzebue Sound and along the Chukchi Sea coast to Point Hope. Bird hunting focuses on the lands near Kotzebue, around the mouth of the Kobuk River, along the Noatak River, and along the coast extending from the Delong Mountain Transportation System (DMTS), Cape to Cape Krusenstern, Sheshalik, and the mouth of the Noatak River. Kotzebue use areas for fish are most concentrated around the mouth of the Kobuk River, in various areas of Kotzebue Sound and along the Noatak River. Large and small game hunting game hunting by Kotzebue residents focuses on coastal areas of Kotzebue Sound, along the Kobuk and Noatak rivers, and in overland areas to the northeast of the community in the Brooks Range. Plant gathering activities are focused on coastal areas in Kotzebue Sound and along the Noatak River, with some plant harvesting also occurring near the mouth of the Kobuk River (Satterthwaite-Phillips et al. 2016).

Noatak use areas for all available time periods (Lifetime ca. 1925-1985; Lifetime to 2014; 1998-2007; 2007) (Map 9) occur along the entire lower and upper Noatak River drainage, north onto the North slope, west to the Chukchi Sea coast and in marine waters of the Chukchi Sea, and south into Kotzebue Sound, along Kobuk river, and around the Selawik River drainage. More recently documented use areas occur in similar areas surrounding the Noatak River drainage but with less extensive use to the north of Brooks Range and south of the community along the Selawik River drainage. Marine mammal hunting by Noatak residents occurs throughout Kotzebue Sound and in marine waters off the Chukchi Sea coast as far as Point Hope. Bird hunting primarily occurs in overland areas surrounding the Noatak River, while fishing is focused along the Noatak River drainage with some fishing also occurring in coastal areas of Kotzebue Sound, particularly near Sheshalik. Contemporary large game and small game hunting in Noatak is focused heavily along the Noatak River drainage and in various overland areas surrounding the Noatak River. Plant gathering in Noatak is also focused around the Noatak River, with some coastal use areas identified as well (Satterthwaite-Phillips et al. 2016).

As shown on Map 10, Selawik subsistence use areas for all available time periods (Lifetime ca. 1925-1985; Lifetime to 2014; 2010-11) occur in an area surrounding the Selawik Lake and river, extending east toward the upper Kobuk and Koyukuk river drainages, north into the Brooks Range and as far as the upper Colville River, and west into Kotzebue Sound and along the Chukchi Sea coast to Kivalina. More recently documented subsistence use areas (Satterthwaite-Phillips et al. 2016) are focused primarily to the south of the Kobuk River drainage, with a majority of subsistence harvesting activities occurring around Selawik Lake, Selawik River, and in overland areas to the south of the community. Bird hunting is focused to the east of Selawik Lake along Inland Lake, Selawik River, and Tagagawik River. Fishing occurs with the greatest concentrations in Selawik Lake and along Selawik River, with lesser use of Kotzebue Sound and in several locations along the Kobuk River. Large game hunting focuses along local lakes and waterways in addition to extending across larger overland areas both north and south of the community of Selawik. Small game hunting and trapping occurs in similar overland areas but focused to the east of Selawik Lake. Residents also have reported a couple of isolated hunting areas for large and small game along the Kobuk River. Plant gathering by Selawik residents is more concentrated near the community and around river and lakesides.

5.2.2 Harvest Data

Harvest data for the Kotzebue Sound study communities are provided on Figure 4 through Figure 6 and in Table 12. As shown on Figure 4, based on an average of available data, non-salmon fish is the primary resource harvested among the study communities in terms of percentage of usable pounds (32 percent), followed closely by caribou (31 percent). Marine mammals (15 percent), and salmon (12 percent) also contribute a substantial amount to Kotzebue Sound study communities. Other resources which contribute smaller amounts in terms of pounds include moose, vegetation, and migratory birds. Resource contribution varies by study community. Selawik shows a much higher reliance on non-salmon fish than other Kotzebue Sound study communities, at 68 percent of the total subsistence harvest. Noatak and Buckland show a higher reliance on caribou, while Kotzebue harvests are nearly evenly split between caribou, non-salmon fish, salmon, and marine mammals. This page is intentionally left blank.



Map 7. Buckland subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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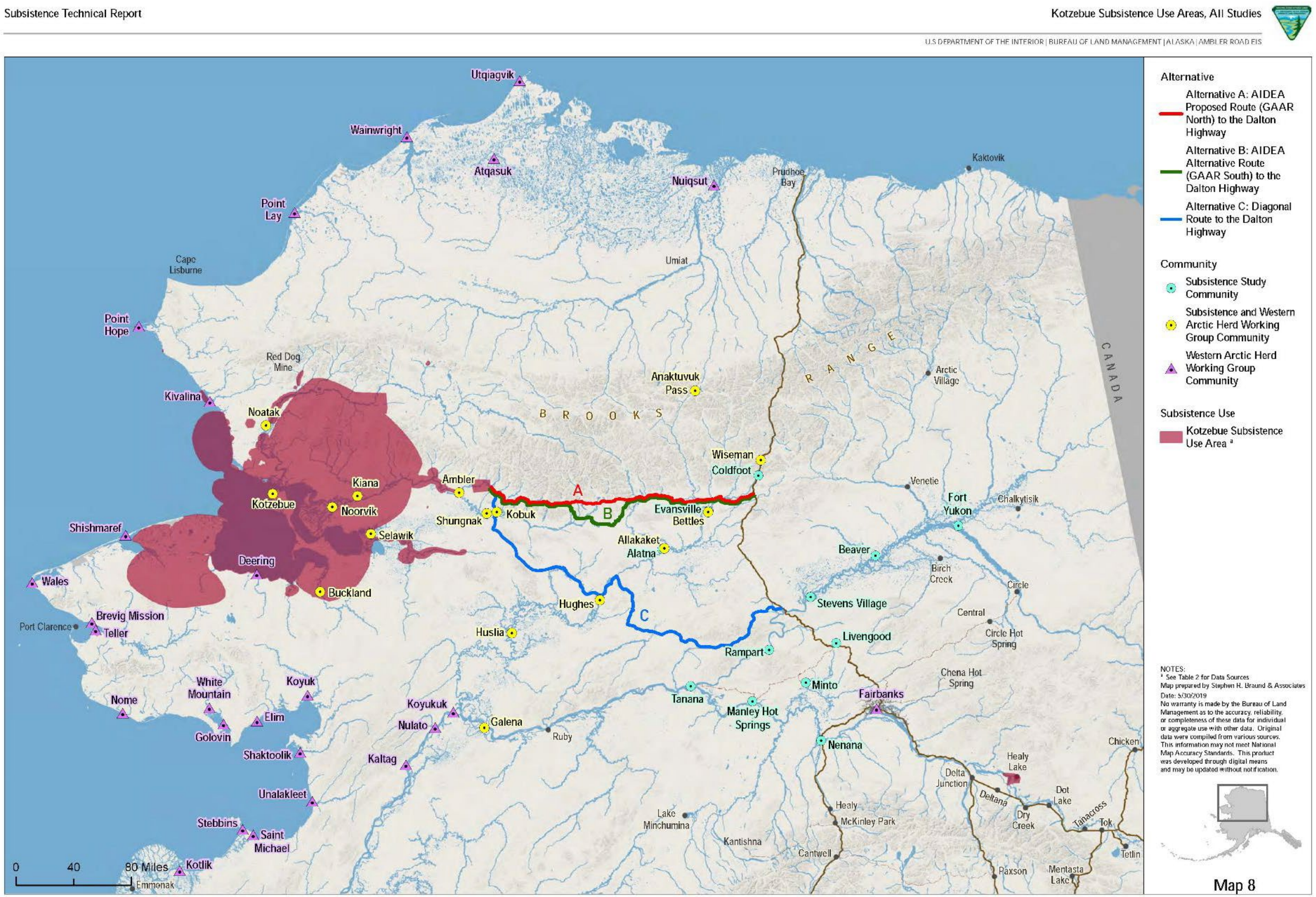

Map 8. Kotzebue subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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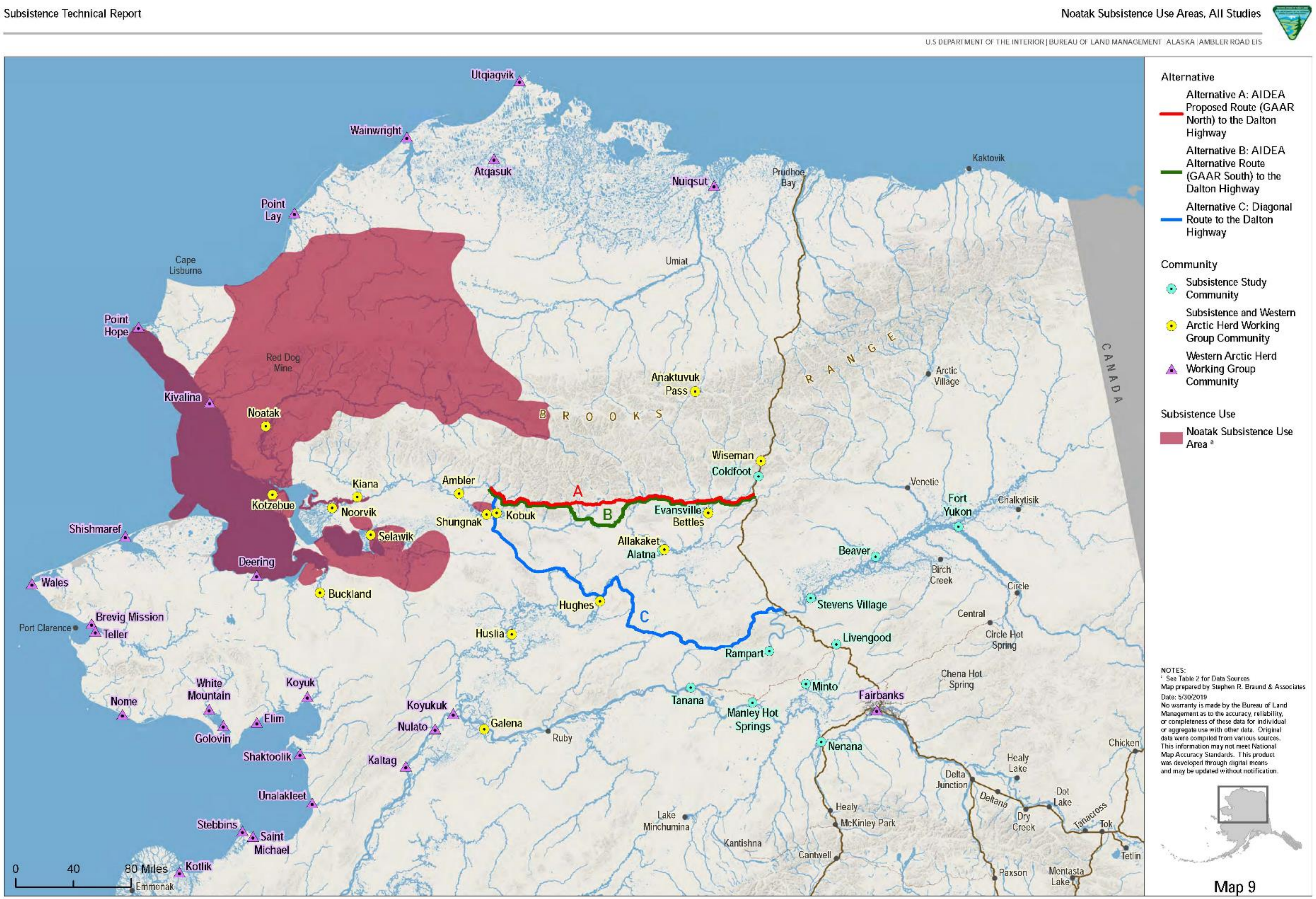

Map 9. Noatak subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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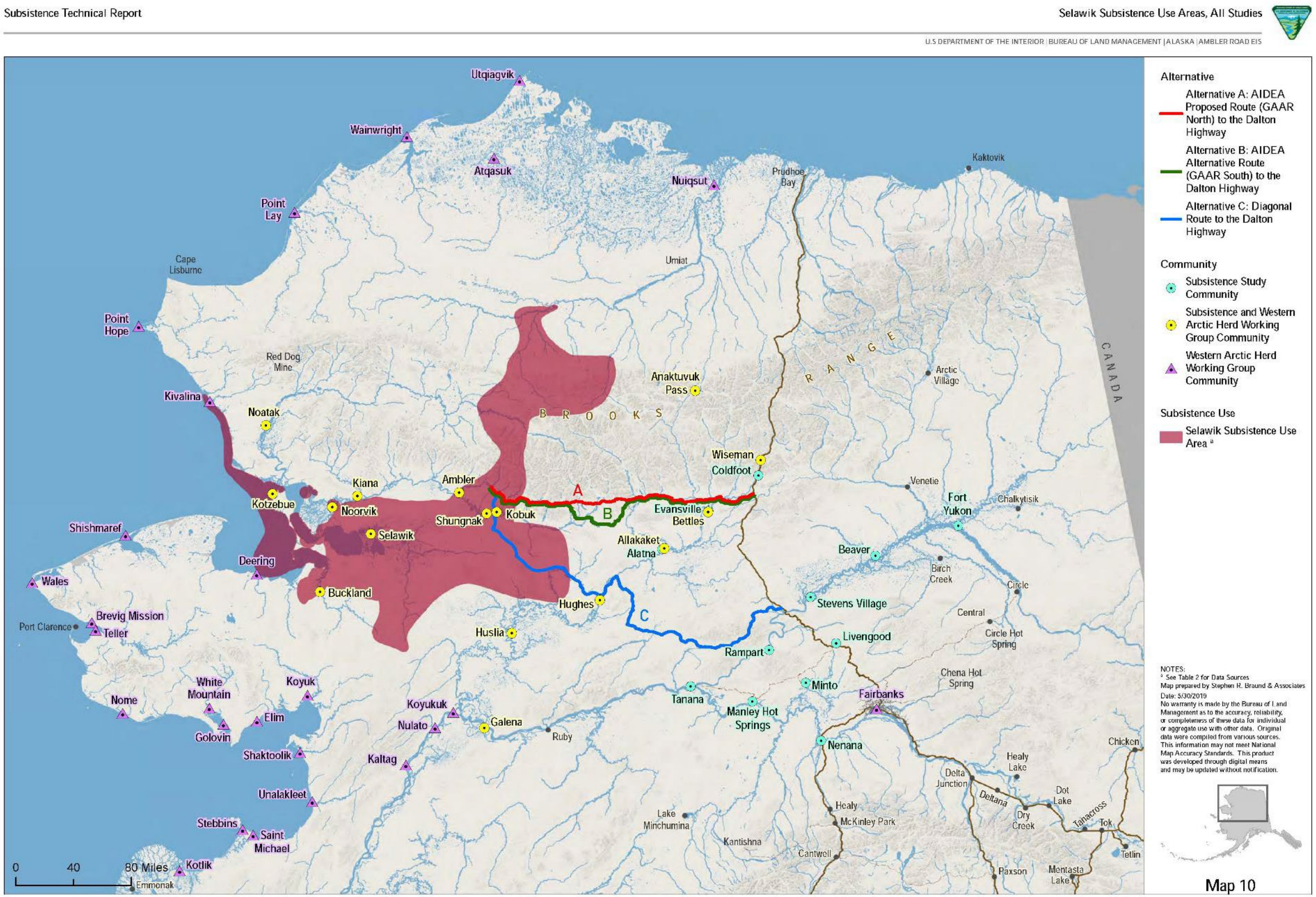

Map 10.Selawik subsistence use areas, all studies
Note: where the use overlays water, the shade is darker.

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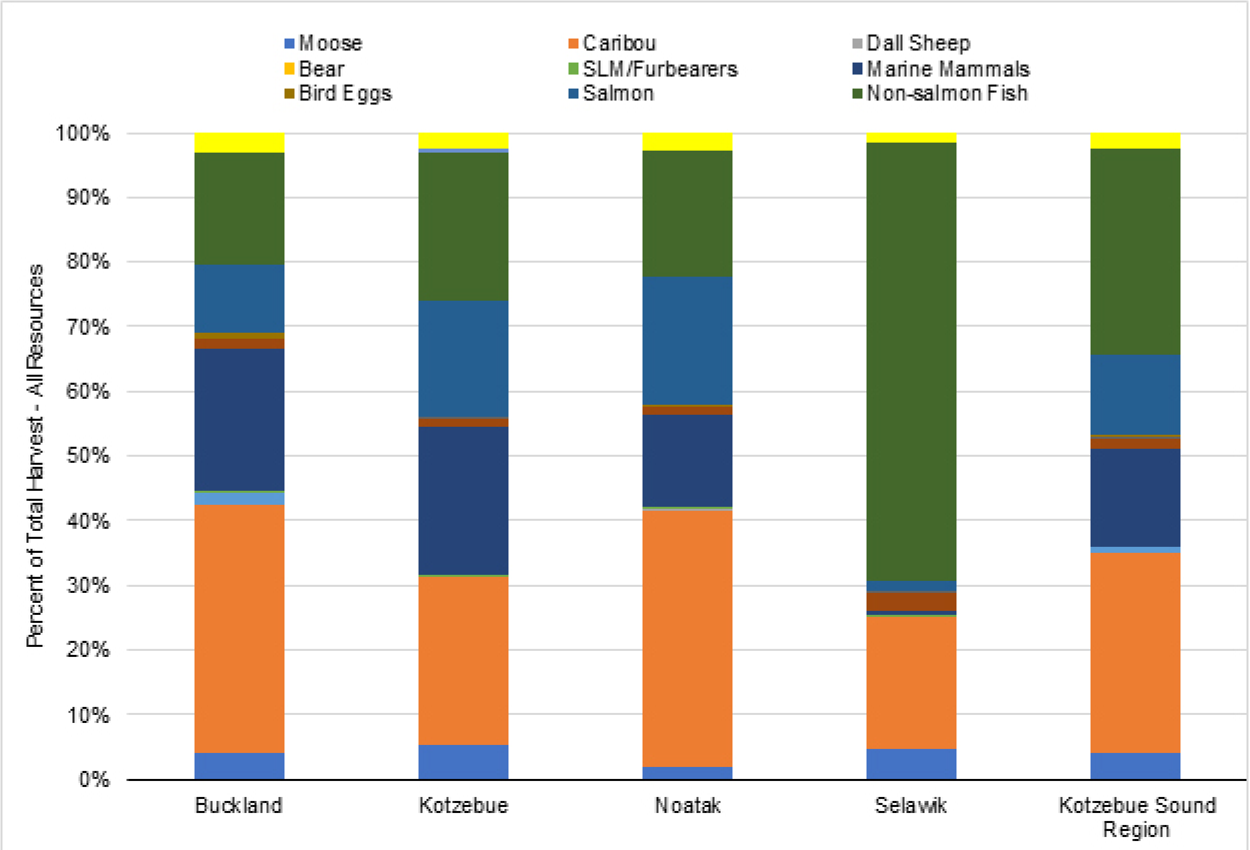

Figure 4. All resources percent of total harvest by Kotzebue Sound region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of harvest across all available study years for comprehensive (i.e., all resources) household harvest surveys. In many cases, averages represent only a single study year. Available study years for each community are as follows: Buckland (2003); Kotzebue (1986, 1991, 2002-2004, 2014); Noatak (1994, 2007); Selawik (2010-11).

Average participation rates among Kotzebue Sound study communities, in terms of the average percentage of households attempting harvests by resource during individual study years, are shown on Figure 5. These data are based on averages across available study years; it is likely that in some years (or across all years) a higher percentage of households participates in each resource activity. Across all Kotzebue Sound study communities, households most commonly participate in harvests of vegetation (80 percent of households), followed by non-salmon fish (74 percent), caribou (63 percent), salmon (47 percent), and migratory birds (43 percent). Fewer households participate in harvests of marine invertebrates, Dall sheep, other large land mammals, and small land mammals/furbearers. While an important resource in terms of harvest amounts, participation in marine mammal harvesting occurs among a smaller subset of households (23 percent). The average percentage of households receiving different resources is shown on Figure 6. Similar to the Kobuk River region, this figure shows that while certain resources are not as commonly harvested within a community, they may still be highly consumed through sharing. For example, while only 23 percent of households hunt marine mammals over 50 percent of households receive this resource. The most commonly shared resources in Kotzebue Sound communities (more than half of households receiving) include non-salmon fish, caribou, marine mammals, salmon, and vegetation.

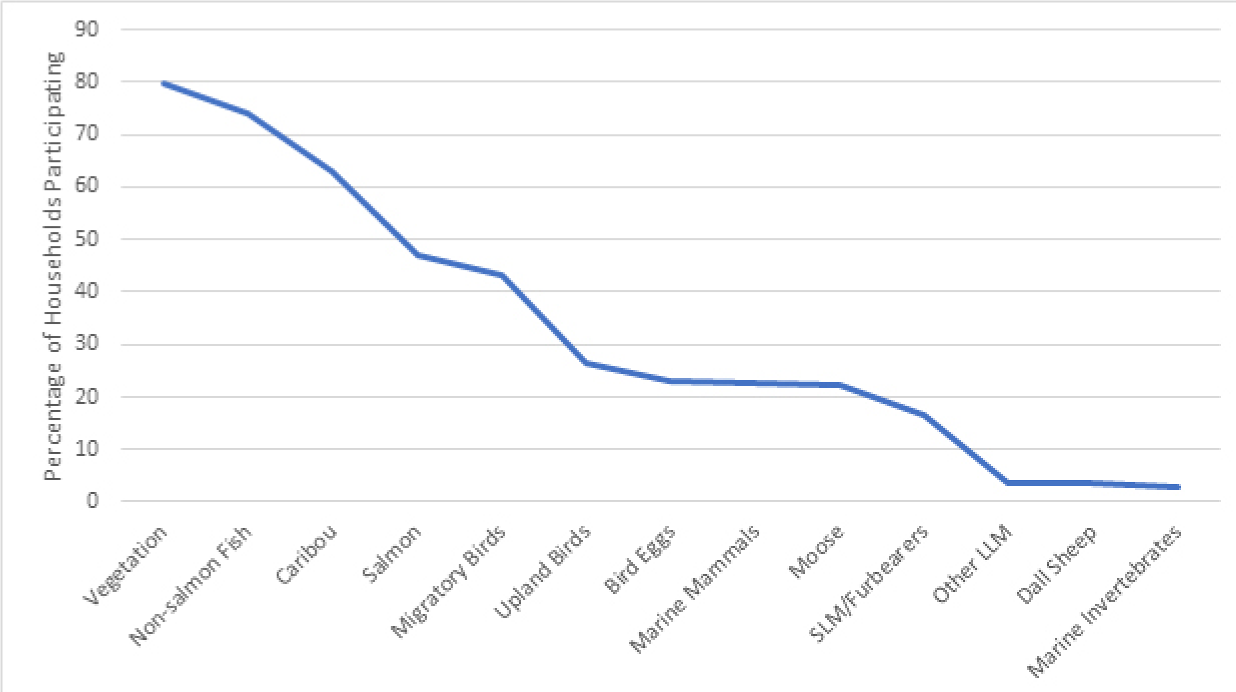

Figure 5. Percent of households attempting harvests of resources, Kotzebue Sound region communities

Source: See Table 2 for citations, time period, and resources addressed.
Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows (available study years vary by resource): Buckland (1996, 2003, 2009-10, 2012-2014, 2016-17); Kotzebue (1986, 1991,1997, 2002-2004, 2012, 2012-2013, 2013-2014, 2014); Noatak (1994, 1997, 1999, 2002, 2007, 2010-11, 2011-12, 2012-2014); Selawik (1993, 1997-1998, 1998, 2006, 2010-11, 2013-2014).

Table 12 shows average harvest and use data for the top five species harvested (in terms of average contribution toward the total subsistence harvest) by each of the Kotzebue Sound Region study communities. Caribou is the top species in three of the four study communities (Buckland, Kotzebue, and Noatak), contributing between 25.7 percent and 39.6 percent of the total subsistence harvest. Broad whitefish is the top harvested resource in Selawik, at 33.2 percent of the harvest. Other non-salmon fish species are among the top five species in Kotzebue Sound study communities and include sheefish (Kotzebue and Selawik), smelt (Buckland), and Dolly Varden (locally called trout; Noatak). Salmon—specifically chum salmon—are among the top five species harvested in two of the study communities. Other top species in the Kotzebue Sound Region include moose (Buckland, Kotzebue), seal (spotted and bearded; Buckland, Kotzebue, and Noatak), and northern pike (Selawik). Data on the percentage of households using subsistence resources illustrates the heavy reliance of Kotzebue Sound communities on resources such as caribou and fish, with between 86 percent and 97 percent of households in the individual communities using caribou; and between 81 and 97 percent of households using fish (Table 5). Across all study years, these percentages are likely higher.

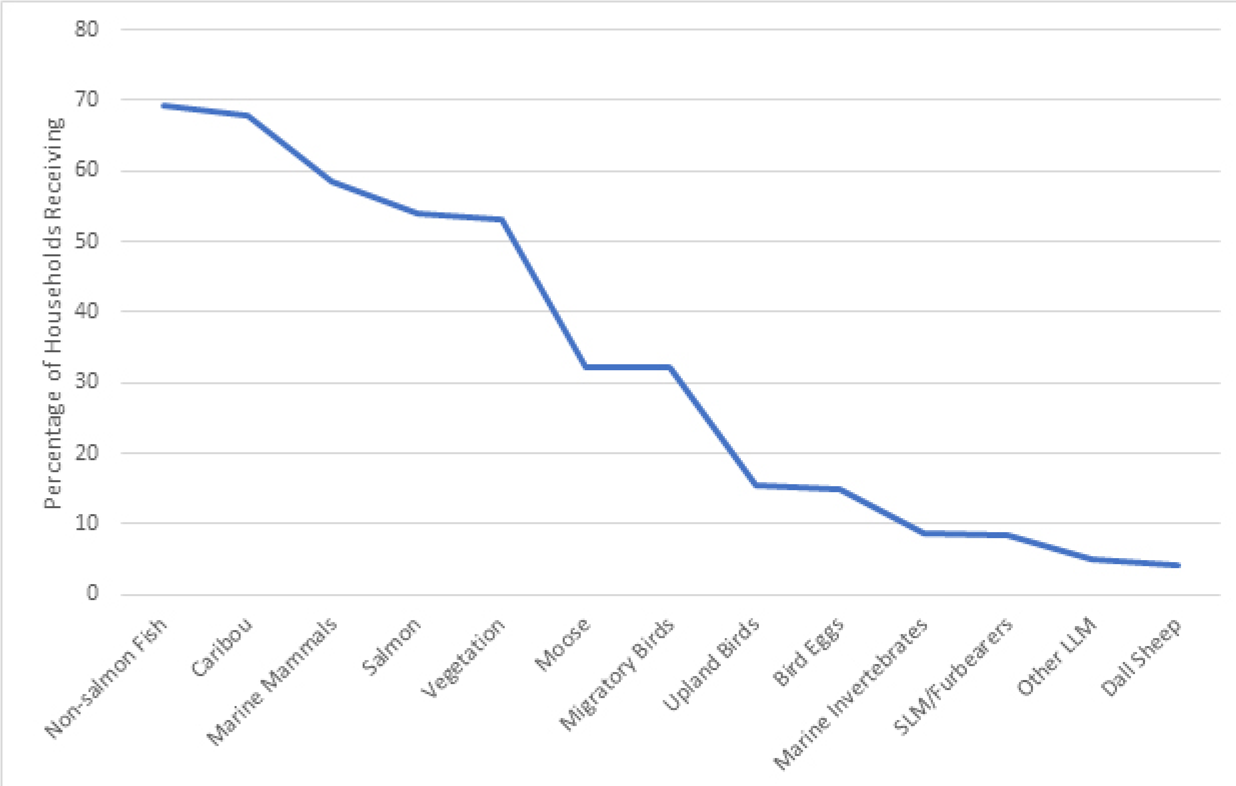

Figure 6. Percent of households receiving resources, Kotzebue Sound region communities

Source: See Table 2 for citations, time period, and resources addressed.

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows (available study years vary by resource): Buckland (1996, 2003, 2009-10, 2012-2014, 2016-17); Kotzebue (1986, 1991,1997, 2002-2004, 2012, 2012-2013, 2013-2014, 2014); Noatak (1994, 1997, 1999, 2002, 2007, 2010-11, 2011-12, 2012-2014); Selawik (1993, 1997-1998, 1998, 2006, 2010-11, 2013-2014).

5.2.3 Timing of Subsistence Activities

Data on the timing of subsistence activities for Kotzebue Sound study communities are provided in Table 13. This table shows the number of communities reporting subsistence activity or harvests within each month, based on the most recent data sources for each community. Overall, Kotzebue Sound communities target the greatest number of resources during the spring month of April, followed by the fall month of September.

In early spring (March/April), residents continue to trap and hunt for furbearers and small land mammals. Sheefish are also commonly harvested in the spring through the ice, while residents may also set nets to harvest whitefish and Dolly Varden (locally referred to as “trout”) during their spring runs. Geese and duck hunting peaks in May (Braem et al. 2017). When available, residents may also hunt WAH caribou during their spring migration north. Marine mammal hunting also begins during the spring months, as bearded seals begin migrating on the ice past Kotzebue Sound.

Salmon harvesting is a key summer activity which peaks in July and August. Harvesting of sheefish continues through summer as well. Harvesting of berries and wild plants begins in summer, as does hunting of large land mammals. Harvesting of marine mammals throughout the summer.

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Table 12. Average harvest and use data, top 5 species, Kotzebue Sound region communities

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% Total harvest
Buckland	Caribou	84	75	72	61	63	639	86,973	922	184	38.3
Buckland	Smelt	84	72	71	47	42	49,823	18,433	193	39	8.9
Buckland	Bearded seal	33	28	23	13	19	56	16,135	183	40	7.1
Buckland	Moose	23	17	9	13	14	13	6,873	73	15	4.0
Buckland	Spotted seal	33	30	28	7	17	88	8,624	98	21	3.8
Kotzebue	Caribou	86	49	42	47	64	2,094	284,711	353	90	25.7
Kotzebue	Chum salmon	84	47	45	41	60	32,714	199,009	244	59	17.0
Kotzebue	Sheefish	82	54	52	42	52	39,545	217,497	271	66	15.9
Kotzebue	Bearded seal	55	23	19	25	40	22,179	218,447	274	67	15.6
Kotzebue	Moose	47	23	12	16	38	105	56,591	70	18	5.4
Noatak	Caribou	88	66	60	54	67	416	44,761	12,355	124	39.6
Noatak	Chum salmon	85	75	74	57	58	6,282	28,800	8,869	74	18.8
Noatak	Dolly Varden	90	78	69	63	67	6,685	18,724	3,207	42	12.8
Noatak	Bearded seal	52	19	32	40	56	48	12,579	7,176	42	10.6
Noatak	Whitefish	61	39	38	37	54	6,778	14,234	120	27	7.4
Selawik	Broad whitefish	66	44	43	36	42	29,252	93,626	544	115	33.2
Selawik	Caribou	97	65	59	67	82	969	131,801	810	174	20.4
Selawik	Sheefish	72	56	53	39	42	6,011	43,712	256	55	15.1
Selawik	Northern pike	63	51	46	34	31	11,612	37,485	218	47	11.5
Selawik	Humpback whitefish	31	21	19	16	20	8,515	16,930	98	21	5.2

Source: See Table 2 for citations, time period, and resources addressed
Notes: HH = households; N/A = Not available

Table 13. Kotzebue Sound region timing of subsistence activities, number of communities reporting subsistence activity

Resources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon fish	2	2	2	2	2	2	2	2	2	2	2	2
Salmon	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	2	N/A	N/A	N/A
Caribou	4	4	4	4	3	N/A	2	4	4	4	4	3
Moose	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	4	2	N/A	N/A
Bear	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
Other large land mammals	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Furbearers	3	3	2	2	N/A	N/A	N/A	N/A	N/A	N/A	2	3
Small land mammals	2	N/A	2	2	2	N/A	N/A	N/A	2	2	N/A	N/A
Marine mammals	N/A	N/A	N/A	2	2	3	2	2	3	2	N/A	N/A
Upland birds	2	2	2	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2
Waterfowl	N/A	N/A	N/A	2	2	2	N/A	N/A	2	N/A	N/A	N/A
Plants and berries	N/A	N/A	N/A	N/A	N/A	2	2	2	2	N/A	N/A	N/A
Total number of resources per month	**5**	**4**	**5**	**8**	**5**	**4**	**4**	**6**	**9**	**5**	**4**	**4**

Source: Gonzalez et al. 2018; Georgette and Loon 1993; Braem et al. 2017; SRB&A 2009b; Mikow et al. 2014; Braem et al. 2013
Notes: Apr = April; Aug = August; Dec = December; Feb = February; Mar = March; Jan = January; Jul = July; Jun = June; N/A = Not applicable (no or limited subsistence activity); Nov = November; Oct = October; Sep = September
Kotzebue Sound Region Communities = 4 (Buckland, Kotzebue, Noatak, and Selawik).
Each cell contains the number of communities reporting subsistence activity or harvests during each month, based on the most recent data source for each community. Months with only one community report harvests or activity are not included in the table. Resources with no subsistence activity data available are not included in the table

As with the Kobuk River region, subsistence harvesting in the Kotzebue Sound region peaks in fall. Caribou and moose hunting is most intense during the fall months of August through October, and residents also resume hunting waterfowl as they migrate south. Seal hunting continues into the fall as well during the open water months. Residents set nets for whitefish and trout as well during this time.

Hunting and fishing (through the ice) continues at somewhat lower levels into winter. For some residents, sheefish harvesting continues into the winter. Residents hunt caribou throughout the winter as they are available. Hunting and trapping of furbearers and small land mammals is most active during the winter and into the early spring.

5.2.4 Travel Method

While systematic, quantitative data on travel methods are not available for most Kotzebue Sound subsistence study communities, several studies provide qualitative and quantitative information on travel methods and routes in the Kotzebue Sound region. Primary travel corridors within the Kotzebue Sound region include the Noatak River, Kobuk River, and Kotzebue Sound, in addition to the Selawik and Buckland rivers. Similar to the Kobuk River region, snowmachines and boats are the primary mode of travel to subsistence harvesting areas, although ATVs are also present in the study communities as well (Satterthwaite-Phillips et al. 2016). A subsistence mapping and traditional knowledge study conducted in 2007 provides more quantitative data on travel methods for Noatak (SRB&A 2009). These data show Noatak residents traveling by boat primarily from May to September, with limited travel reported in April and October. Snowmachine travel generally occurs from November through April and dropping off in May. To a lesser extent, residents take four-wheelers during the summer months, primarily in July and August. Documented travel routes for the community of Noatak occur over a large area, with the Noatak River a primary travel corridor in addition to various overland snowmachine routes between Noatak and Kivalina, Kiana, Noorvik, Selawik, and Kotzebue.

5.2.5 Resource Importance

The relative importance of subsistence resources to the individual Kotzebue Sound study communities, based on selected variables, is provided in Table 14 through Table 17 (see Section 5.3.5 for discussion of methods). Based on this analysis, caribou, marine mammals, non-salmon fish, and vegetation are resources of high importance in all four study Kotzebue Sound Region study communities. In addition, salmon are a resource of high importance in three of the four study communities (Buckland, Kotzebue, and Noatak). Resources of moderate importance in the study communities include moose (four study communities), other large land mammals (one study community), migratory birds (four study communities), upland birds (three study communities), and salmon (one study community).

5.3. Koyukuk River

The Koyukuk River region includes the communities of Alatna, Allakaket, Anaktuvuk Pass, Bettles, Coldfoot, Evansville, Hughes, Huslia, and Wiseman. These communities are located along the Koyukuk River drainage which is crossed in multiple locations by the AMDIAR project alternatives. Bettles and Evansville are located directly along the northern project corridor alternatives, while Hughes is located directly along the southern project corridor alternative. Alatna and Allakaket are located on the Koyukuk River between the northern and southern alternatives; Anaktuvuk Pass, Wiseman, and Coldfoot are located north of all project alternatives; and Huslia is located south of all project alternatives.

Table 14. Relative importance of subsistence resources based on selected variables, Buckland

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	17	14	4	M
2	Caribou	75	63	38	H
3	Dall sheep	N/A	N/A	N/A	N/A
4	Bear	2	0	0.02	L
5	Other large land mammals	9	6	2	M
6	Small land mammals/furbearers	22	7	0.3	L
7	Marine mammals	35	18	22	H
8	Migratory birds	51	36	2	M
9	Upland birds	34	24	0.2	M
10	Bird eggs	53	35	1	M
11	Salmon	49	49	11	H
12	Non-salmon fish	79	64	17	H
13	Marine invertebrates	2	1	0.004	L
14	Vegetation	82	46	3	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A = Not Available

Table 15. Relative importance of subsistence resources based on selected variables, Kotzebue

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	23	38	5	M
2	Caribou	49	64	26	H
3	Dall sheep	3	4	0.1	L
4	Bear	N/A	N/A	0.1	L
5	Other large land mammals	1	6	0.05	L
6	Small land mammals/furbearers	11	11	0.2	L
7	Marine mammals	26	70	23	H
8	Migratory birds	31	23	1	M
9	Upland birds	31	13	0.2	M
10	Bird eggs	14	13	0.1	L
11	Salmon	50	60	18	H
12	Non-salmon fish	74	76	23	H
13	Marine invertebrates	5	24	1	L
14	Vegetation	72	50	2	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A = Not Available

Table 16. Relative importance of subsistence resources based on selected variables, Noatak

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	12	23	2	M
2	Caribou	66	67	40	H
3	Dall sheep	4	5	0.3	L
4	Bear	N/A	N/A	0.1	L
5	Other large land mammals	1	3	0.2	L
6	Small land mammals/furbearers	11	4	0.1	L
7	Marine mammals	20	72	14	H
8	Migratory birds	46	29	1	M
9	Upland birds	20	17	0.1	L
10	Bird eggs	20	9	0.1	L
11	Salmon	77	62	20	H
12	Non-salmon fish	79	78	19	H
13	Marine invertebrates	1	3	0.02	L
14	Vegetation	85	64	3	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A – Not Available

Table 17. Relative importance of subsistence resources based on selected variables, Selawik

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	36	53	5	M
2	Caribou	65	82	20	H
3	Dall sheep	N/A	N/A	N/A	N/A
4	Bear	N/A	N/A	0.04	L
5	Other large land mammal	N/A	N/A	N/A	N/A
6	Small land mammal/furbearers	19	9	0.3	L
7	Marine mammals	10	75	1	H
8	Migratory birds	44	41	3	M
9	Upland birds	30	17	0.3	M
10	Bird eggs	6	3	0.02	L
11	Salmon	12	45	1	M
12	Non-salmon fish	65	59	68	H
13	Marine invertebrates	2	7	0.001	L
14	Vegetation	80	53	1	H

Source: See Table 2
Notes: H = High; HH = Households; L = Low; M = Moderate; N/A = Not Available

5.3.1 Subsistence Use Areas

Subsistence use areas for the Koyukuk River region study communities are focused around the upper and lower Koyukuk river drainages and various tributaries of the Koyukuk River, the upper Kobuk River, and overland areas surrounding the Koyukuk River and into the Brooks Range. Use areas for the northernmost Koyukuk River region study community of Anaktuvuk Pass extend onto the North Slope of Alaska and as far north as Nuiqsut, while use areas for the southernmost community of Huslia extend west to Kotzebue Sound and south to the Yukon River. More recently documented subsistence use areas for the study communities (Watson 2018; SRB&A 2016a) indicate various changes to contemporary subsistence use areas compared to historic use areas, including certain changes brought about by establishment of the Gates of the Arctic National Park and Preserve (Watson 2018).

As shown on Map 11 and Map 12, Alatna and Allakaket subsistence use areas for all available time periods ("Traditional"; Lifetime to 2012; 1981-1985; 1981-83; 2006-2015; 2011) occur along the Koyukuk River between Huslia and the Dalton Highway, along the Alatna, Kanuti, and Hogatza rivers and various smaller tributaries of the Koyukuk River; and in various overland areas surrounding the Koyukuk River. Recent subsistence use areas documented for Alatna and Allakaket (Watson 2018; SRB&A 2016a) indicate similar subsistence uses, with the greatest concentration of use occurring along the Koyukuk, Alatna, and Kanuti rivers. Ristroph et al. (2019) also recently documented traditional subsistence use areas in addition to place names that show similar areas of importance to Alatna and Allakaket; these use areas are displayed on Map 11 and Map 12 along with place name areas as documented by Jones et al. (1997). Areas of high overlapping use along the Alatna River are crossed by the northern project alternatives. Comparison of more recent use area data to historic use areas indicate a shift away from overland use and toward riverine use. According to Watson (2018) contemporary large land mammal hunting by Alatna and Allakaket hunters, including hunting of Dall sheep and moose, occurs along the Koyukuk and Alatna rivers. Hunting of Dall sheep is focused on drainages that extend into the Brooks Range (Alatna and John rivers), while moose hunting occurs along a more extensive riverine area including the Koyukuk River drainage both upriver and downriver from Alatna and Allakaket, Henshaw Creek, Kanuti River, and Hogatza River. Furbearer trapping occurs along the Kanuti River and along the Koyukuk as far as the Dalton Highway; recent furbearer trapping areas are more concentrated along river corridors than historic trapping areas which may be a result of changes in transportation method (e.g., less plane travel) or an overall decline in the number of furbearer trappers (Watson 2018). Non-salmon fish harvesting is also focused along the Koyukuk River, Henshaw Creek, Alatna River, and Kanuti River, while salmon harvesting is limited primarily to the Alatna River and Henshaw Creek areas. Harvest of vegetation is also focused on the Alatna River and Henshaw Creek.

Map 13 shows use areas for Anaktuvuk Pass for all available time periods (Lifetime Pre-1979; 2001-2010; 2001-02, 2002-03, 2006-07, 2011, 2014) occurring throughout the Brooks Range and into the foothills of the Brooks Range on the North Slope. Use areas for this community extend into the John River which is a tributary of the Koyukuk River. In addition, community residents travel to the west and southwest of the community and have reported caribou and furbearer hunting areas which overlap with the terminus of the project alternatives. According to Brown et al. (2016), during the 2014 study year hunting for caribou, moose, and Dall sheep occurred in various drainages of the Brooks Range, including the John River, a tributary of the Koyukuk River. Caribou hunting also extended into the foothills of the Brooks Range on the North Slope. Various other resource activities extended into the John River drainage, including small land mammal hunting/trapping, non-salmon fish harvesting, and vegetation harvesting.

Use areas for Bettles and Evansville for all available time periods (Lifetime to 2016; 1981-82; 1981-83; 2006-2015; 2011) are shown on Map 14 and Map 15 and indicate use areas that extend along the foothills of the Brooks Range; along various drainages of the southern Brooks Range, including the Kobuk River, upper Koyukuk River, Alatna River, and John River; in an area surrounding Iniakuk Lake; and along the Dalton Highway north of Coldfoot and Wiseman. Some isolated use areas occur on the North Slope. Recent studies indicate somewhat disjointed subsistence use areas which may reflect the increased use of planes for accessing harvesting areas, in addition to the creation of the Gates of the Arctic National Park which limits residents' access and harvesting activities. In terms of specific resources, contemporary Dall sheep use areas occur along the Koyukuk River, including the Middle Fork Koyukuk parallel to the Dalton Highway. Moose hunting occurs in a large area surrounding the upper Alatna River in the Brooks Range, and in an area surrounding the community along the John, Wild, and Koyukuk rivers. Trapping also occurs in an area surrounding the Alatna River and Iniakuk Lake, in addition to the John and Koyukuk rivers. Caribou hunting occurs near the communities of Bettles and Evansville, near Iniakuk Lake, and in the foothills of the Brooks Range on the North Slope. Residents access fish in various lakes and rivers of the Brooks Range in addition to the upper Kobuk River, Iniakuk Lake, John River, and North Fork Koyukuk River. Contemporary vegetation harvesting occurs in several areas of the Brooks Range surrounding Walker Lake, Iniakuk Lake, and Evansville and Bettles.

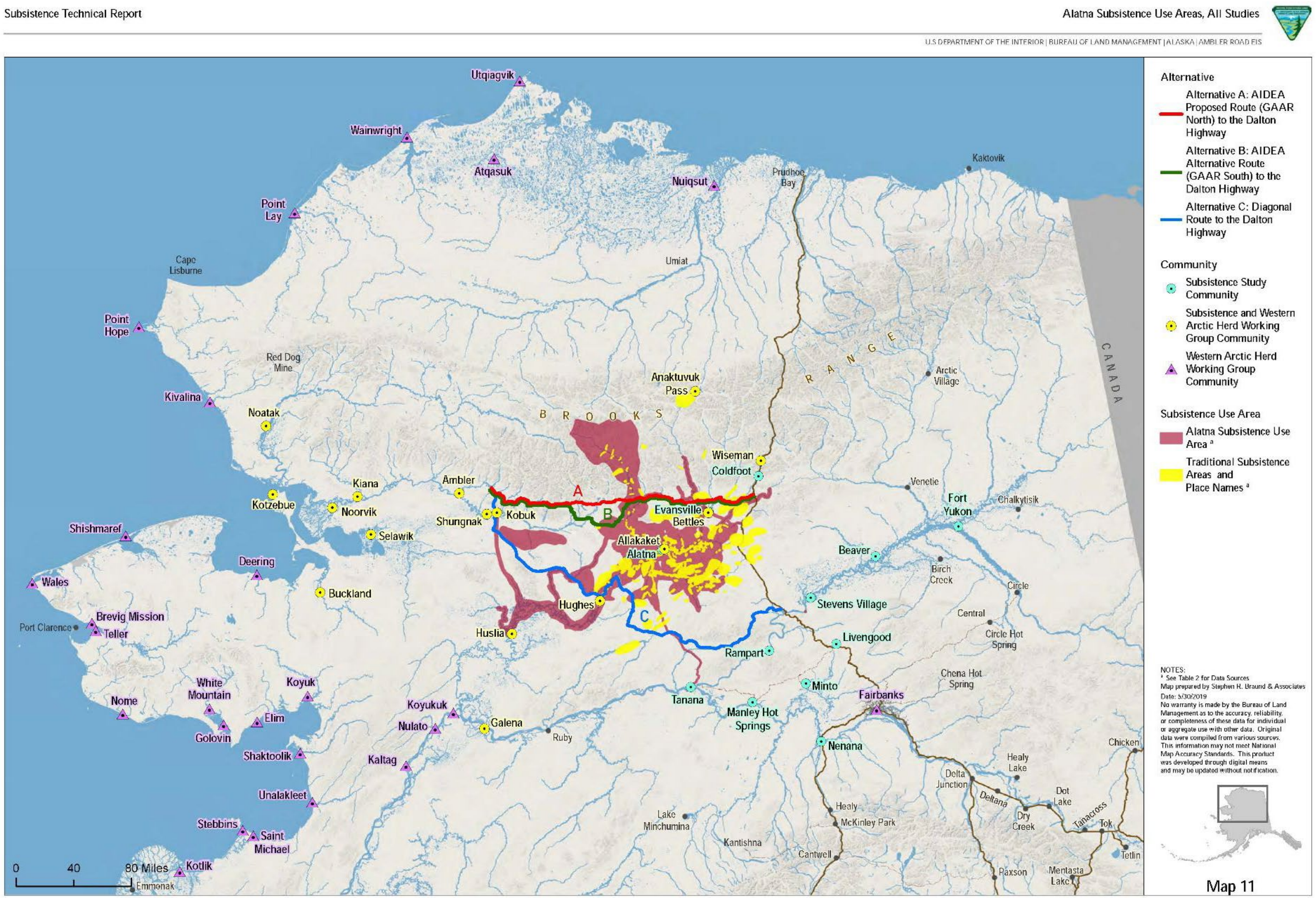
Coldfoot and Wiseman use areas for all time periods (2005-2014; 2011) are depicted on Map 16 and Map 17 and indicate subsistence harvesting activities surrounding the Dalton Highway in the Brooks Range and at various locations to the west and southwest of the communities including along the Koyukuk River, Alatna River, Iniakuk Lake area, John River, and upper Kobuk River. Recently documented resource-specific use areas (SRB&A 2016a) for the 2005–2014 time period show moose, caribou, bear and small land mammal hunting occurring primarily along the Dalton Highway in addition to various mountain passes extending off of the Dalton Highway. Dall sheep hunting occurs in larger areas off of the highway into the mountains. Hunting of large and small land mammals, in addition to bird hunting occurs primarily to the north of the communities although some activities occur farther south in or near the upper Koyukuk River drainages. Harvesting of non-salmon fish occurs primarily south of the communities along the Dalton Highway where it crosses the South Fork Koyukuk and Jim rivers, in addition to various small lakes in the Brooks Range.

Subsistence use areas for Hughes for all available time periods (Lifetime to 2016; 1981-1985; 1981-83; 2014) are shown on Map 18. Use areas for this community are primarily focused along the Koyukuk River between Huslia and Evansville/Bettles and along the Alatna River into the Brooks Range. In addition, Hughes subsistence harvesting areas extend overland from the community both south and north of the Koyukuk River. The southern project alternative crosses through the heart of Hughes subsistence harvesting areas near the community, while the northern alternatives cross through subsistence harvesting areas along the Alatna and John rivers. According to Watson (2018), contemporary subsistence use areas occur over a more extensive riverine area, although this may be attributed to the lack of documentation of Dall sheep use areas in earlier studies. Contemporary Dall sheep use areas occur along the Koyukuk River upriver from the community and substantial distances into the Alatna and John rivers. Contemporary and historic moose hunting occur in similar areas both upriver and downriver from the community of Hughes. Furbearer hunting and trapping occurs overland both north and south of the community and along the Koyukuk River between Huslia and Alatna/Allakaket. Salmon and non-salmon fish harvesting both occur in the Koyukuk River near Hughes, while vegetation harvesting occurs primarily downriver from the community.

Huslia use areas (Map 19) for all available time periods (Lifetime to 2016; 1981-83) occur along the mid- to lower-Koyukuk River, the Yukon River, and in large overland areas which extend to the north and west toward Buckland, Selawik, and along the Kobuk River from Shungnak to Kotzebue Sound. Huslia use areas, including overland hunting areas to the north of the community and use areas along the Koyukuk River, are overlapped with the southern project corridor. Watson (2018) indicates that the community's primary hunting areas occur along the Yukon River toward Ruby, along the Koyukuk River to Hughes, and in an overland areas between the Koyukuk River and the Kobuk River. Other overland areas, such as those toward Buckland, Selawik, and Kotzebue are less commonly used. More recent contemporary use areas compared to historic use areas indicate an expansion of harvest areas over time, although this may be partly attributed to underreporting of use areas during earlier studies (Watson 2018), as respondents characterized their contemporary areas as "traditional" areas that were used by their elders. Moose hunting by Huslia residents occurs along the Yukon and Koyukuk rivers in addition to some overland use areas directly around the community. Caribou hunting extends over a larger overland area, including hunting areas between the Koyukuk River toward Selawik and Buckland, which is reflective of recent reports of changes in caribou distribution toward the Buckland area. Non-salmon fish harvesting occurs in various lake systems and creeks surrounding the Koyukuk River, including Clear Creek, Caribou Creek, and the Huslia River. Residents fish for salmon in various river systems including the Yukon, Koyukuk, and Kobuk rivers (Watson 2018).

5.3.2 Harvest Data

Harvest data for the Koyukuk River study communities are provided on Figure 7 through Figure 9 and in Table 18. As shown on Figure 7, based on an average of available data, salmon is the primary resource harvested among the study communities in terms of percentage of usable pounds (31 percent), followed closely by moose (28 percent) and caribou (26 percent). Non-salmon fish (12 percent) and vegetation (4 percent) also contribute a substantial amount to Koyukuk River Region study communities. Other resources which contribute smaller amounts in terms of pounds include Dall sheep, small land mammals, and migratory birds. Resource contribution varies widely among the Koyukuk River Region study communities, reflecting the large variation in geography and resource availability across the region. The communities of Anaktuvuk Pass and Coldfoot rely on caribou for a majority of their harvests, with caribou contributing over 80 percent of the harvest. Compared to the other subsistence study communities, these two communities have access to the Central Arctic Herd on the North Slope. Bettles, Evansville, and Wiseman rely primarily on moose for their subsistence harvests, while Alatna, Allakaket, Hughes, and Huslia rely primarily on non-salmon fish harvests.



Map 11. Alatna subsistence use areas, all studies

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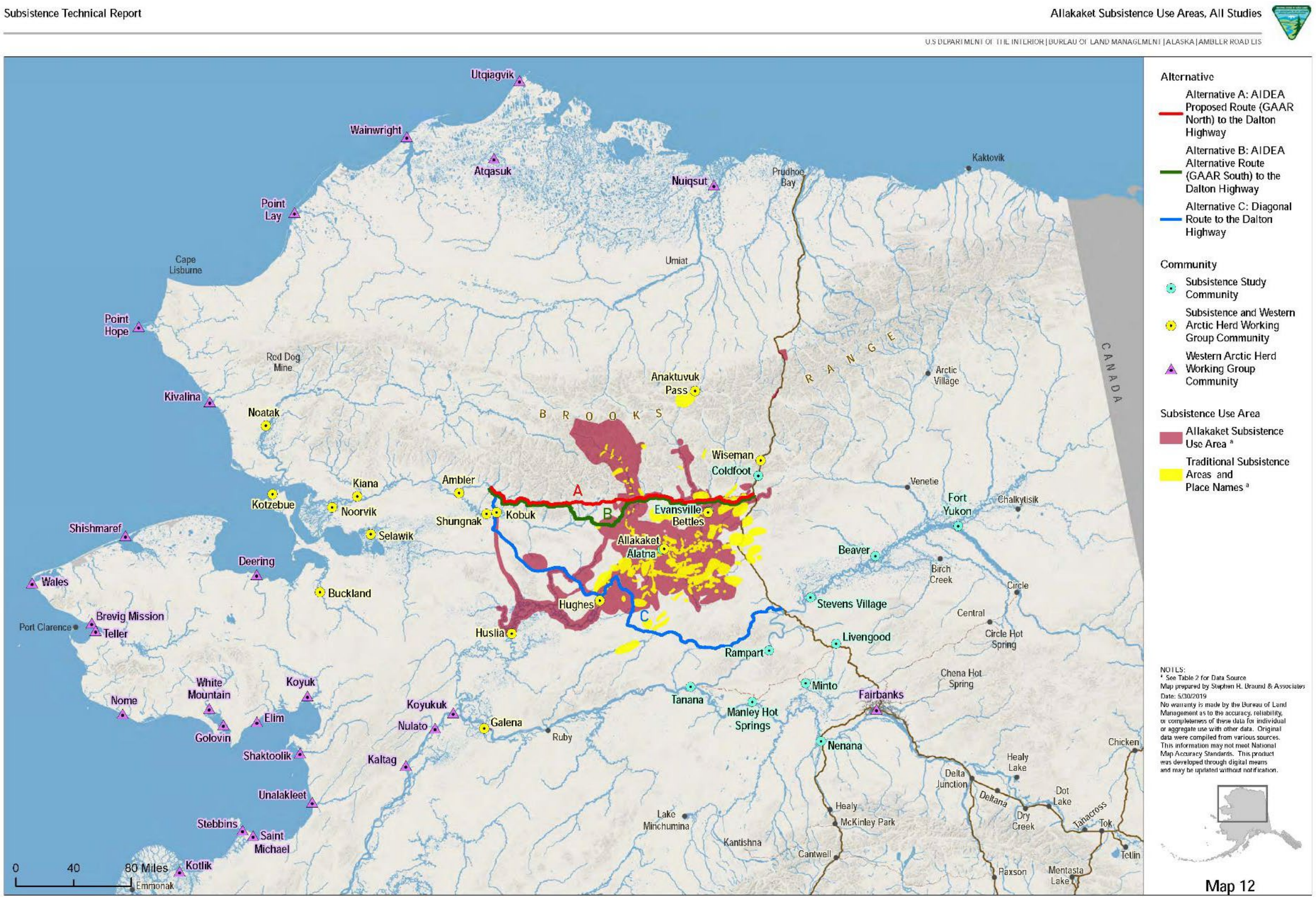

Map 12. Allakaket subsistence use areas, all studies

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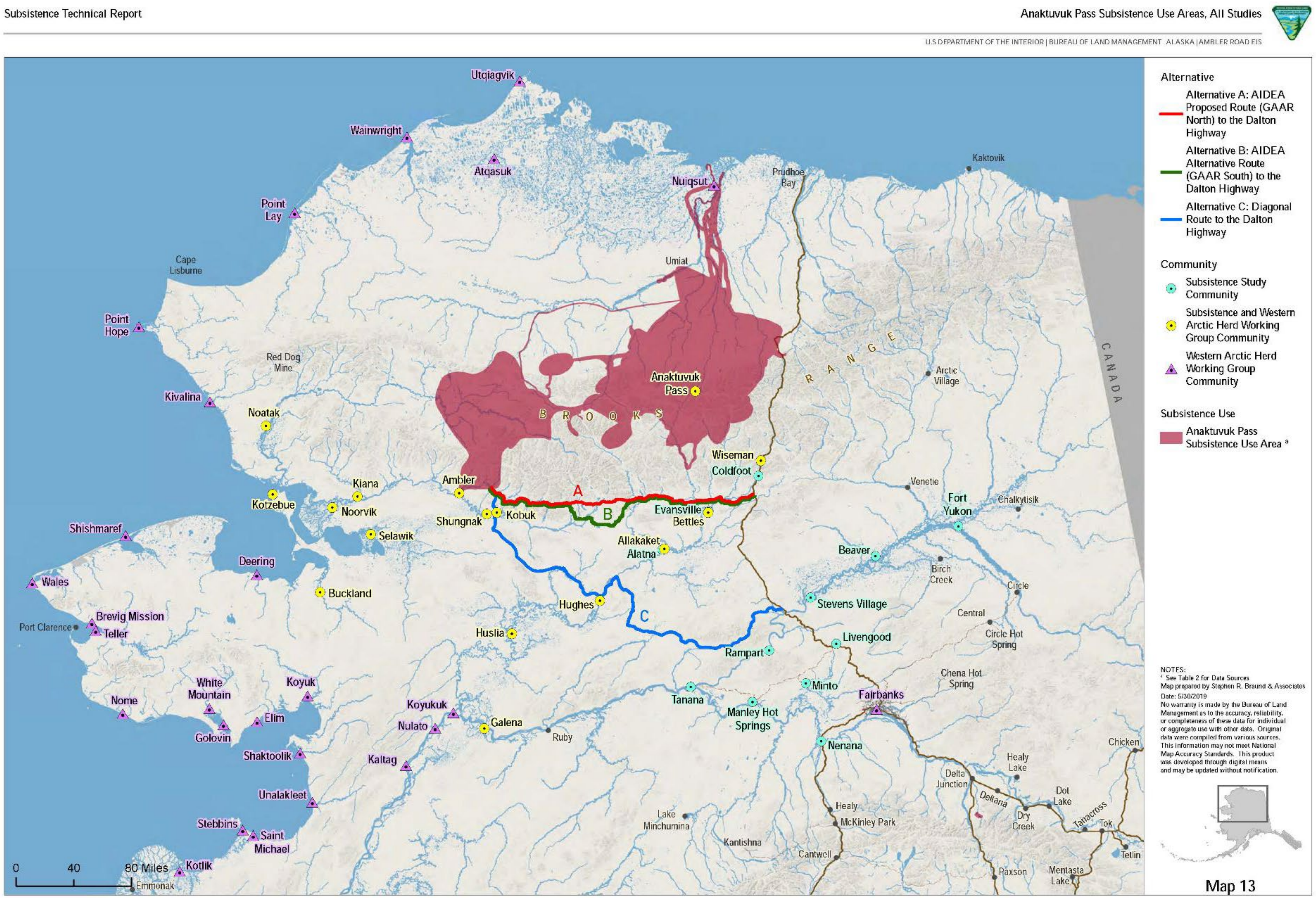

Map 13. Anaktuvuk Pass subsistence use areas, all studies

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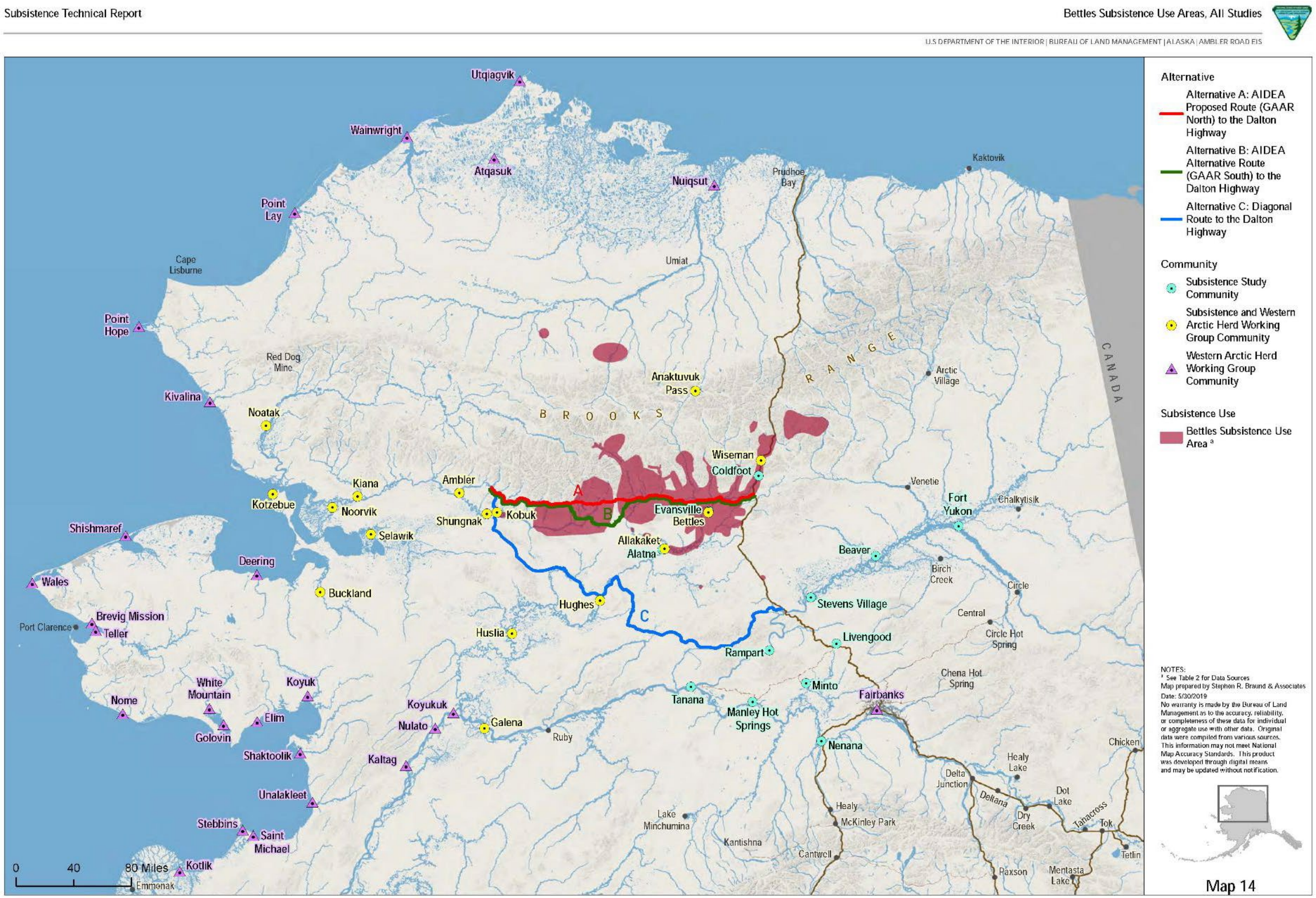

Map 14. Bettles subsistence use areas, all studies

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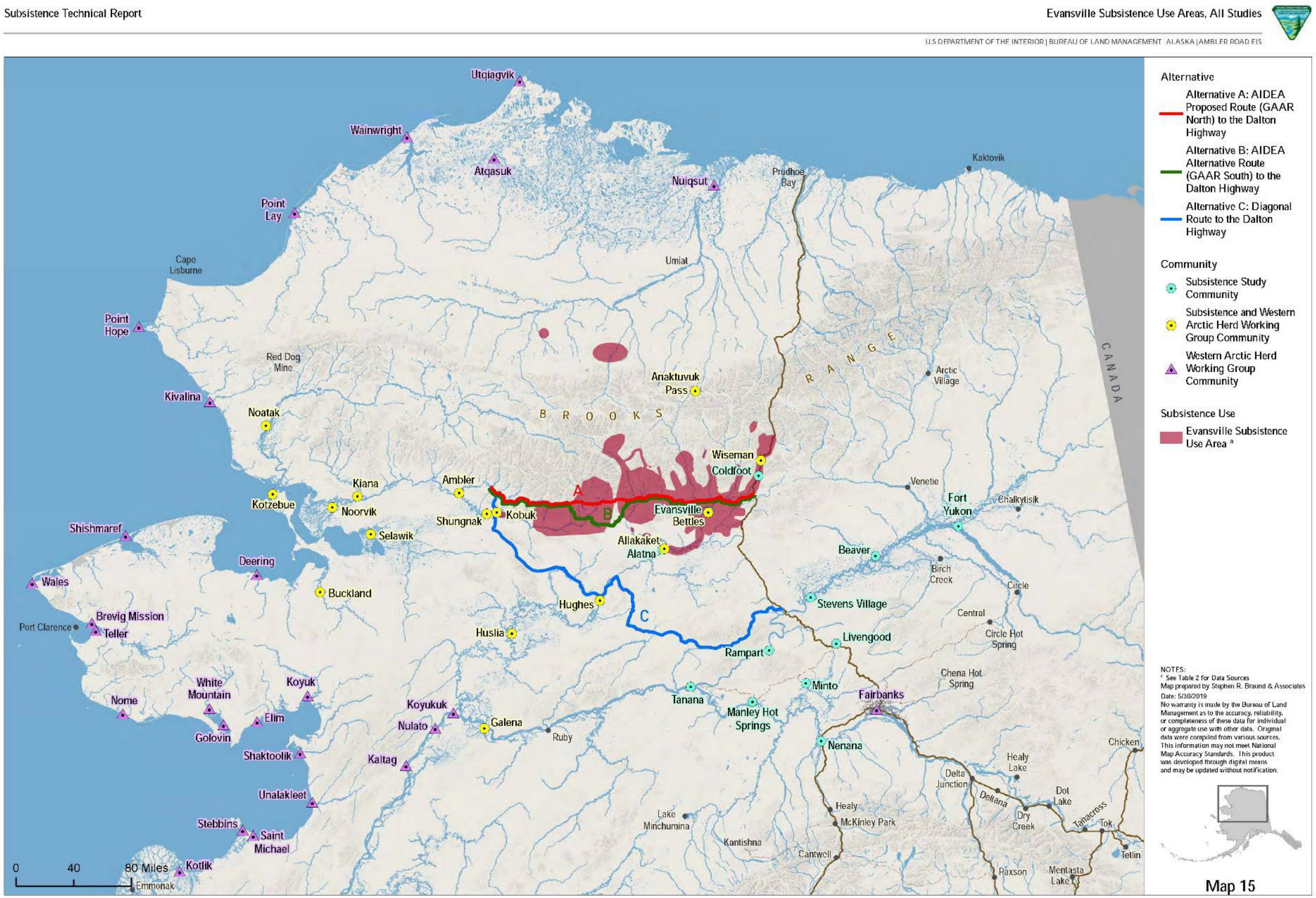

Map 15. Evansville subsistence use areas, all studies

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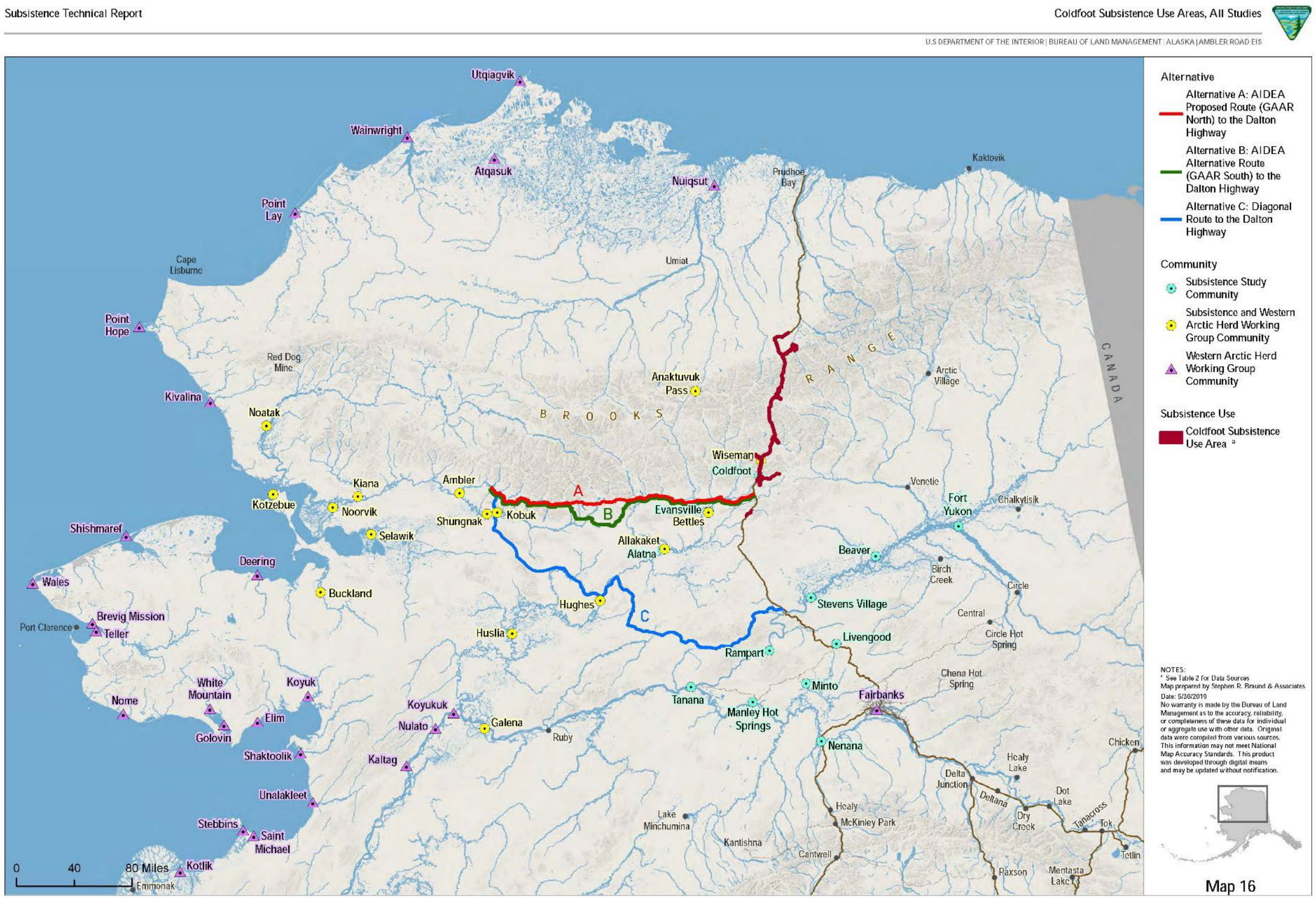

Map 16. Coldfoot subsistence use areas, all studies

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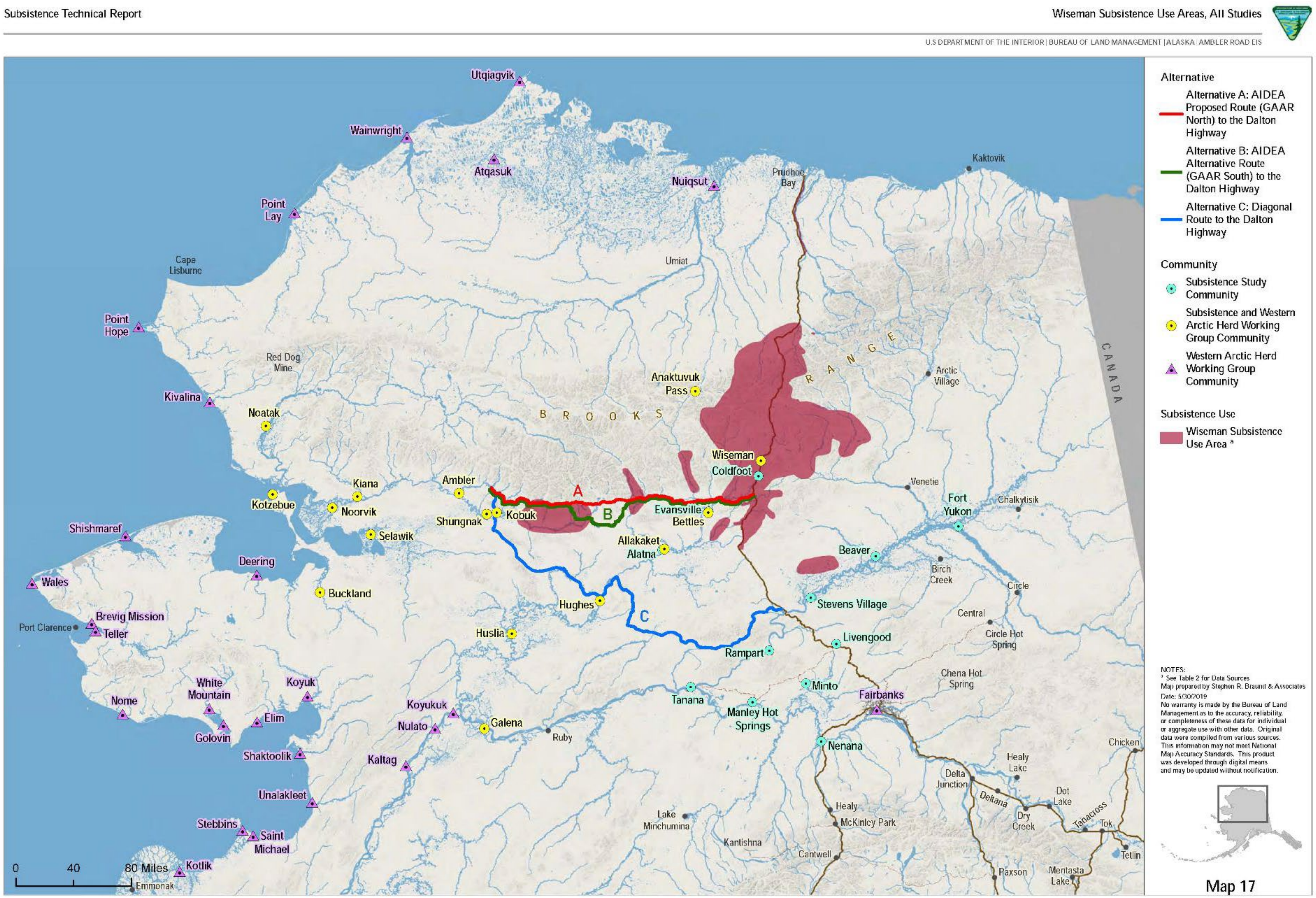

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Map 17. Wiseman subsistence use areas, all studies

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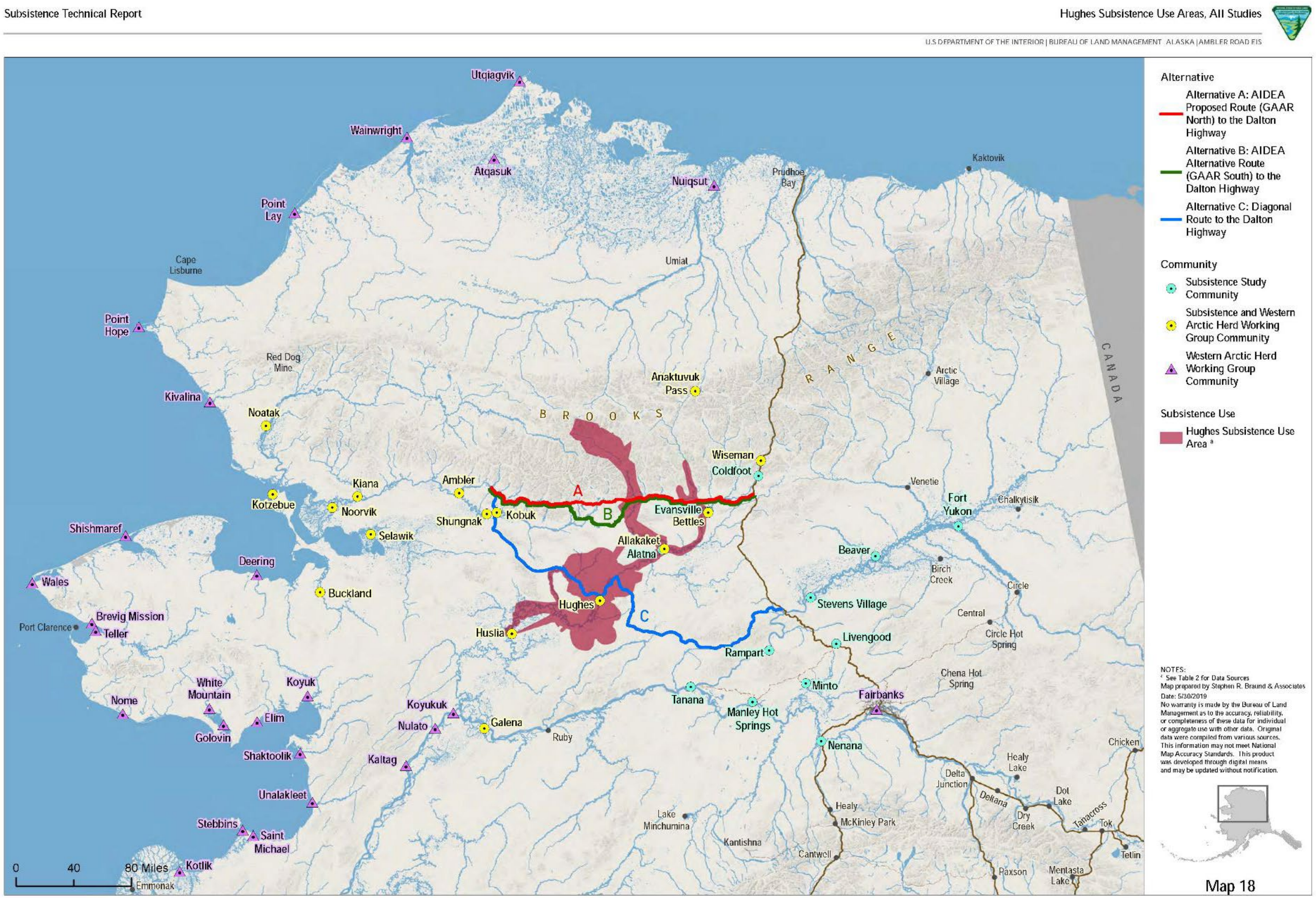

Map 18. Hughes subsistence use areas, all studies

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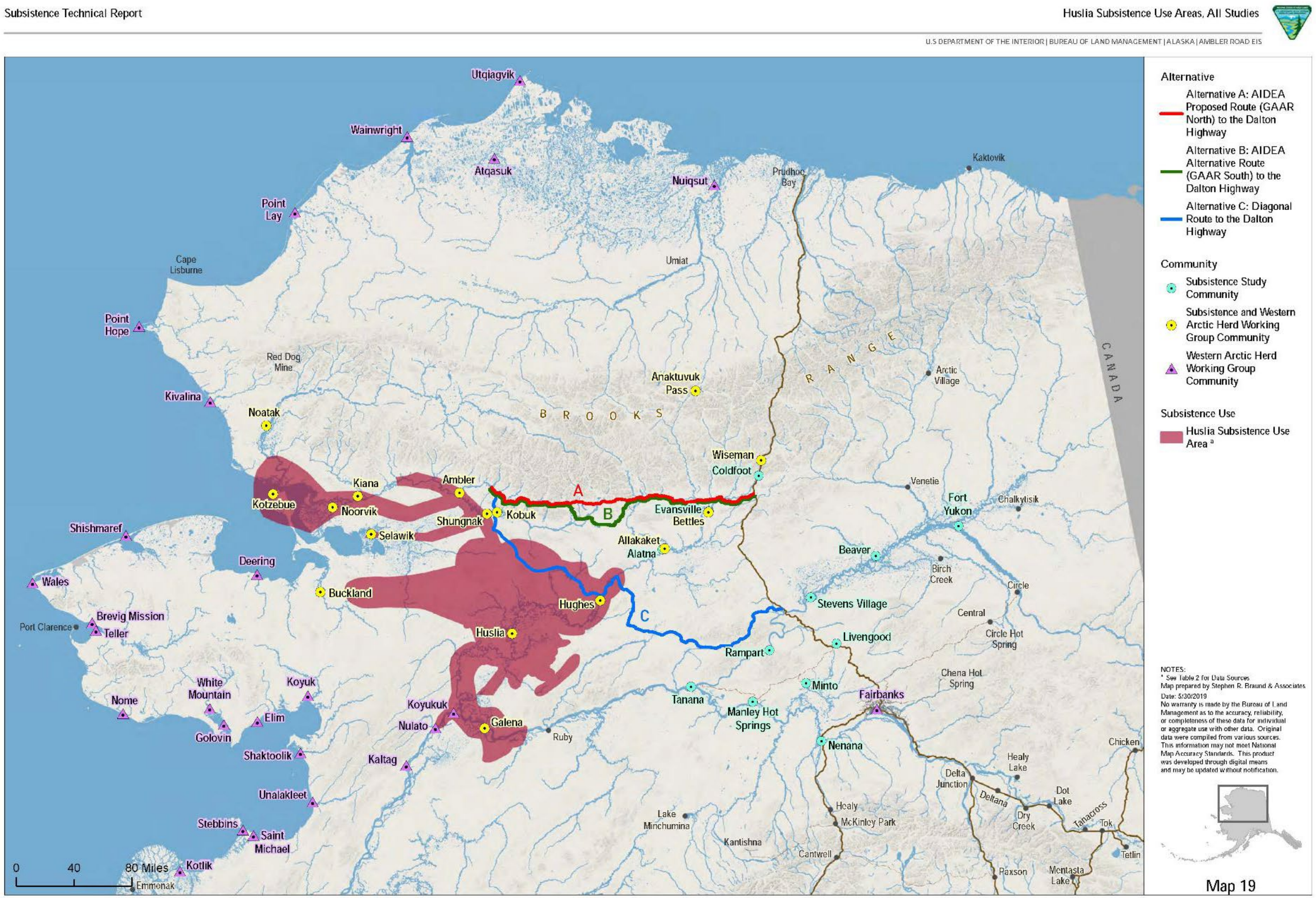

Map 19. Huslia subsistence use areas, all studies

Note: where the use overlays water, the shade is darker.

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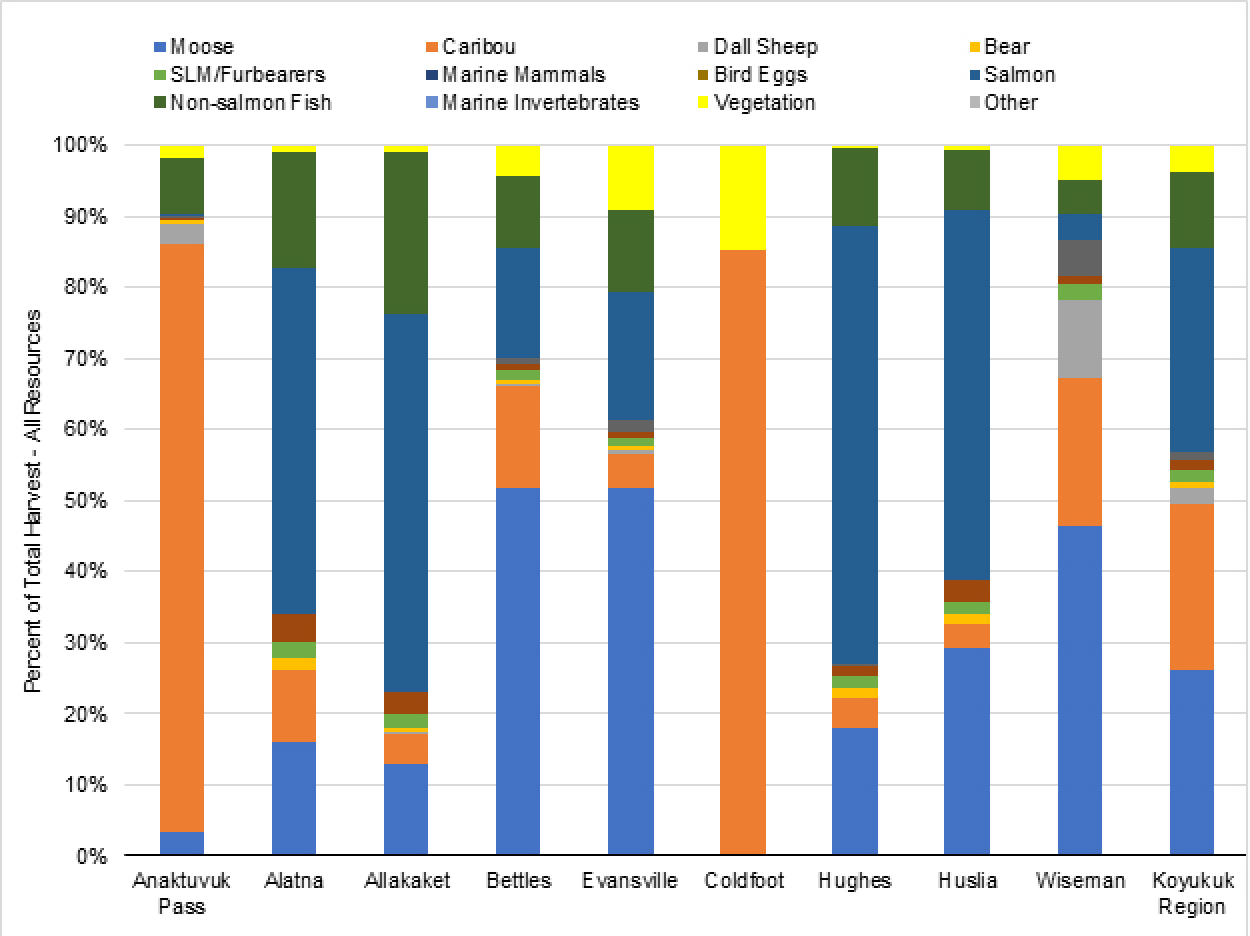

Figure 7. All resources percent of total harvest by Koyukuk River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of harvest across all available study years for comprehensive (i.e., all resources) household harvest surveys. In some cases, averages represent only a single study year. Available study years for each community are as follows: Anaktuvuk Pass (1992, 1994-95, 1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2011, 2014); Alatna (1982, 1983, 1984, 2011); Allakaket (1982, 1983, 1984, 2011); Bettles (1982, 1983, 1984, 2011); Evansville (1982, 1983, 1984, 2011); Coldfoot (2011); Hughes (1982, 2014); Huslia (1983); Wiseman (1991, 2011).

Average participation rates among Koyukuk River Region study communities, in terms of the average percentage of households attempting harvests by resource during individual study years, are shown on Figure 8. These data are based on averages across available study years; it is likely that in some years (or across all years) a higher percentage of households participates in each resource activity. Across all Koyukuk River Region study communities, households most commonly participate in harvests of vegetation (89 percent of households), followed by non-salmon fish (59 percent), moose (54 percent), upland birds (49 percent), migratory birds (43 percent), and caribou (45 percent). Fewer households participate in harvests of marine mammals, salmon, Dall sheep, and small land mammals. While all communities report high participation rates overall, participation in specific resource harvesting activities varies by community. For example, while Dall sheep hunting is not particularly common for the region as a whole, a substantial percentage of households in Wiseman (80 percent) and Anaktuvuk Pass (32 percent) engage in this activity. The average percentage of households receiving different resources is shown on Figure 9. Similar to the Kobuk River and Kotzebue Sound regions, some resources which are not regularly harvested by Koyukuk River Region study communities are still highly consumed through sharing with other regions. For example, while only 1 percent of households hunt marine mammals, nearly 50 percent of households receive this resource. In addition to marine mammals, the most commonly shared resources in Koyukuk River Region communities (more than half of households receiving) include non-salmon fish, moose, vegetation, and salmon.

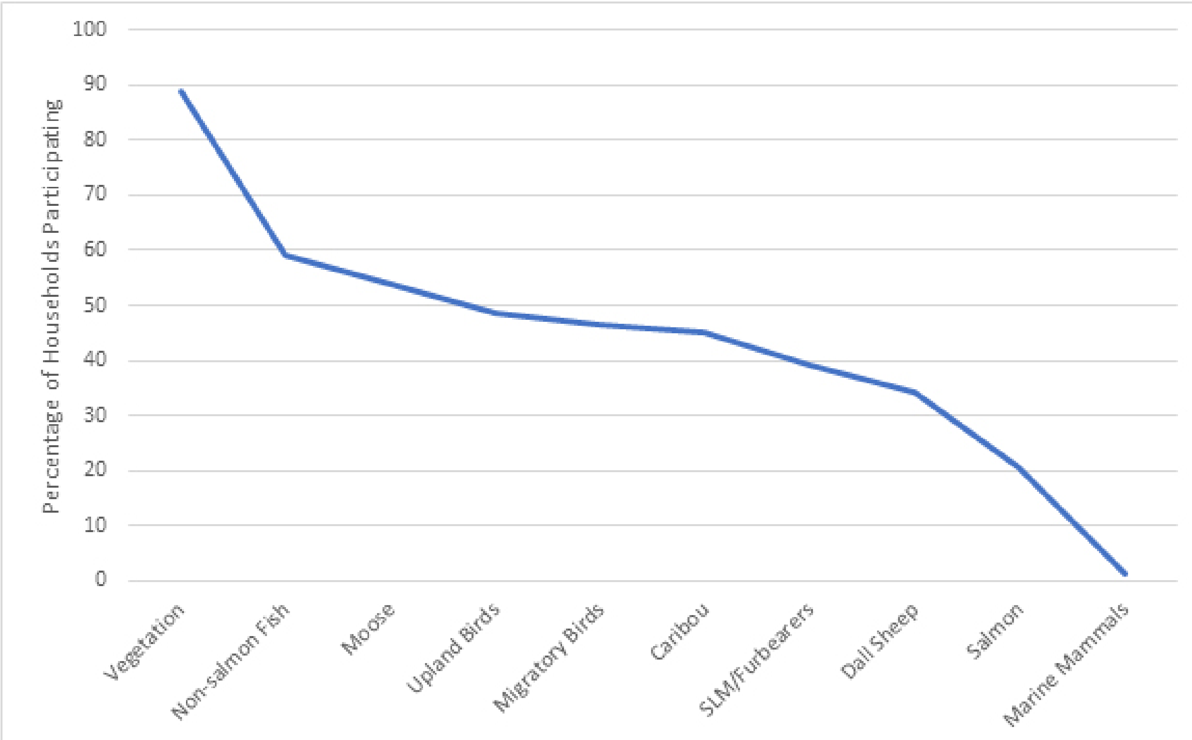

Figure 8. Percent of households attempting harvests of resources, Koyukuk River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Anaktuvuk Pass (1986-1991, 1990-91, 1991-92, 1992, 1993-94, 1994-95, 1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2006-07, 2011, 2014); Alatna (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Allakaket (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Bettles (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Evansville (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Coldfoot (2011); Hughes (1982, 1998, 1998-99, 2002, 2014); Huslia (1983, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03); Wiseman (1991, 2011).

Table 18 shows average harvest and use data for the top five species harvested (in terms of average contribution toward the total subsistence harvest) by each of the Koyukuk River Region study communities. Chum salmon is the top species in four of the nine study communities (Alatna, Allakaket, Hughes, and Huslia), contributing between 44 percent and 57 percent of the total subsistence harvest. Moose is the top harvested resource in three of the nine study communities (Bettles, Evansville, and Wiseman; between 46 and 52 percent), and caribou is the top harvested in two of the nine study communities (Anaktuvuk Pass and Coldfoot; 86 and 85 percent respectively). Other top species in the Kotzebue Sound Region include sheefish (Alatna, Allakaket, and Huslia), whitefish (Alatna, Allakaket, and Hughes), other salmon species (Chinook and sockeye; Allakaket and Evansville), Dall sheep (Anaktuvuk Pass, Wiseman), black bear (Huslia), and berries (Anaktuvuk Pass, Bettles, Coldfoot, Evansville, and Wiseman).

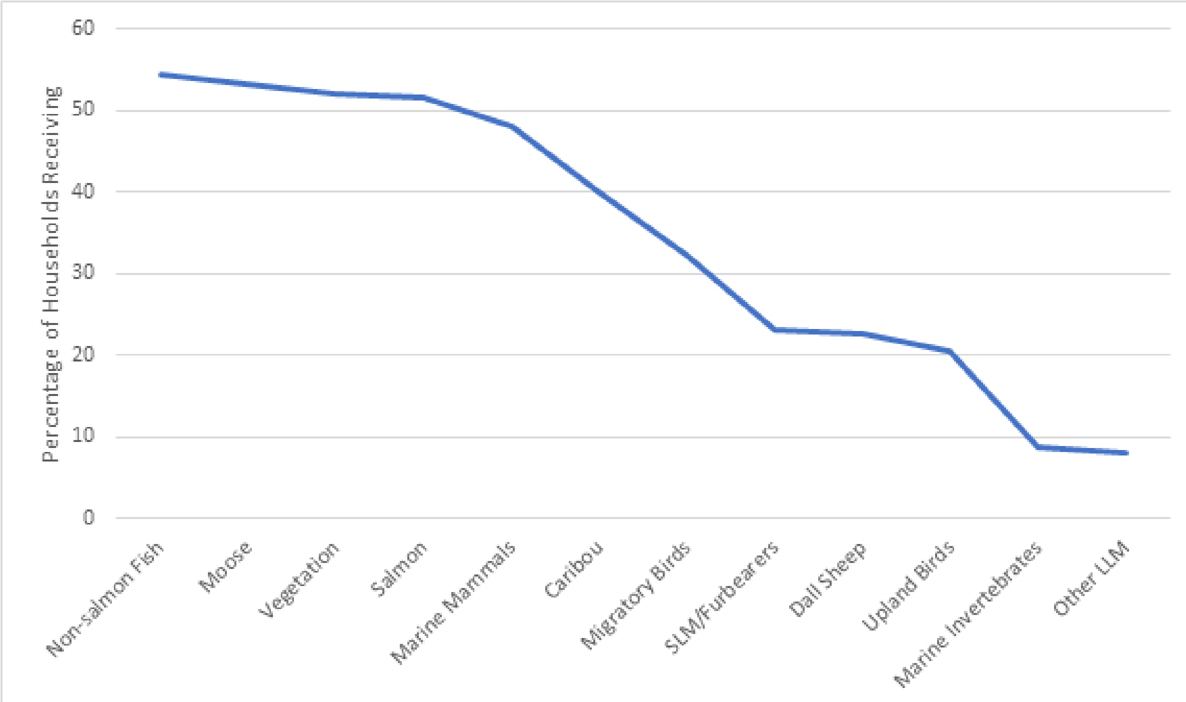

Figure 9. Percent of households receiving resources, Koyukuk River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Anaktuvuk Pass (1986-1991, 1990-91, 1991-92, 1992, 1993-94, 1994-95, 1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2006-07, 2011, 2014); Alatna (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Allakaket (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Bettles (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Evansville (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Coldfoot (2011); Hughes (1982, 1998, 1998-99, 2002, 2014); Huslia (1983, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03); Wiseman (1991, 2011).

5.3.3 Timing of Subsistence Activities

Data on the timing of subsistence activities for Koyukuk River study communities are provided in Table 19. This table shows the number of communities reporting subsistence activity or harvests within each month, based on the most recent data sources for each community. Overall, Koyukuk River communities target the greatest number of resources during the spring months of April and the summer/fall months of August and September.

Spring (April-May) in the Koyukuk River Region is characterized by warming temperatures, breakup on the rivers, and lengthening days. Spring marks a decrease in seasonal harvests of furbearers, upland birds, and small land mammals; however, it also marks the beginning of the waterfowl hunting season, as ducks and geese arrive in the area. Koyukuk River Region residents occasionally harvest small land mammals, including marten, hare, and beaver, in the springtime, but harvest by month data show harvests more commonly occurring over the winter months (Van Lanen et al. 2012, Holen et al. 2012). Fishing for non-salmon fish occurs in the region during the springtime, either through the ice or after breakup in the open water. Harvests of caribou, bear, and sheep may also occur in the springtime in a number of communities.

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Table 18. Average harvest and use data, top 5 species, Koyukuk River region communities

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Alatna	Chum salmon	50	33	42	33	33	8,865	54,036	1,157	321	44
Alatna	Moose	98	75	50	41	74	15	7,905	355	117	16
Alatna	Caribou	83	57	27	34	60	12	1,498	133	46	10
Alatna	Sheefish	67	67	47	29	33	1,335	9,340	203	56	10
Alatna	Whitefish	N/A	N/A	56		14	7,512	6,761	140	38	5
Allakaket	Chum salmon	50	38	42	31	19	9,723	58,398	1,216	346	48
Allakaket	Moose	97	73	52	45	65	34	17,676	332	98	13
Allakaket	Sheefish	72	53	55	34	27	1,968	13,111	266	80	12
Allakaket	Humpback whitefish	44	30	27	17	25	1,611	4,817	86	31	7
Allakaket	Chinook salmon	48	29	39	24	33	317	5,374	111	32	4
Anaktuvuk Pass	Caribou	92	61	49	49	68	514	65,678	784	222	86.2
Anaktuvuk Pass	Moose	29	10	6	9	24	4	2,230	25	7	3.2
Anaktuvuk Pass	Dall sheep	48	24	16	19	36	22	2,249	26	8	2.9
Anaktuvuk Pass	Berries	84	76	76	42	44	728	1,978	22	6	2.0
Anaktuvuk Pass	Grayling	70	68	50	43	29	1,715	1,471	17	5	2.0
Bettles	Moose	88	35	24	40	62	8	3,792	193	72	51.5
Bettles	Chum salmon	13	13	13		0	338	2,057	79	29	14.3
Bettles	Caribou	62	29	18	32	32	11	1,387	106	38	14.1
Bettles	Char	38	8	8	8	38	264	429	16	6	5.4

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Bettles	Berries	N/A	N/A	43	N/A	N/A	160	638	23	8	4.7
Coldfoot	Caribou	75	50	25	50	50	2	325	65	33	85.3
Coldfoot	Blueberry	100	100	100	0	0	14	40	8	4	10.5
Coldfoot	Low bush cranberry	25	25	25	0	0	4	15	3	2	3.9
Evansville	Moose	78	33	20	39	68	7	3,201	133	55	51.4
Evansville	Chum salmon	N/A	N/A	21	N/A	5	447	2,725	103	38	13.7
Evansville	Sockeye salmon	46	8	8	31	46	18	91	7	5	8.6
Evansville	Low bush cranberry	77	69	69	54	46	22	89	7	4	8.4
Evansville	Blueberry	85	85	85	46	46	21	84	6	4	8.0
Hughes	Chum salmon	46	19	19	15	39	15,195	56,895	2,474	603	56.8
Hughes	Moose	96	62	57	35	69	26	13,083	538	140	17.6
Hughes	Caribou	31	27	6	4	18	10	1,360	40	15	4.2
Hughes	Chinook salmon	N/A	N/A	68		16	586	10,603	482	112	7.5
Hughes	Humpback whitefish	51	29	29	14	27	1,959	5,877	219	86	5.0
Huslia	Chum salmon	N/A	N/A	43	14	41	22,583	102,603	1,800	533	49.3
Huslia	Moose	99	66	58	36	52	79	44,774	608	198	28.8
Huslia	Caribou	75	40	33	23	38	107	13,880	182	60	3.3
Huslia	Sheefish	60	31	34	20	37	896	5,815	85	27	3.0
Huslia	Black bear	60	34	23	18	37	29	3,240	47	15	2.9
Wiseman	Moose	100	80	60	60	40	4	1,890	432	166	46.4
Wiseman	Caribou	80	80	60	60	20	7	890	104	40	20.9

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Wiseman	Dall sheep	75	80	40	25	25	5	468	42	16	10.8
Wiseman	Low bush cranberry	100	100	100	40	20	42	169	34	13	4.4
Wiseman	Ptarmigan	80	80	80	40	N/A	229	151	46	18	3.8

Source: See Table 2 for citations, time period, and resources addressed
Notes: HH = Households; N/A = Not Available
Data represent the average across all available study years. Available study years for each community are as follows: Anaktuvuk Pass (1986-1991, 1990-91, 1991-92, 1992, 1993-94, 1994-95, 1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2006-07, 2011, 2014); Alatna (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Allakaket (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03, 2011); Bettles (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Evansville (1982, 1983, 1984, 1997-98, 1998-99, 1999-00, 2002, 2002-03, 2011); Coldfoot (2011); Hughes (1982, 1998, 1998-99, 2002, 2014); Huslia (1983, 1997-98, 1998-99, 1999-00, 2001-02, 2002, 2002-03); Wiseman (1991, 2011).

Table 19. Kotzebue Sound region timing of subsistence activities, number of communities reporting subsistence activity

Resources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon fish	5	7	6	4	7	8	8	8	8	5	4	6
Marine non-salmon fish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salmon	N/A	N/A	N/A	N/A	2	6	4	4	4	2	N/A	N/A
Caribou	8	9	8	9	5	N/A	3	6	6	6	8	8
Moose	5	4	5	3	N/A	N/A	N/A	6	9	7	4	4
Bear	3	4	5	6	9	4	8	9	6	6	5	2
Sheep	3	3	3	3	N/A	3	3	7	6	4	3	3
Furbearers	2	2	2	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2
Small land mammals	9	9	9	8	7	3	4	6	6	6	9	9
Upland birds	9	9	9	7	6	4	4	8	9	9	9	9
Waterfowl	N/A	N/A	N/A	6	8	6	2	3	3	N/A	N/A	N/A
Eggs	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plants and berries	2	2	2	2	3	6	8	8	8	3	2	2
Wood	6	6	6	6	6	6	6	6	6	6	6	6
Total number of resources per month	10	10	10	11	10	9	10	11	11	10	10	10

Source: Holen et al. 2012; SRB&A 2016a; SRB&A 2013a; Brown et al. 2016; Marcotte and Haynes 1985; Wilson and Kostick 2016; Andersen et al. 2004b; Marcotte 1986
Notes: Apr = April; Aug = August; Dec = December; Feb = February; Mar = March; Jan = January; Jul = July; Jun = June; N/A = Not applicable (no or limited subsistence activity); Nov = November; Oct = October; Sep = September
Koyukuk River Region Communities = 9 (Alatna, Allakaket, Anaktuvuk Pass, Bettles, Coldfoot, Evansville, Hughes, Huslia, and Wiseman)
Each cell contains the number of communities reporting subsistence activity or harvests during each month, based on the most recent data source for each community. Months with only one community report harvests or activity are not included in the table. Resources with no subsistence activity data available are not included in the table.

While non-salmon fish and plants and berries are harvested year round in the Koyukuk River Region, during summer (June-August) residents begin to focus on fishing and collecting plants and berries. Salmon abundances vary throughout the region and therefore harvesting salmon is a strong focus of some communities, including Allakaket and Alatna, while other communities located further from the major salmon rivers (i.e., Bettles and Evansville) focus their fishing endeavors on non-salmon fish. Berries are a particularly important resource in the region; they are among the highest- used resources (in terms of the percentage of households using) in many of the communities (Holen et al. 2012). Most large land mammal subsistence activity, more commonly a fall activity, occurs at the end of the summer in August. However, communities hunt bear year round and may also take a caribou in July. Harvests of waterfowl occur during the summer months, although harvest activities decrease during the July nesting and rearing period

Many subsistence activities which occur over the summer, including fishing, waterfowl hunting, and large land mammal hunting, continue or amplify during the fall (September-October). Caribou and moose are particularly important resources for the northern communities in the Koyukuk River Region (i.e., Wiseman, Coldfoot, Evansville, and Bettles), and by weight make up the majority of the annual subsistence harvest in these communities. Moose harvests most commonly occur in the month of September and residents harvest caribou during the fall and into the winter months. Dall sheep and bear harvests continue in early fall and berry picking may also continue from the summer into fall. Fall in the Koyukuk River Region marks the end of waterfowl subsistence activity and an increase of harvests of upland birds, such as grouse and ptarmigan. Wood is collected year-round and in the fall is a particularly important resource to prepare for heating through the upcoming winter.

During the winter season (November-March), focus shifts to harvests of small land mammals and furbearers as watersheds freeze over creating conditions for travel to trapping grounds. Pelts of the small mammals and furbearers are prime over the winter season and residents of the region hunt or trap for the pelts and/or meat of small mammals for subsistence purposes. Large land mammal harvests, including caribou, moose, bears, and sheep, occur over the winter months although moose, bear, and sheep harvests occur with more frequency during other seasons. Ice fishing for non-salmon fish occurs over winter months. In Bettles and Evansville changing ice conditions have decreased winter non-salmon fishing subsistence activities in recent years (Holen et al. 2012). Residents of the Koyukuk River Region harvest upland birds throughout the winter and into the spring as the annual cycle of subsistence activities begins again.

5.3.4 Travel Method

A recent subsistence mapping study (SRB&A 2016a) collected data on travel methods for a majority of Koyukuk River study communities. The data show that a majority of use areas in the study communities are accessed by boat and, to a lesser extent, snowmachine. Other methods used to access subsistence use areas include truck/car, plane, ATV, and foot. Primary travel methods used to search for resources within use areas are boat, snowmachine, and foot (SRB&A 2016a). Access and search methods vary by community. For example, the communities of Bettles and Evansville rely more heavily on plane travel to access subsistence use areas, although Watson (2018) indicates that access to airplanes may decrease with the newer generations. In addition, Wiseman and Coldfoot report much heavier use of trucks/cars to access their harvesting areas, given their proximity to the Dalton Highway. The communities of Alatna and Allakaket are much more likely to use boats to access their harvesting areas than other Koyukuk River study communities. Data on travel methods for Anaktuvuk Pass (SRB&A 2013b) indicate a heavy reliance on ATVs and snowmachines rather than boats, which reflects the lack of access to navigable rivers near that community. Travel routes documented for Anaktuvuk Pass show various overland travel routes which follow mountain passes to the south toward Bettles and Evansville and to the southwest as far as Ambler. Finally, travel method data for the community of Hughes are available in Wilson and Kostick (2016) and indicate that boat is the primary method used by community households, followed closely by snowmachine and to a lesser extent, ATV. Watson (2018), who mapped contemporary subsistence use areas for a number of the Koyukuk River study communities (Allakaket, Alatna, Bettles, Evansville, Hughes, and Huslia) included access routes to subsistence use areas within the use areas mapped in that study; thus many of the use areas shown on Map 11 through Map 19 include travel routes as well.

5.3.5 Resource Importance

The relative importance of subsistence resources to the individual Koyukuk River Region study communities, based on selected variables, is provided in Table 20 through Table 28 (see Section 4.3 for discussion of methods). Based on this analysis, vegetation is of high importance in the largest number of Koyukuk River study communities (eight communities), followed by moose and non-salmon fish (seven communities), salmon (six communities), and caribou (five communities). Other resources of high importance in the Koyukuk River Region study communities include marine mammals (three communities), upland birds (two communities), and migratory birds and Dall sheep (one community each).

Table 20. Relative importance of subsistence resources based on selected variables, Alatna

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	75	74	16	H
2	Caribou	57	34	10	M
3	Dall Sheep	N/A	9	0.1	L
4	Bear	N/A	N/A	1	L
5	Other LLM	N/A	N/A	N/A	I
6	SLM/Furbearers	67	67	2	M
7	Marine mammals	N/A	100	N/A	H
8	Migratory birds	83	83	4	H
9	Upland birds	83	50	0.2	H
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	33	50	48	H
12	Non-salmon fish	71	58	16	M
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	100	100	1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M - Moderate; N/A = Not Available; LLM = Large land mammals; SLM = Small land mammals

Table 21. Relative importance of subsistence resources based on selected variables, Allakaket

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	73	65	13	H
2	Caribou	38	52	4	H
3	Dall sheep	12	9	0.2	L
4	Bear	-	-	1	L
5	Other large land mammals	-	2	-	L
6	Small land mammals/ furbearers	40	38	2	M
7	Marine mammals	-	55	-	H
8	Migratory birds	55	40	3	M
9	Upland birds	43	10	0.2	M
10	Bird eggs	-	-	-	-
11	Salmon	40	60	53	H
12	Non-salmon fish	64	55	23	H
13	Marine invertebrates	-	2	-	L
14	Vegetation	83	57	1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 22. Relative importance of subsistence resources based on selected variables, Anaktuvuk Pass

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	6	26	3	M
2	Caribou	66	68	84	H
3	Dall sheep	32	42	3	M
4	Bear	N/A	N/A	0.4	L
5	Other large land mammals	N/A	2	N/A	L
6	Small land mammals/ furbearers	18	8	0.03	L
7	Marine mammals	1	60	N/A	H
8	Migratory birds	23	21	0.3	L
9	Upland birds	18	18	0.2	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	11	40	0.4	M
12	Non-salmon fish	74	61	8	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	79	47	2	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 23. Relative importance of subsistence resources based on selected variables, Bettles

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	35	62	51	H
2	Caribou	29	32	14	M
3	Dall sheep	13	19	0.4	L
4	Bear	N/A	N/A	1	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	50	13	1	M
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	13	N/A	1	L
9	Upland birds	25	13	1	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	13	25	15	M
12	Non-salmon fish	38	46	10	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	88	63	4	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 24. Relative importance of subsistence resources based on selected variables, Evansville

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	33	68	51	H
2	Caribou	18	50	5	H
3	Dall sheep	N/A	33	0.4	M
4	Bear	N/A	N/A	0.6	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	8	8	1.3	L
7	Marine mammals	N/A	23	N/A	L
8	Migratory birds	N/A	15	1	L
9	Upland birds	46	38	1.5	M
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	8	62	18	H
12	Non-salmon fish	38	60	12	H
13	Marine invertebrates	N/A	15	N/A	L
14	Vegetation	100	62	9	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 25. Relative importance of subsistence resources based on selected variables, Coldfoot

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	N/A	25	N/A	L
2	Caribou	50	50	85	H
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	N/A	I
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	N/A	N/A	N/A	I
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	N/A	N/A	N/A	I
9	Upland birds	N/A	25	N/A	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	N/A	25	N/A	L
12	Non-salmon fish	N/A	N/A	N/A	I
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	100	N/A	15	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 26. Relative importance of subsistence resources based on selected variables, Hughes

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	62	69	18	H
2	Caribou	27	18	4	M
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	1	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	31	12	2	M
7	Marine mammals	N/A	31	N/A	M
8	Migratory birds	46	19	1	M
9	Upland birds	46	4	0.2	M
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	19	50	61	H
12	Non-salmon fish	51	39	11	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	62	23	1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 27. Relative importance of subsistence resources based on selected variables, Huslia

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	66	52	29	H
2	Caribou	40	38	3	M
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	1	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	N/A	18	2	M
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	N/A	27	3	M
9	Upland birds	N/A	7	0.1	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	N/A	52	51	H
12	Non-salmon fish	58	55	8	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	N/A	5	1	L

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 28. Relative importance of subsistence resources based on selected variables, Wiseman

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	80	40	46	H
2	Caribou	80	20	21	H
3	Dall sheep	80	25	11	H
4	Bear	N/A	N/A	N/A	I
5	Other large land mammals	N/A	20	N/A	L
6	Small land mammals/ furbearers	60	N/A	2	M
7	Marine mammals	N/A	20	N/A	I
8	Migratory birds	60	20	1	M
9	Upland birds	80	20	5	H
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	20	100	4	H
12	Non-salmon fish	80	60	5	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	100	60	5	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

5.4. Tanana River

The Tanana River region includes the communities of Manley Hot Springs, Minto, Nenana, and Tanana. Tanana use areas are overlapped with the southern corridor alternative, while the three other Tanana River region communities have uses which occur within 30 miles of (but do not overlap with) the southern corridor. Three of four of the Tanana River region communities (Manley Hot Springs, Minto, and Nenana) are road-connected.

5.4.1 Subsistence Use Areas

Subsistence use areas for the Tanana River region study communities are focused around the Tanana River, Yukon River, Nenana River, and Minto Flats. For road-connected communities (e.g., Manley Hot Springs, Minto, and Nenana) use areas also occur along the Parks, Elliot, Steese, and/or Dalton highways. In the case of Nenana, documented use areas occur as far west as the Koyukuk River.

Manley Hot Springs subsistence use areas for all available time periods (1975-1995; 2012) are shown on Map 20. The community's harvesting activities occur in an area surrounding the community, along the Tanana River to its mouth, and upriver into the Minto Flats. In addition, use areas occur at several locations along the Yukon River. Use areas recently documented by the ADF&G (Brown et al. 2014) show salmon and non-salmon fish harvesting areas for the community occurring along the Tanana River and on the Yukon River at a location referred to as The Rapids. Additional non-salmon fish harvesting areas occur at various lakes and sloughs near the community. Large land mammal hunting for bears and moose occur along the Tanana River in addition to areas accessed along the local road system and several overland areas south and north of the community. Small land mammal hunting and trapping areas in addition to bird hunting and vegetation harvesting also occur in various overland areas north and south of the community and along the nearby road system. Vegetation harvesting areas also occur to the north of the community along the Yukon River.

Minto subsistence use areas (Map 21) for all available time periods (1960-84; 1960-85; 2006-2015; 2012) occur throughout the Minto Flats, along the Elliot Highway, and along the Tanana, Kantishna, and Yukon rivers. Recent use areas documented for Minto (SRB&A 2016a) show large land mammal (moose and bear) hunting concentrated in the Minto Flats including the Tolovana and Chatanika Rivers and Sawmill Slough. Small land mammal hunting and trapping is focused on the Chatanika and Tanana Rivers in addition to various overland areas within the Minto Flats, to the north near the Elliot Highway, and at an isolated area long the Yukon River near Stevens Village. Waterfowl hunting is also concentrated within the Minto Flats close to the community and near Sawmill Slough, while upland bird hunting occurs most commonly along the road system out of Minto and along the Elliot Highway. Fishing for Minto residents occurs within the Minto Flats but with a majority of activity in the Tanana River and at various locations along the Yukon River. Non-salmon fish harvesting generally occurs closer to the community than salmon harvesting. Harvesting of berries and vegetation occur within the Minto Flats and to a lesser extent along the Elliot Highway.

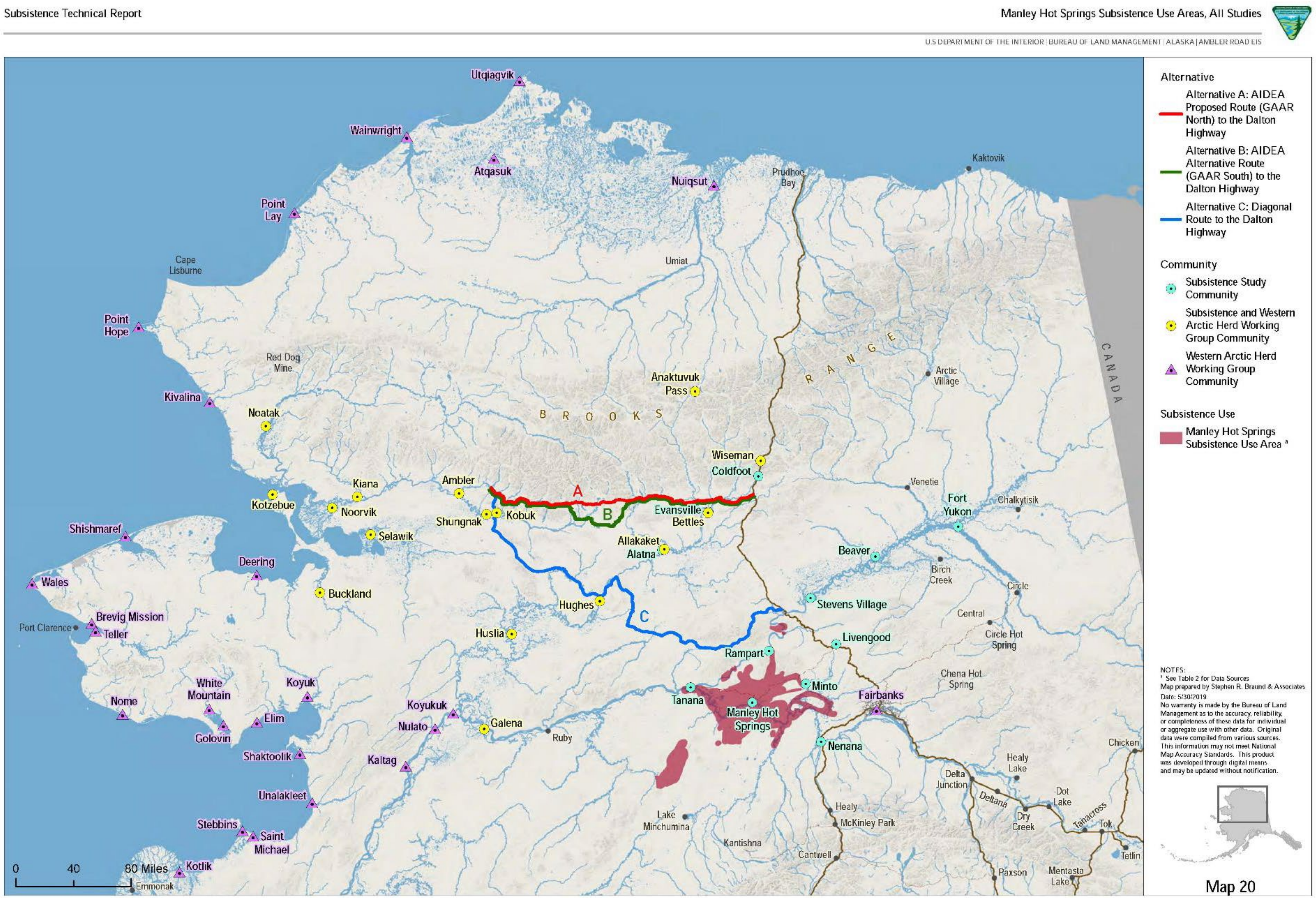
As shown on Map 22, Nenana use areas for all available time periods (1981-1982; 2006-2015; 2015) occur primarily along the Tanana, Nenana, and Kantishna rivers, portions of the Minto Flats, and along the highway system north and south of the community. Recent use areas documented for Nenana (SRB&A 2016a) show large land mammal hunting for moose and bear occurring primarily along the Parks Highway south of the community and along the Tanana River and Minto Flats; waterfowl hunting occurs in a similar area. Caribou hunting by Nenana residents was reported primarily to the northeast of the community along the Steese Highway, while small land mammal and upland game hunting occur closer to the community and in overland areas extending north to the Elliot Highway. Salmon fishing by

Nenana residents is focused along the Tanana River near the community, while non-salmon fish harvesting extends farther from the community into the Tanana River and Minto Flats. Vegetation harvesting occurs along the road system near to and south of the community of Nenana, in addition to various spots along the Tanana River and in the Minto Flats.

Of the four Tanana Region study communities, Tanana has uses closest to the AMDIAR project corridors, with subsistence use areas overlapping with the southern corridor alternative north of the Yukon River. Map 23 shows Tanana use areas for all available time periods (1968-1988; 2006; 2014) extending along the Tanana and Yukon rivers and in overland areas both north and south of the Yukon River. Recently documented use areas for the 2014 time period (Brown et al. 2016) show moose hunting occur along the Yukon River downriver from their community, along the Tanana-Allakaket Winter Trail extending north of their community toward Allakaket, and along the Koyukuk River to Huslia. Small land mammal hunting and trapping occurs north of the community along the Tanana-Allakaket Winter Trail to its crossing with the Tozlina River, in addition to locations along the Yukon River and overland to the south of the community. Several caribou hunting areas were documented to the east and north of their community, including in the Ray Mountains. Fishing for salmon and non-salmon fish occurs on the Yukon River primarily in front of or upriver from the community of Tanana. Waterfowl hunting took place along the Yukon and Tanana rivers including the lake system surrounding Fish Creek and Fish Lake to the southeast of the community, while upland bird hunting occurred primarily in overland areas to the north and west of the community. Vegetation harvesting by Tanana residents took place in overland areas to the north of the community in addition to the Fish Creek/Fish Lake area southeast from the community.

5.4.2 Harvest Data

Harvest data for the Tanana River study communities are provided on Figure 10 through Figure 12 and in Table 29. As shown on Figure 10, based on an average of available data, salmon is the primary resource harvested among the study communities in terms of percentage of usable pounds (70 percent), followed by non-salmon fish (12 percent) and moose (11 percent). Other resources which contribute smaller amounts in terms of pounds include vegetation, small land mammals, migratory birds, and caribou. Resource contribution is relatively similar among the Tanana River Region study communities, although Minto relies more heavily on moose harvests than the other study communities, at 22 percent of the total harvest. Data on resource contribution are not available for the community of Nenana, for which there are no comprehensive (i.e., all resources) harvest studies.



Map 20. Manley Hot Springs subsistence use areas, all studies

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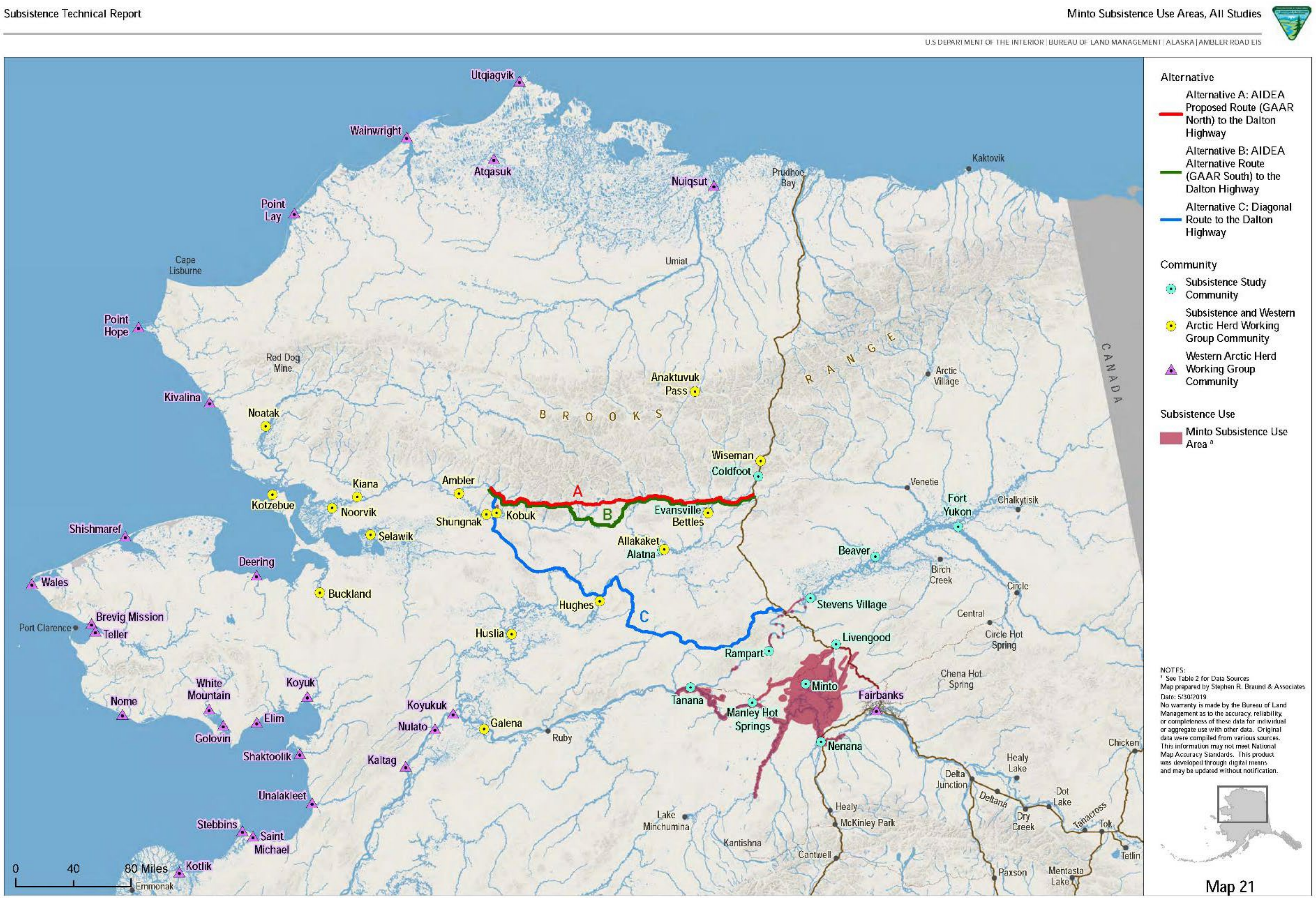

Map 21. Minto subsistence use areas, all studies

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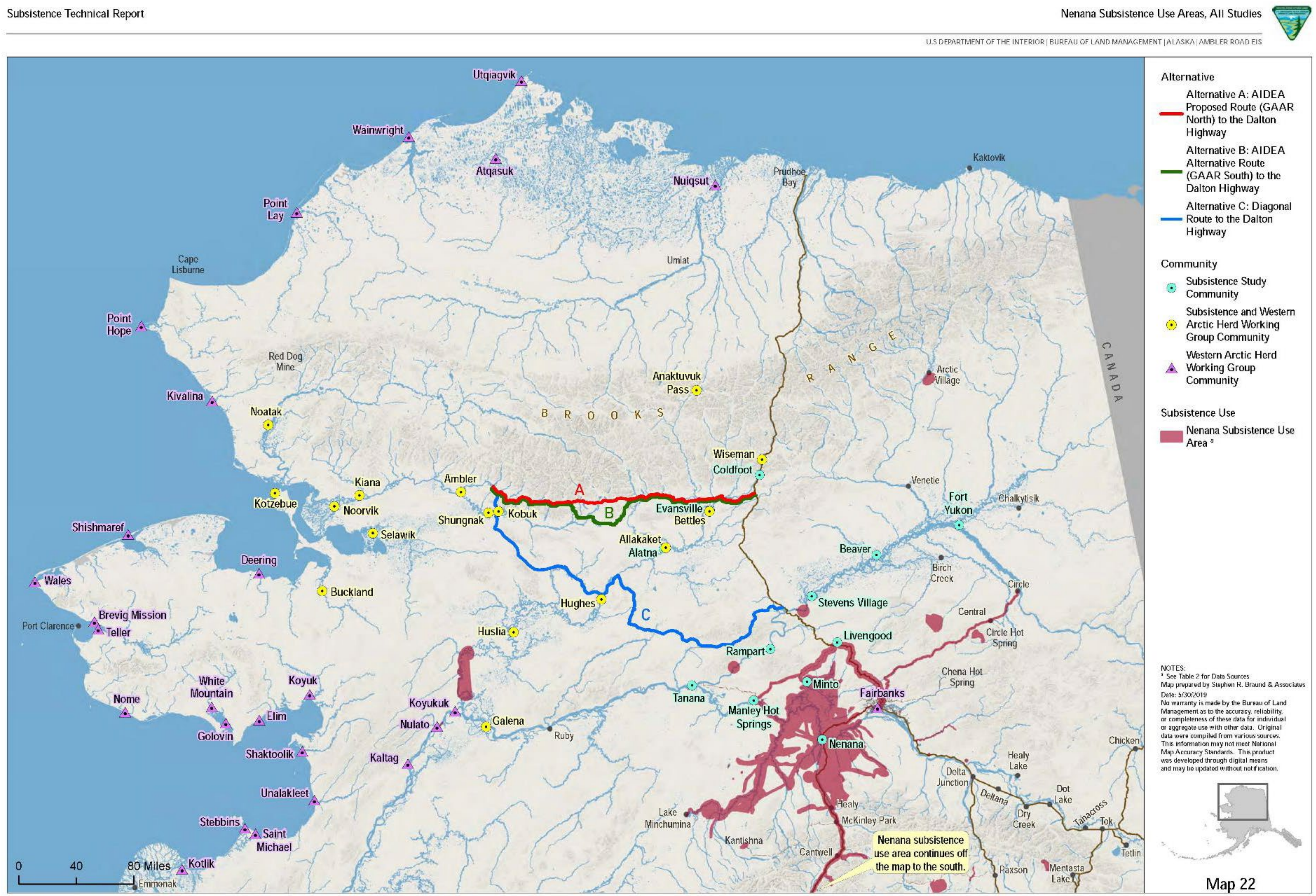

Map 22. Nenana subsistence use areas, all studies

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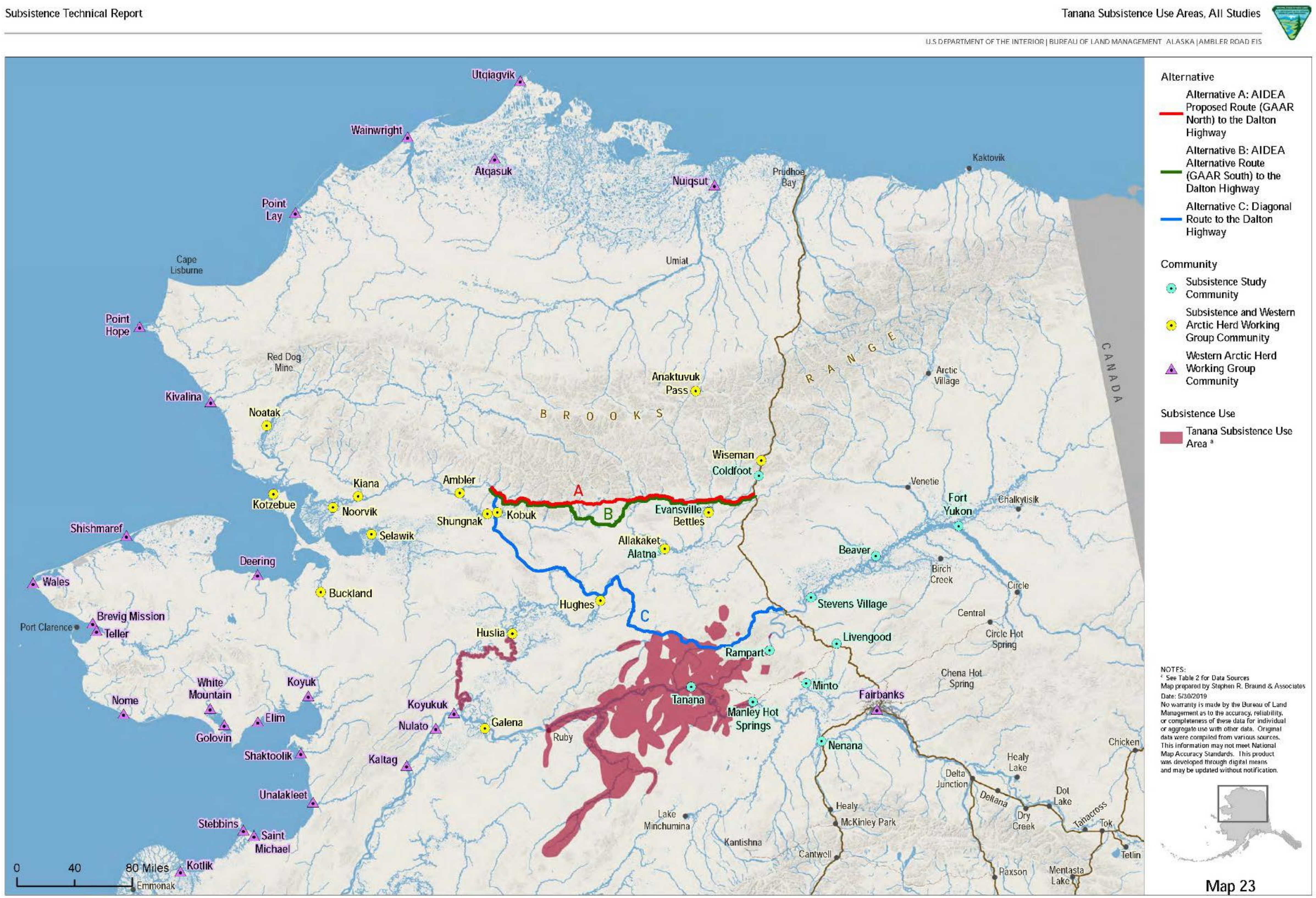

Map 23. Tanana subsistence use areas, all studies

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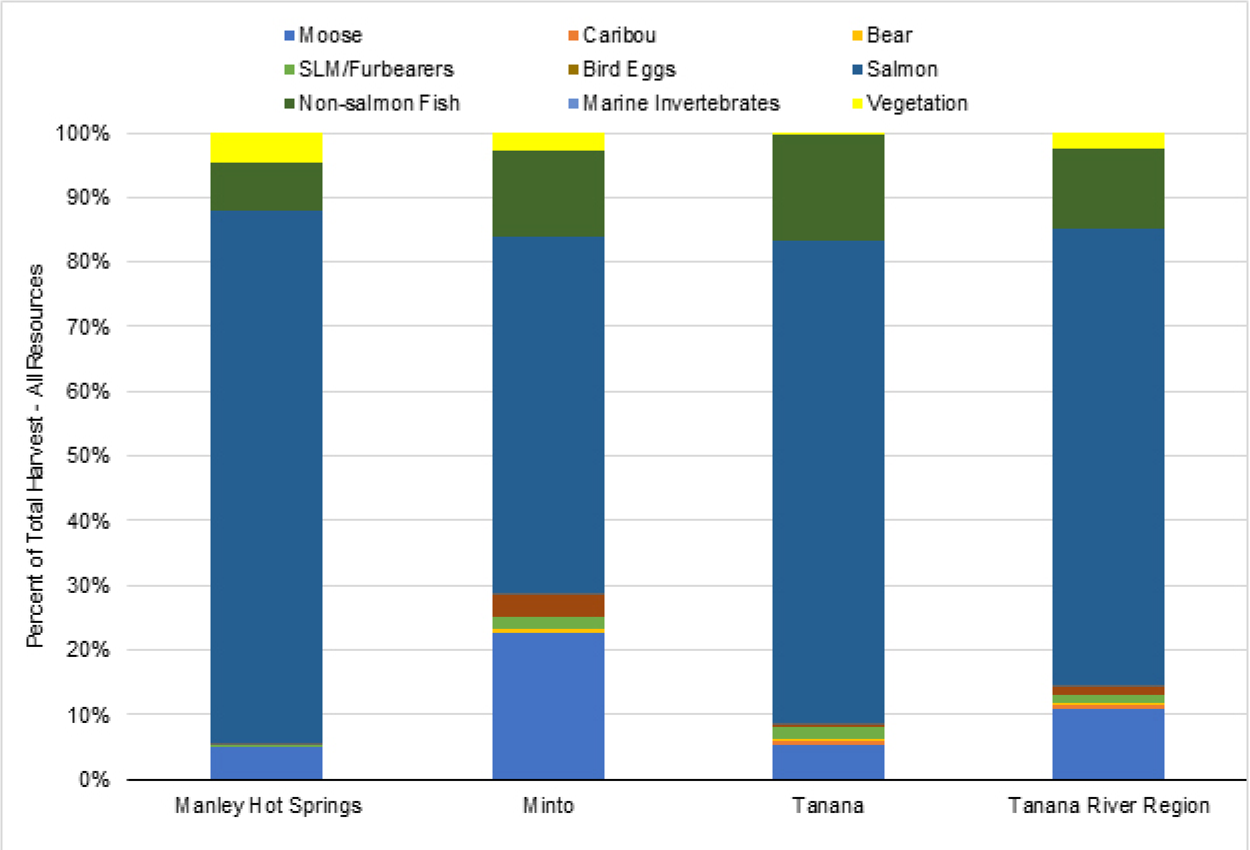

Figure 10. All resources percent of total harvest by Tanana River region communities

Source: See Table 2 for citations, time period, and resources addressed
Notes: Data represent the average percent of harvest across all available study years for comprehensive (i.e., all resources) household harvest surveys. In some cases, averages represent only a single study year. Available study years for each community are as follows: Manley Hot Springs (2012); Minto (1983-84, 2012); Tanana (1987, 2008, 2014).

Average participation rates among Tanana River Region study communities, in terms of the average percentage of households attempting harvests by resource during individual study years, are shown on Figure 11. These data are based on averages across available study years; it is likely that in some years (or across all years) a higher percentage of households participates in each resource activity. Across all Tanana River Region study communities, households most commonly participate in harvests of vegetation (86 percent of households), followed by moose (64 percent), salmon (56 percent), upland birds (55 percent), and non-salmon fish (53 percent). A smaller percentage of households participate in harvests of migratory birds and small land mammals, while participation in caribou hunting, bird egg harvesting, marine invertebrate harvesting, and Dall sheep hunting is minimal. The average percentage of households receiving different resources is shown on Figure 12. The most widely received resources in the region are also the most widely harvested. Salmon is the most commonly received resource among Tanana River Region study communities, followed by moose, vegetation, non-salmon fish, and migratory birds.

Table 29 shows average harvest and use data for the top five species harvested (in terms of average contribution toward the total subsistence harvest) by each of the Tanana River Region study communities. Data for Nenana are for selected land mammal and non-salmon fish species and are based on per capita harvests of these resources. For the three communities where data are available (Manley Hot Springs, Minto, and Tanana), chum salmon is the top species harvested, contributing between 34 percent and 54 percent of the total subsistence harvest. Chinook and coho salmon are also among the top species harvested in these communities, as is moose. Northern pike is among the top species harvested in Minto, whereas whitefish is a top species harvested in Tanana. Although limited data are available, data show Nenana residents harvesting an average of 83 pounds of moose per capita, and approximately two per capita pounds of humpback whitefish, beaver, and pike.

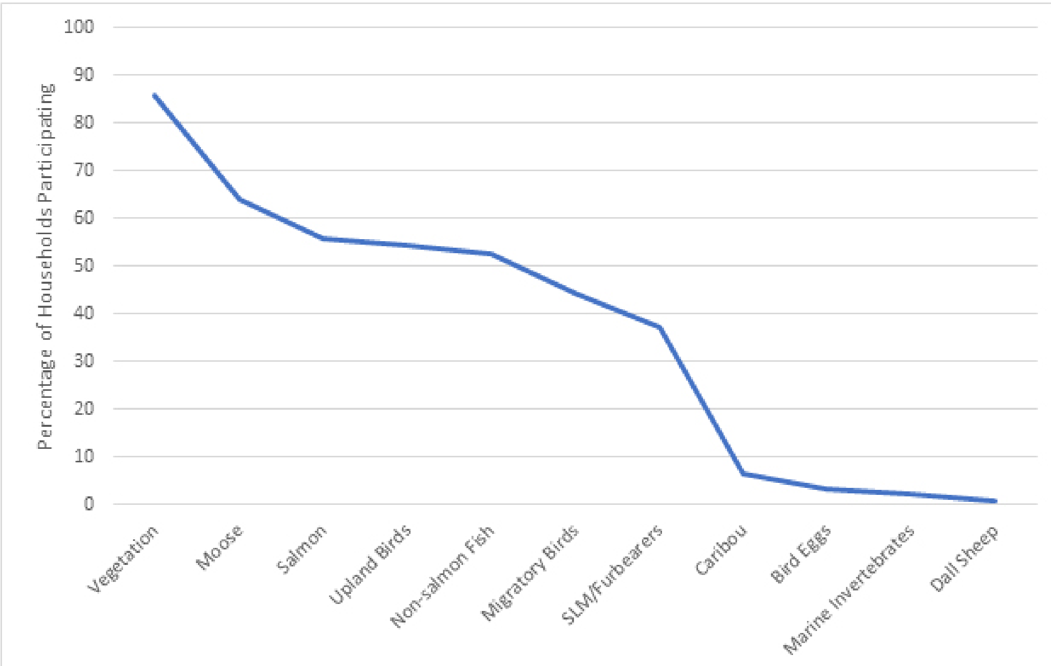

Figure 11. Percent of households attempting harvests of resources, Tanana River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Manley Hot Springs (2004, 2012); Minto (1983-84, 1994, 2004, 2012); Tanana (1987, 1997-98, 1998-99, 1999-00, 2002-03, 2006, 2008, 2014)

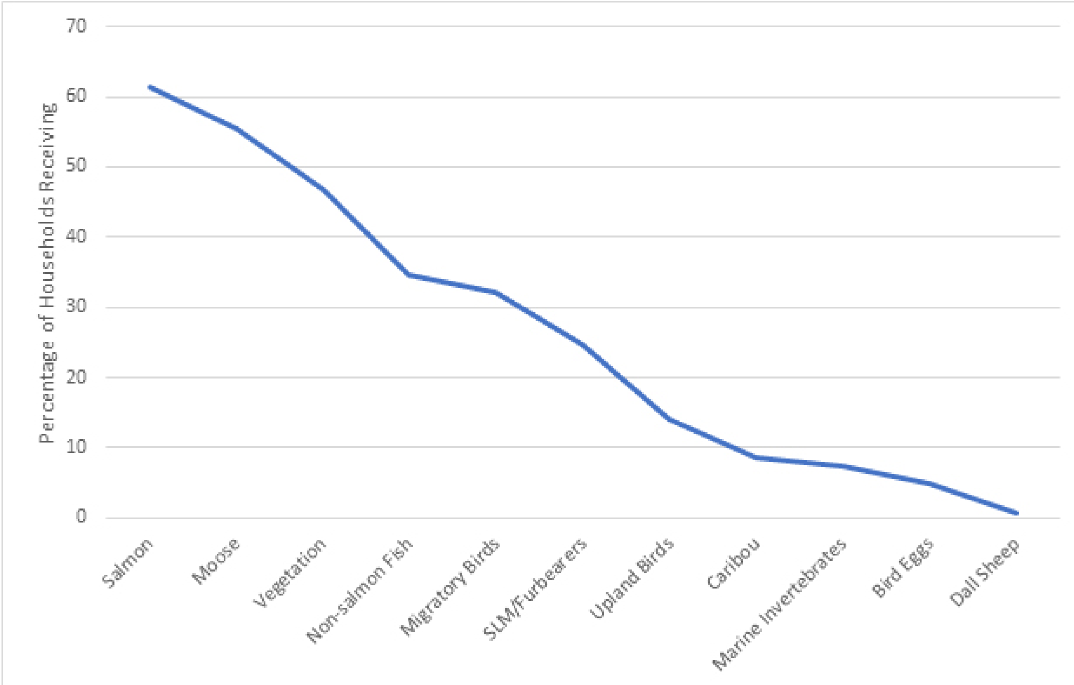

Figure 12. Percent of households receiving resources, Tanana River region communities

Source: See Table 2 for citations, time period, and resources addressed.
Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Manley Hot Springs (2004, 2012); Minto (1983-84, 1994, 2004, 2012); Tanana (1987, 1997-98, 1998-99, 1999-00, 2002-03, 2006, 2008, 2014)

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Table 29. Average harvest and use data, top 5 species, Tanana River region communities

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HHs receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% total harvest
Manley Hot Springs	Chum salmon	32	15	12	15	20	3,586	17,992	310	146	34.3
Manley Hot Springs	Chinook salmon	80	29	20	29	68	979	12,958	223	105	24.7
Manley Hot Springs	Coho salmon	39	12	12	10	27	1,835	11,858	204	96	22.6
Manley Hot Springs	Moose	59	50	11	25	49	8	4,498	123	55	4.9
Manley Hot Springs	Northern pike	39	29	29	7	17	364	1,018	18	8	1.9
Minto	Chum salmon	41	44	44	11	24	12,578	62,903	1,294	336	40.4
Minto	Moose	90	70	39	34	74	32	18,732	309	96	22.5
Minto	Coho salmon	35	11	11	9	26	690	4,457	73	25	11.2
Minto	Chinook salmon	61	37	37	22	43	485	7,044	139	38	7.2
Minto	Northern pike	61	44	47	22	25	1,740	5,639	113	30	5.7
Nenana	Moose	65	58	16	15	39	50	30,351	154	59	31.5
Nenana	Coho salmon	28	12	10	9	20	1,788	9,629	40	16	14.8
Nenana	Chum salmon	33	10	8	12	28	8,039	8,039	33	14	12.4
Nenana	Sockeye salmon	30	10	10	10	25	954	4,588	19	8	7.1
Nenana	Chinook salmon	31	10	10	14	27	564	4,466	18	8	6.9
Tanana	Chum salmon	70	66	62	28	27	67,411	400,317	3,127	1,158	53.7
Tanana	Whitefish	49	33	33	23	18	16,598	54,489	435	136	11.7
Tanana	Chinook salmon	92	53	52	46	47	4,769	81,079	633	270	10.9
Tanana	Coho salmon	35	30	27	7	10	14,374	71,870	561	106	9.6
Tanana	Moose	94	67	38	42	70	48	27,253	258	105	5.4

Source: See Table 2 for citations, time period, and resources addressed
Notes: HH = households; N/A = Not available
Data represent the average across all available study years. Available study years for each community are as follows: Manley Hot Springs (2004, 2012); Minto (1983-84, 1994, 2004, 2012); Tanana (1987, 1997-98, 1998-99, 1999-00, 2002-03, 2006, 2008, 2014)

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5.4.3 Timing of Subsistence Activities

Data on the timing of subsistence activities for Tanana River study communities are provided in Table 30. This table shows the number of communities reporting subsistence activity or harvests within each month, based on the most recent data sources for each community. Overall, Tanana River communities target the greatest number of resources during August and September. In general, subsistence activities are at their highest between the months of April through October, with less activity in winter.

Spring (April–May) in the Tanana River Region is a transitional time when winter subsistence activities wane and activities that will occur throughout the summer begin. Subsistence activity for upland birds and furbearers declines in early spring as residents of the region shift focus to non-salmon fish and waterfowl as they migrate through the area. However, communities continue to harvest upland birds throughout the year except in the month of June, during the nesting and rearing period. Spring is a primary harvest time for bear in the region, although bear can be taken year round. Spring marks a decline of small land mammal harvests in general, though beaver and porcupine subsistence activity continues.

Summer (June–August) in the Tanana River Region is characterized by intensified fishing activities. Salmon fishing begins in June and continues through the fall as different species navigate the watersheds of the region. Non-salmon fish harvests, including whitefish and sheefish harvests, occur along with the summer salmon fishing. Waterfowl subsistence activity continues through the summer as well as harvests of small land mammals, namely squirrel. Residents of the region may target moose in late summer; however, harvests at that time are only occasional. The emergence and ripening of vegetation in the region allows for increased harvests of plants and berries.

The focus on fishing continues into the fall (September–October) with harvests of coho salmon and non-salmon fish; moose harvests begin to intensify at this time. Moose subsistence activity occurs year round, but is primarily in September-March. Bear subsistence activity continues and is particularly common in the fall in Tanana and Minto. Moose and bear are the most common large land mammal resources harvested in the region. Waterfowl subsistence activity intensifies to peak activity with the fall migration, particularly in Manley Hot Springs and Tanana. Ripe berries are collected into early fall and wood collection begins at the end of fall.

The focus of subsistence activity shifts in the winter (November–March), with the end of salmon fishing and the slowing of non-salmon fishing. Residents primarily harvest small land mammals and upland birds for fresh meat over the winter season. Furbearer pelts are in prime condition over the winter and residents report peak activity during this time. Moose subsistence activity may occur during December and wood collection continues to maintain a fuel supply.

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Table 30. Tanana River region timing of subsistence activities, number of communities reporting subsistence activity

Resources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon fish	3	3	4	4	4	4	4	4	4	4	4	4
Salmon	N/A	N/A	N/A	N/A	N/A	4	4	4	4	4	N/A	N/A
Caribou	N/A	2	2	2	N/A	N/A	N/A	2	2	N/A	2	N/A
Moose	4	4	4	2	2	3	3	2	4	4	3	4
Bear	2	2	4	3	4	4	4	4	4	3	2	2
Furbearers	2	2	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	2
Small land mammals	4	4	4	4	3	3	2	3	4	4	4	4
Upland birds	4	4	4	4	3	N/A	2	4	4	4	4	4
Waterfowl	N/A	N/A	N/A	4	3	4	3	4	4	2	N/A	N/A
Eggs	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plants and berries	N/A	N/A	N/A	2	2	3	4	4	4	2	N/A	N/A
Wood	3	3	3	3	3	3	3	3	3	3	3	3
Total number of resources per month	**7**	**8**	**8**	**9**	**9**	**8**	**9**	**10**	**10**	**9**	**8**	**7**

Source: Case and Halpin 1990; Brown et al. 2010; Brown et al. 2016; Betts 1997; Brown et al. 2014; SRB&A 2016a
Notes: Apr = April; Aug = August; Dec = December; Feb = February; Mar = March; Jan = January; Jul = July; Jun = June; N/A = Not applicable (no or limited subsistence activity); Nov = November; Oct = October; Sep = September
Tanana River Region Communities = 4 (Manley Hot Springs, Minto, Nenana, and Tanana)
Each cell contains the number of communities reporting subsistence activity or harvests during each month, based on the most recent data source for each community. Months with only one community report harvests or activity are not included in the table. Resources with no subsistence activity data available are not included in the table.

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5.4.4 Travel Method

A recent subsistence mapping study (SRB&A 2016a) collected data on travel methods for a two of the four of Tanana River study communities (Minto and Nenana). The data show that a majority of use areas in the study communities are accessed by boat and, to a lesser extent, truck/car and snowmachine. Many use areas are accessible directly from the community. Other methods used to access subsistence use areas include truck/car and ATV. Both of these study communities have road access. Primary travel methods used to search for resources within use areas are boat, foot, and snowmachine (SRB&A 2016a). Access and search methods vary by community. Nenana residents are more likely to use road vehicles to access subsistence harvesting areas, while Minto residents are more likely to use boats to access and search within their harvesting areas. Unlike many other rural communities who have abandoned the use of dog teams in winter for snowmachines, some individuals in the community of Tanana continue to run dog teams and use their teams to access winter harvesting areas (Brown et al. 2016).

5.4.5 Resource Importance

The relative importance of subsistence resources to the individual Tanana River Region study communities, based on selected variables, is provided in Table 31 through Table 34 (see Section 4.3 for discussion of methods). Based on this analysis, salmon and vegetation are of high importance in all communities where data are available, while moose is of high importance in three out of the four Tanana River Region study communities (Minto, Nenana, and Tanana). Other resources of high importance in the Tanana River Region study communities include upland birds (one community), migratory birds (one community), non-salmon fish (one community), and small land mammals (one community).

5.5. Yukon River

The Yukon River region includes the communities of Beaver, Galena, Livengood, Rampart, and Stevens Village. Stevens Village use areas are overlapped with the eastern end of the southern corridor alternative, while the three Yukon River region communities of Beaver, Galena, and Rampart have uses which occur within 30 miles of (but do not overlap with) the southern corridor. Subsistence data are not available for Livengood.

5.5.1 Subsistence Use Areas

Subsistence use areas for the Yukon River region study communities (Map 24 through Map 27) are focused around the Yukon River system, extending from the Chalkyitsik area to the mouth of the Koyukuk River, in addition to along the Koyukuk River toward the southern corridor alternative near Hughes. A majority of use areas for the Yukon River region study communities are located to the east and south of the AMDIAR project alternatives.

Table 31. Relative importance of subsistence resources based on selected variables, Manley Hot Springs

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	58	39	32	H
2	Caribou	4	7	2	M
3	Dall sheep	0	2	0	L
4	Bear	3	1	0.15	L
5	Other large land mammals	-	-	-	L
6	Small land mammals/ furbearers	17	7	2	M
7	Marine mammals	0	13	0	L
8	Migratory birds	47	14	5	M
9	Upland birds	32	5	1	L
10	Bird eggs	2	0	0	L
11	Salmon	51	47	41	H
12	Non-salmon fish	54	36	12	H
13	Marine invertebrates	2	6	0.1	L
14	Vegetation	77	43	5	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 32. Relative importance of subsistence resources based on selected variables, Minto

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	70	74	22	H
2	Caribou	N/A	8	N/A	L
3	Dall sheep	1	N/A	N/A	L
4	Bear	N/A	N/A	1	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	48	35	2	M
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	69	46	3	H
9	Upland birds	48	7	0.3	M
10	Bird eggs	2	N/A	0.01	L
11	Salmon	54	80	55	H
12	Non-salmon fish	54	40	13	M
13	Marine invertebrates	2	N/A	0.001	L
14	Vegetation	87	35	3	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 33. Relative importance of subsistence resources based on selected variables, Nenana

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	69	29	N/A	H
2	Caribou	4	1	N/A	L
3	Dall sheep	1	1	N/A	L
4	Bear	N/A	N/A	N/A	I
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	15	5	N/A	L
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	N/A	N/A	N/A	I
9	Upland birds	73	N/A	N/A	H
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	73	26	N/A	H
12	Non-salmon fish	61	26	N/A	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	N/A	N/A	N/A	I

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 34. Relative importance of subsistence resources based on selected variables, Tanana

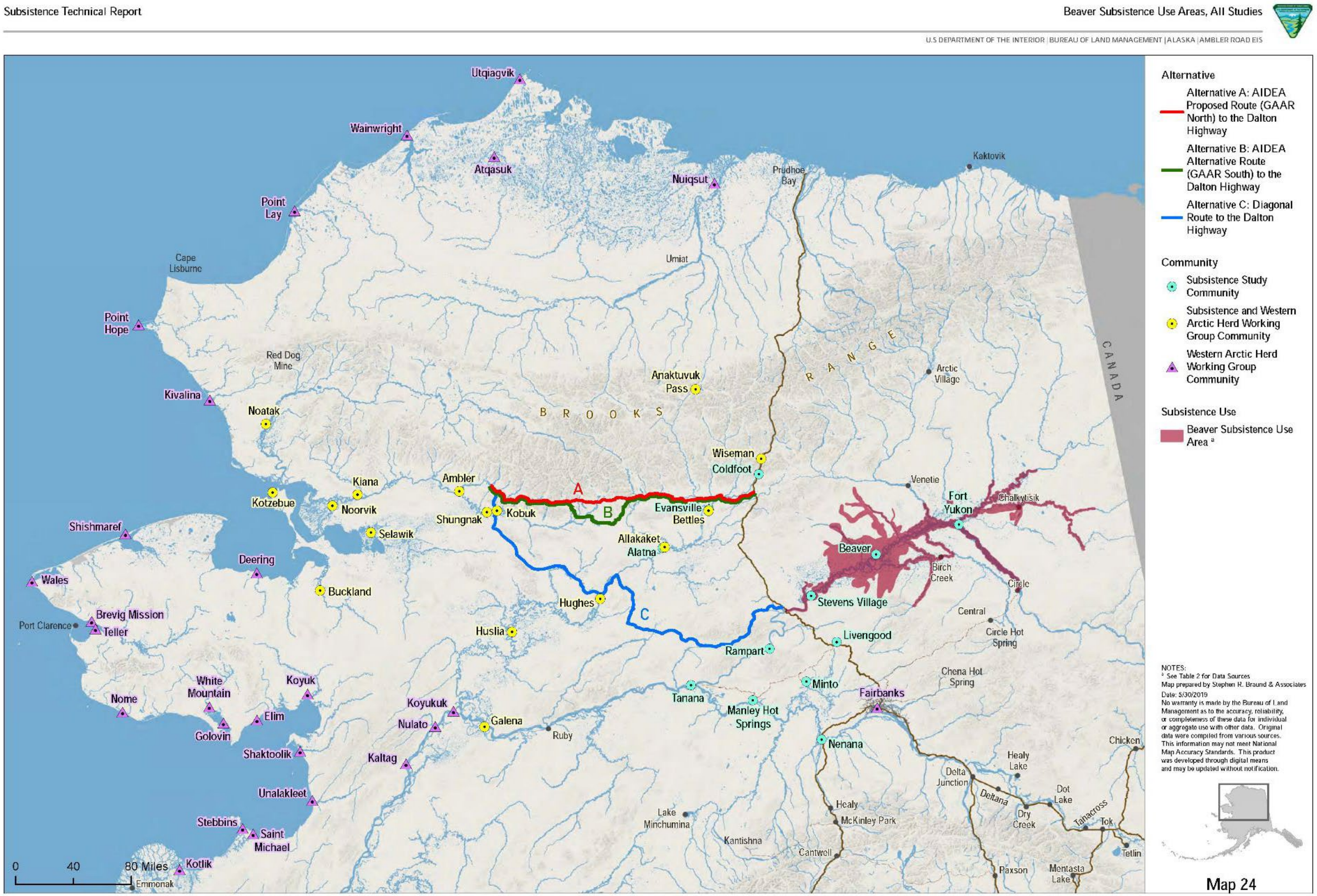
Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	67	70	5	H
2	Caribou	10	10	1	L
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	0.3	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/ furbearers	54	44	2	H
7	Marine mammals	N/A	N/A	N/A	I
8	Migratory birds	49	34	0.5	M
9	Upland birds	55	21	0.3	H
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	62	59	74	H
12	Non-salmon fish	50	26	17	M
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	73	45	0.1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Beaver subsistence use areas for all available time periods (1930-86; 1997-2006; 2010; 2011) are shown on Map 24. The community's use areas cover an extensive river system with residents traveling along various drainages of the Yukon River between the Circle and the Dalton Highway; other primary river drainages used for subsistence harvesting activities include the Porcupine River, Black River, Beaver Creek, and Birch Creek. As shown in SRB&A (2007) Beaver use areas for moose and bear are most focused along the Yukon River between the mouths of Birch Creek and Stevens Village, while furbearer and small land mammal use areas extend farther from the community along the river system and include various traplines that extend both north and south of the community. Fishing areas are located in relatively close proximity to the community of Beaver on the Yukon River while waterfowl hunting and egg harvesting occur along the Yukon River to the Dalton Highway but with the greatest concentration in the sloughs and lakes surrounding the community.

Galena use areas (Map 25) for all available time periods (1986; 2006; 2010) occur farther downriver on the Yukon River and include large areas surrounding both the Yukon and Koyukuk rivers. Isolated harvesting areas occur even farther north toward Selawik, and Hughes, just south and west of the southern project corridor alternative. According to Brown et al. (2015), for the 2014 study year, salmon harvesting by Galena residents took place primarily along the Yukon River upriver from their community and downriver past the mouth of the Koyukuk River to Nulato. Non-salmon fish harvesting occurred on the Yukon River but also in various sloughs and lakes alongside the Yukon River and at a location on the Koyukuk River. Moose harvesting extended along the Yukon and Koyukuk rivers and in overland areas surrounding these drainages; small land mammal harvesting was focused primarily to the north of the community in overland areas between the Yukon River, Koyukuk River, and the community of Huslia. Waterfowl and bird harvesting generally occurred closer to the community of Galena with some isolated search areas reported farther to the north (along the Koyukuk River) and east of the community. Similarly, vegetation harvesting occurred close to the community with isolated harvesting areas reported along the Koyukuk River and near Huslia.

Rampart use areas for all available time periods (1975-1995; 2014) are shown on Map 25 and show subsistence use areas focused relatively close to the community along the Yukon River downriver from the Dalton Highway, in addition to overland harvesting areas to the north and south of the community. Documented use areas for the 2014 time period (Brown et al. 2016) indicate a much smaller extent of harvesting areas for Rampart community residents in that year compared to previously documented use areas, in addition to increased use of the Stevens Village area for subsistence (Betts 1997). Brown et al. (2016) indicate the changes could be a result of the declining population of Rampart in addition to strong social and familial ties with Stevens Village which may have altered harvesting patterns to focus in that area. Use areas in 2014 were concentrated along the Yukon River directly near the community in addition to near Stevens Village. In addition, a couple of isolated harvesting areas were reported at greater distances from the community. Fishing occurred directly in front of the community of Rampart in addition to several locations upriver toward Stevens Village. Moose harvesting occurred at several isolated locations along Hess Creek, Tolovana River, and in a small area north of the Yukon River, while small land mammal and bird harvesting occurred directly near Rampart as well as at Stevens Village. Vegetation harvesting by Rampart households in 2014 occurred directly around the community.



Map 24. Beaver subsistence use areas, all studies

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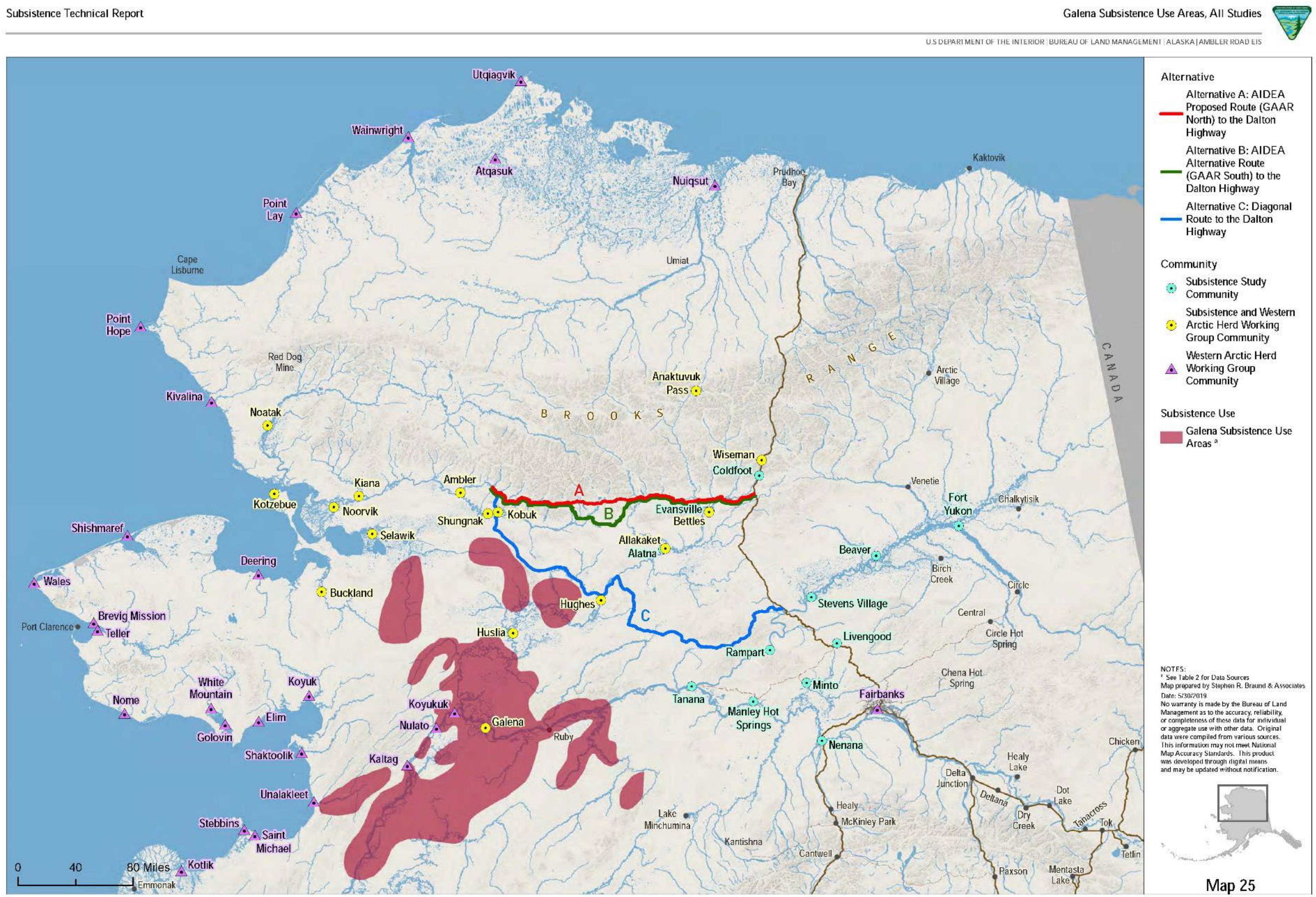

Map 25. Galena subsistence use areas, all studies

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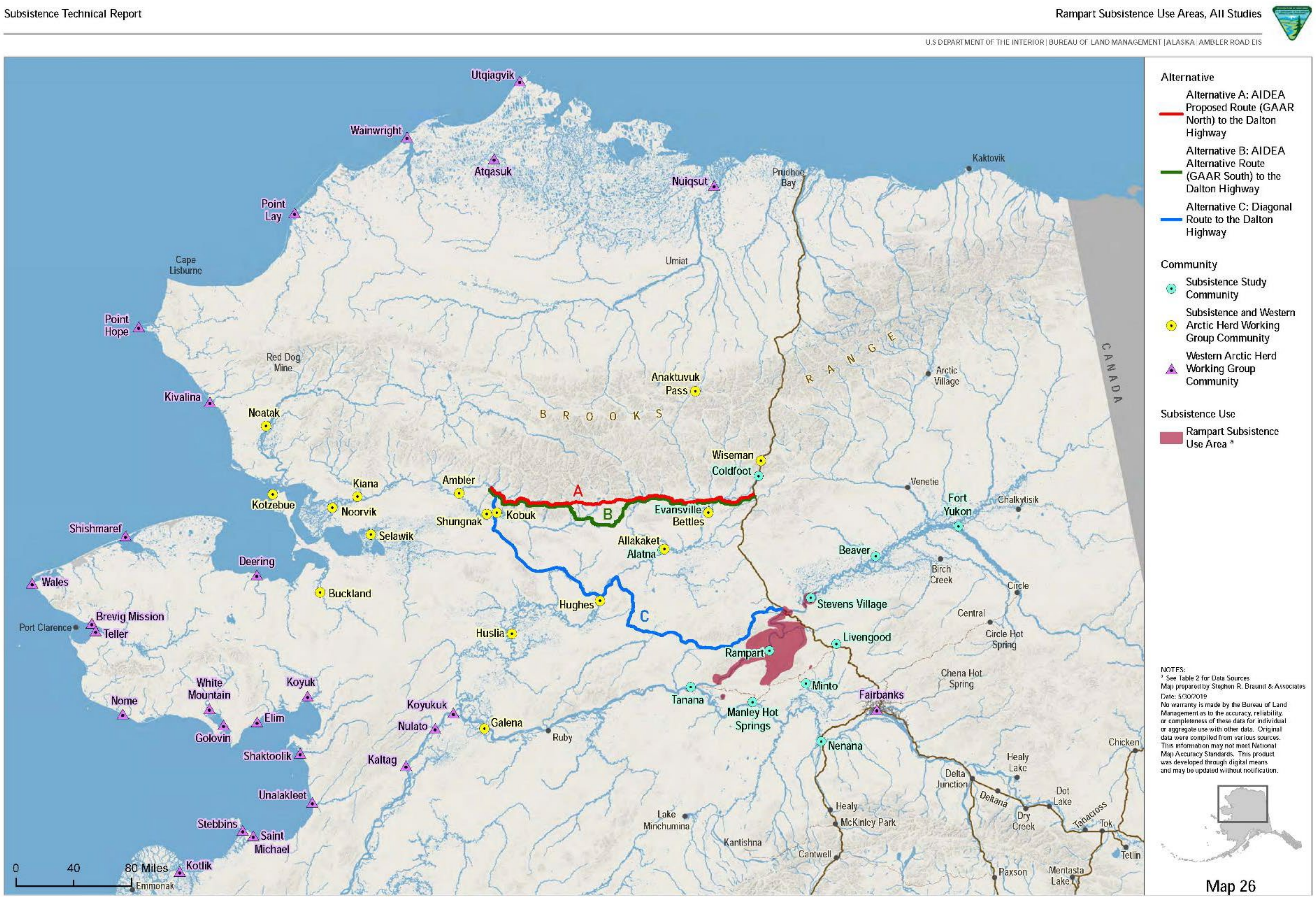

Map 26. Rampart subsistence use areas, all studies

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Stevens Village use areas (Map 27) for all available time periods (1974-1984; 2006-2015) extend along the Yukon River from the mouth of Birch Creek downriver to Rampart, in addition to larger overland use areas primarily to the north of the river. While most Stevens Village use areas remain to the east of the Dalton highway, certain overland and riverine uses cross to the west of the highway and overlap with the eastern portion of the southern corridor alternative. The population of Stevens Village has declined in recent years and an ADF&G comprehensive survey in 2015 found four eligible households. While many have moved away from the community to Fairbanks and other communities, residents continue to return to the community seasonally to engage in subsistence activities. Based on a recent mapping study with community seasonal and permanent residents (SRB&A 2016a), contemporary use areas for the community are similar to historic use areas and are concentrated along the Yukon River between the Dalton Highway and Hodzana River, and in overland areas north and south of the Yukon River. The more recent research shows a greater extent of use areas extending downriver beyond the Dalton Highway with a high concentration of use areas near the mouth of the Ray River. Resource-specific use areas for the more recent mapping study are not available.

5.5.2 Harvest Data

Harvest data for the Yukon River study communities are provided on Figure 13 through Figure 15 and in Table 35. As shown on Figure 13, based on an average of available data, salmon is the primary resource harvested among the study communities in terms of percentage of usable pounds (63 percent), followed by moose (20 percent) and non-salmon fish (nine percent). Other resources which contribute smaller amounts in terms of pounds include small land mammals, migratory birds, vegetation, bear, and caribou. Resource contribution is relatively similar among the Yukon River Region study communities, Stevens Village relies more heavily on salmon, at 81 percent of the total harvest, and less heavily on moose.

Average participation rates among Yukon River Region study communities, in terms of the average percentage of households attempting harvests by resource during individual study years, are shown on Figure 14. These data are based on averages across available study years; it is likely that in some years (or across all years) a higher percentage of households participates in each resource activity. Similar to other study regions, resources with the highest participation rates are not necessarily those that provide the greatest portion of the harvest. Across all Yukon River Region study communities, and similar to the other study regions, households most commonly participate in harvests of vegetation (74 percent of households). Other common subsistence activities across the study region include harvesting of non-salmon fish (60 percent of households participating), followed by migratory birds (56 percent), salmon (56 percent), moose (50 percent), and small land mammals/furbearers (50 percent)[1]. A smaller percentage of households participate in harvests of upland bird, while participation in bird egg harvesting, caribou hunting, marine invertebrate harvesting, and other large land mammal harvesting is minimal. The average percentage of households receiving different resources is shown on Figure 15. In the Yukon River Region, the most widely received resources in the region are also the most widely harvested. Salmon is the most commonly received resource among Yukon River Region study communities, followed by moose, non-salmon fish, and small land mammals.

[1] A Stevens Village commenter on the Draft EIS noted that the Stevens Village estimates for percentage of households using certain resources seemed low. The commenter indicated that 100 percent of Stevens Village households use chum salmon, Chinook salmon, whitefish, sheefish, and moose.

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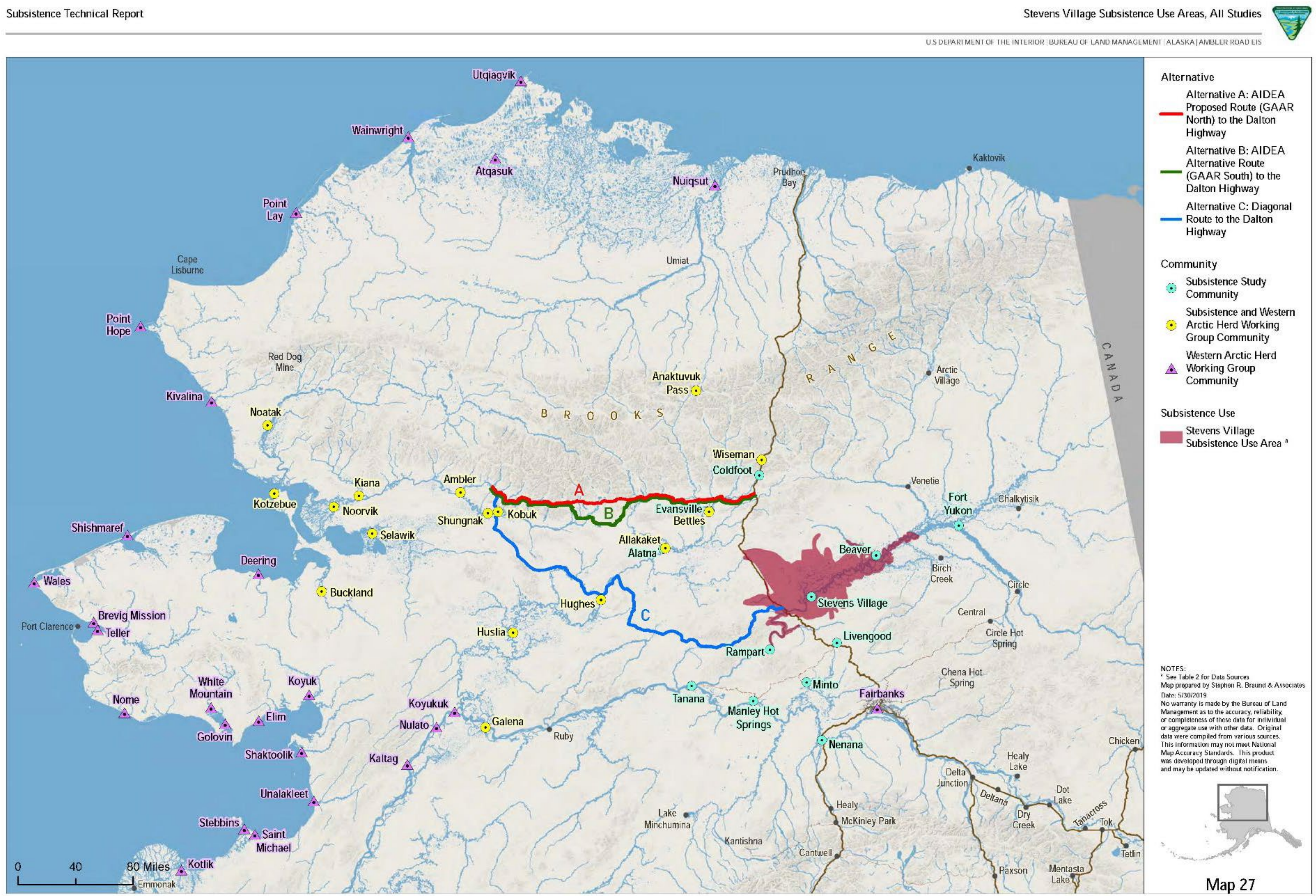

Map 27. Stevens Village subsistence use areas, all studies

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Table 35 shows average harvest and use data for the top five species harvested (in terms of average contribution toward the total subsistence harvest) by each of the Yukon River Region study communities. Chum salmon is the top species harvested among all study communities, contributing between 26 percent and 65 percent of the total subsistence harvest. Moose and other salmon species (coho and Chinook salmon) are also top species among all four study communities. Other top harvested species among the study communities include black bear (Beaver), white-fronted geese (Beaver), whitefish (Galena, Rampart, and Stevens Village), burbot (Rampart), and sheefish (Stevens Village).

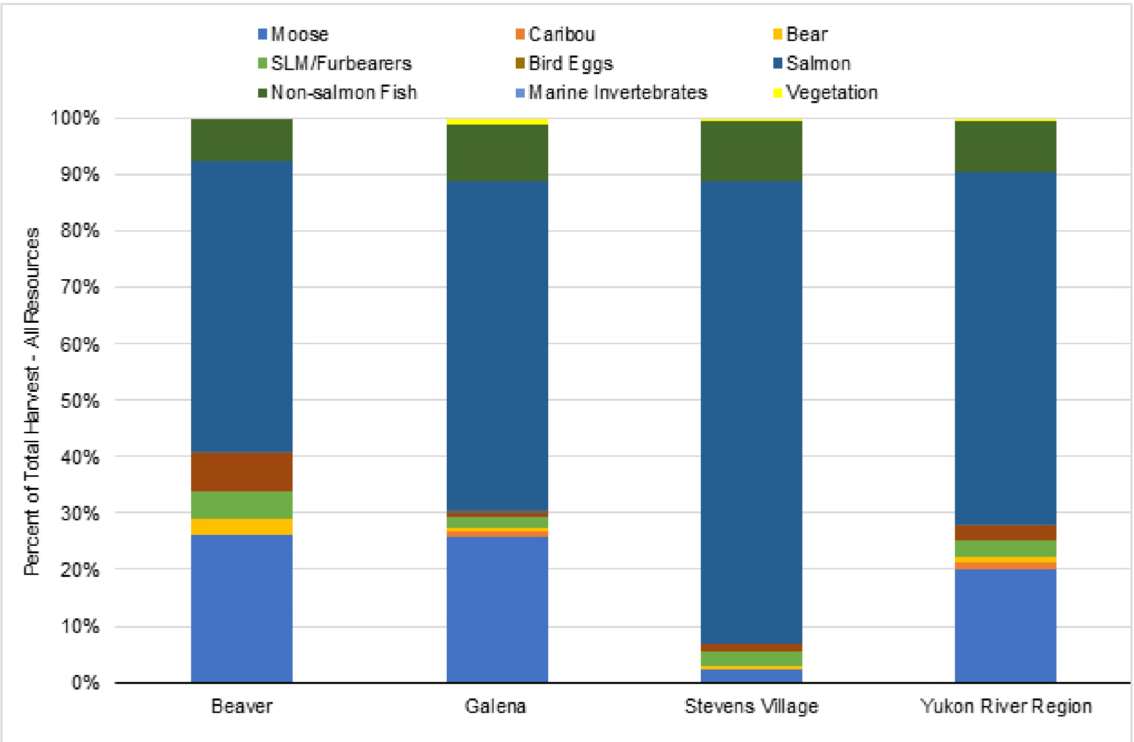

Figure 13. All resources percent of total harvest by Yukon River region communities

Source: See Table 2 for citations, time period, and resources addressed
Notes: Data represent the average percent of harvest across all available study years for comprehensive (i.e., all resources) household harvest surveys. In some cases, averages represent only a single study year. Available study years for each community are as follows: Beaver (1984-85, 2011); Galena (1985-1986, 2010); Stevens Village (1983-84, 2014).

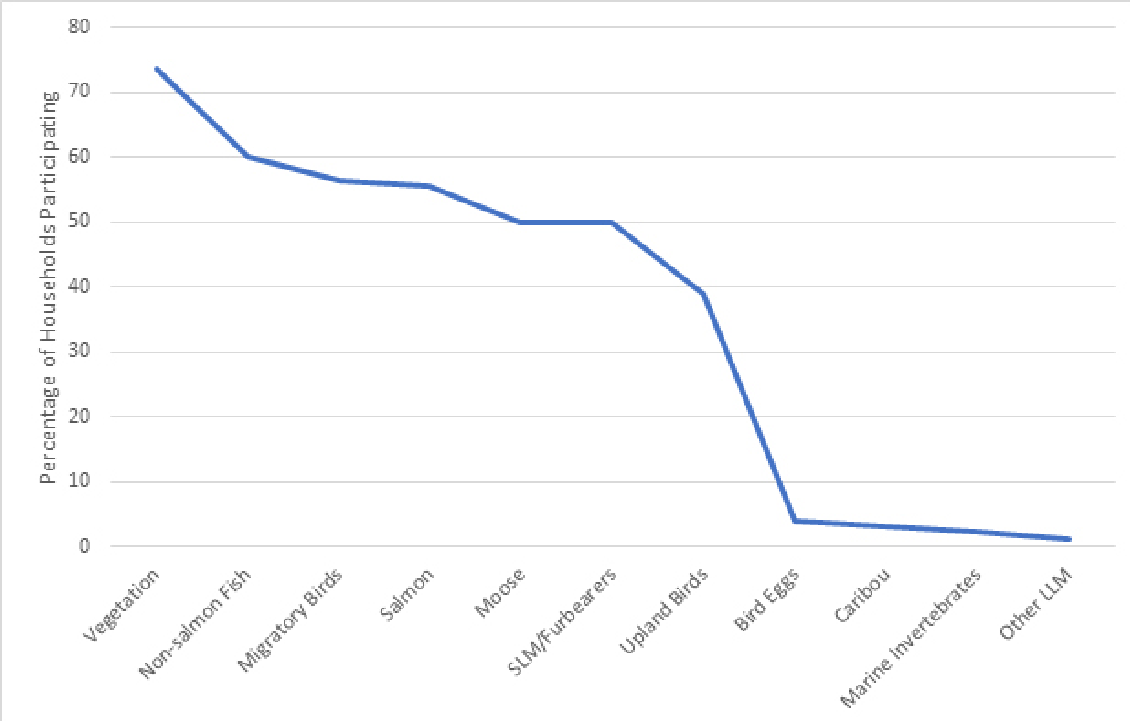

Figure 14. Percent of households attempting harvests of resources, Yukon River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Beaver (1984-85, 2000, 2005, 2008-09, 2009-10, 2010-11, 2011); Galena (1985-1986, 1996-97, 1997-98, 1998-99, 1999-00, 2001-02, 2002-03, 2006, 2010); Stevens Village (1983-84, 1996, 2008, 2008-09, 2009-10, 2010-11, 2014).

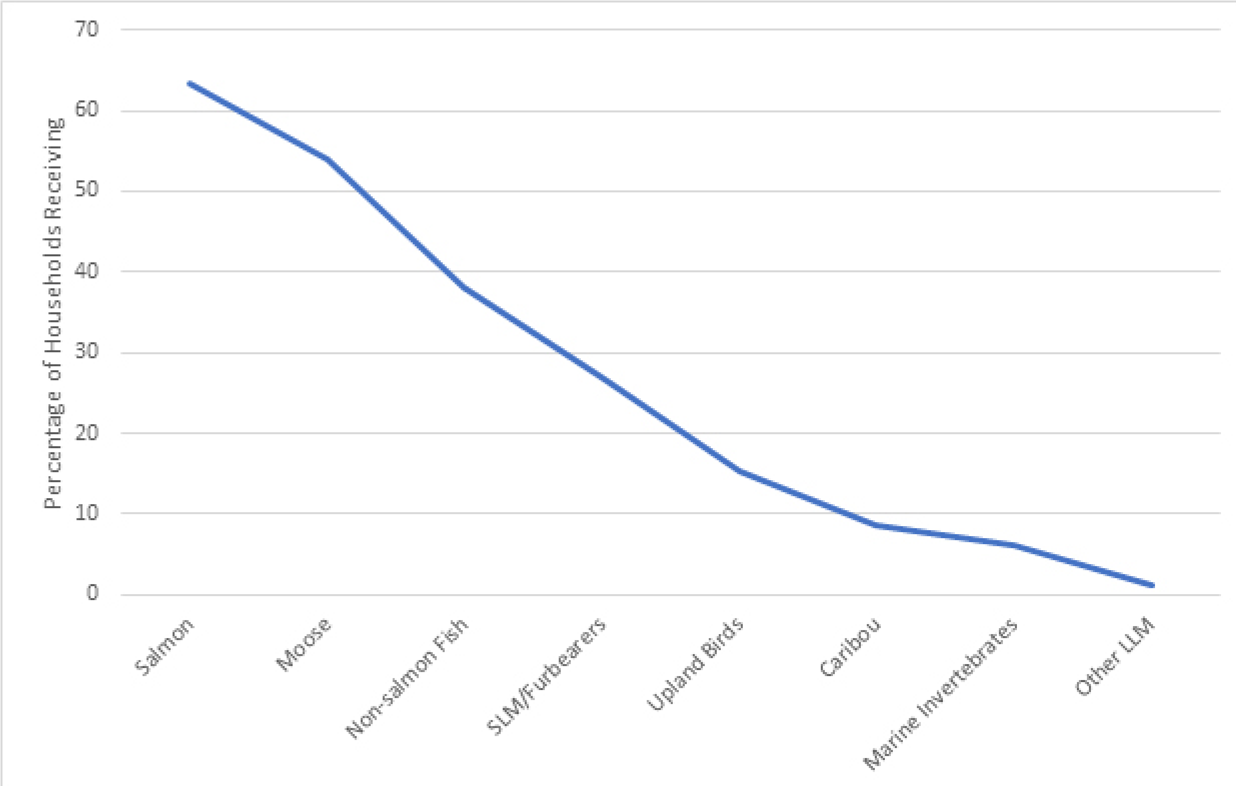

Figure 15. Percent of households receiving resources, Yukon River region communities

Source: See Table 2 for citations, time period, and resources addressed

Notes: Data represent the average percent of households across all available study years. Available study years for each community are as follows: Beaver (1984-85, 2000, 2005, 2008-09, 2009-10, 2010-11, 2011); Galena (1985-1986, 1996-97, 1997-98, 1998-99, 1999-00, 2001-02, 2002-03, 2006, 2010); Stevens Village (1983-84, 1996, 2008, 2008-09, 2009-10, 2010-11, 2014).

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Table 35. Average harvest and use data, top 5 species, Yukon River region communities

Community	Species	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% Total harvest
Beaver	Chum salmon	44	30	28	11	25	2,578	12,689	377	157	25.7
Beaver	Moose	33	27	12	12	28	10	5,927	277	90	25.1
Beaver	Chinook salmon	96	36	34	29	66	775	9,369	277	118	21.8
Beaver	Black bear	13	15	8	7	9	7	684	37	10	4.7
Beaver	White-fronted geese	56	52	52	25	8	390	1,213	33	15	4.4
Galena	Chum salmon	59	26	26	15	35	37,770	180,319	876	274	43.4
Galena	Moose	90	64	48	34	55	106	60,907	316	108	25.6
Galena	Chinook salmon	71	41	31	20	46	2,373	29,060	150	49	11.3
Galena	Coho salmon	13	11	11	8	1	1,092	5,775	37	14	5.4
Galena	Humpback whitefish	16	14	14	8	7	5,322	15,965	83	30	3.9
Rampart	Chum salmon	57	57	57	29	29	500	4,673	359	120	31.7
Rampart	Coho salmon	100	71	71	57	100	450	4,319	332	111	29.3
Rampart	Moose	86	57	57	43	86	4	4,011	309	103	27.2
Rampart	Humpback whitefish	43	43	43	29	14	90	501	39	13	3.4
Rampart	Burbot	71	71	71	29	43	53	236	18	6	1.6
Stevens Village	Chum salmon	50	50	47	25	0	6,927	27,583	1,241	438	65.1
Stevens Village	Chinook salmon	63	48	55	21	21	738	12,036	428	148	16.1
Stevens Village	Whitefish	39	39	51	22	2	940	2,186	100	36	6.4
Stevens Village	Moose	56	52	13	16	47	2	2,140	132	31	2.4
Stevens Village	Sheefish	32	32	37	23	1	87	575	29	11	2.4

Source: See Table 2 for citations, time period, and resources addressed
Notes: HH = households; N/A = Not available
Notes: Data represent the average across all available study years for comprehensive (i.e., all resources) household harvest surveys. Available study years for each community are as follows: Beaver (1984-85, 2000, 2005, 2008-09, 2009-10, 2010-11, 2011); Galena (1985-1986, 1996-97, 1997-98, 1998-99, 1999-00, 2001-02, 2002-03, 2006, 2010); Stevens Village (1983-84, 1996, 2008, 2008-09, 2009-10, 2010-11, 2014).

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5.5.3 Timing of Subsistence Activities

Data on the timing of subsistence activities for Yukon River study communities are provided in Table 36 This table shows the number of communities reporting subsistence activity or harvests within each month, based on the most recent data sources for each community. Overall, Yukon River communities target the greatest number of resources during September. In general, subsistence activities are at their highest between the spring months of April and May and late summer/fall months of August and September, with less activity in winter.

Spring (April–May) in the Yukon River Region is characterized by warming temperatures, breakup on the rivers, and lengthening days. Spring marks a decrease in seasonal harvests of furbearers and upland birds; however, it also marks the beginning of the waterfowl hunting season, as ducks and geese arrive in the area. Yukon River Region residents occasionally harvest small land mammals, including marten, hare, and beaver, in the springtime, but harvest by month data show harvests more commonly occurring over the winter months (Holen et al. 2012, Van Lanen et al. 2012). Fishing for non-salmon fish occurs in the region during the springtime, either through the ice or after breakup in the open water. The first salmon harvests may also occur in May. Harvests of caribou and bear may also occur in the springtime in a number of communities.

During summer (June–August) residents of the Yukon River Region focus on fishing and collecting plants and berries. Salmon harvesting is a strong focus of certain communities, including Beaver, Rampart, and Stevens Village. Non-salmon fish harvesting also occurs throughout most of the year. Berries are a particularly important resource in the region; they are among the highest- used resources (in terms of the percentage of households using) in many of the communities (Holen et al. 2012). Most large land mammal subsistence activity, more commonly a fall activity, occurs at the end of the summer in August, though communities may take moose or bear year-round. Following spring caribou hunting, residents resume caribou harvesting in August and continue into November. Harvests of waterfowl occur during the summer months, although harvesting decreases during the July nesting and rearing period.

Many subsistence activities which occur over the summer, including fishing, waterfowl hunting, and large land mammal hunting, continue or amplify during the fall (September–October). Moose harvests occur throughout the year but most commonly in the month of September. Bear harvests continue in early fall and berry picking may also continue from the summer into the early fall. Fall in the Yukon River Region marks the end of waterfowl subsistence activity and increased focus on upland birds, such as grouse and ptarmigan. Wood is collected beginning in the fall and is a particularly important resource to prepare for heating through the upcoming winter.

During the winter season (November–March), focus shifts to harvests of small land mammals and furbearers as watersheds freeze over creating conditions for travel to trapping grounds. Pelts of the small mammals and furbearers are prime over the winter season and residents of the region hunt or trap for the pelts and/or meat of small mammals for subsistence purposes. Large land mammal harvests, including caribou, moose, and bears in early winter, occur over the winter months although moose and bear harvests occur with more frequency during other seasons. Ice fishing for non-salmon fish occurs during the early winter months. Residents of the Yukon River Region harvest upland birds throughout the winter and into the spring as the annual cycle of subsistence activities begins again.

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Table 36. Yukon River region timing of subsistence activities, number of communities reporting subsistence activity

Resources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon fish	N/A	N/A	3	3	4	4	4	4	4	4	4	1
Salmon	N/A	N/A	N/A	N/A	2	3	3	3	3	2	N/A	N/A
Caribou	N/A	N/A	N/A	1	1	N/A	N/A	1	1	1	1	N/A
Moose	3	3	3	3	3	3	3	3	3	3	3	3
Bear	1	1	1	3	4	3	3	3	3	3	2	1
Furbearers	1	2	1	1		N/A	N/A	N/A	N/A	N/A	1	1
Small land mammals	2	2	2	2	2	2	2	2	2	2	2	2
Upland birds	3	3	3	3	2	2	2	2	3	3	3	3
Waterfowl	N/A	N/A	N/A	2	3	3	2	3	3		N/A	N/A
Eggs	N/A	N/A	N/A	N/A	N/A	2	3	3	3	N/A	N/A	N/A
Plants and berries	2	2	2	2	1	N/A	N/A	N/A	1	2	2	2
Wood	N/A	N/A	3	3	4	4	4	4	4	4	4	1
Total number of resources per month	**6**	**6**	**7**	**9**	**9**	**8**	**8**	**9**	**10**	**8**	**8**	**7**

Source: Andersen et al. 2001; Betts 1997; Brown et al. 2010; Brown et al. 2016; Sumida 1988; Holen et al. 2012; SRB&A 2007; Stevens; Maracle n.d.
Notes: Apr = April; Aug = August; Dec = December; Feb = February; Mar = March; Jan = January; Jul = July; Jun = June; N/A = Not applicable (no or limited subsistence activity); Nov = November; Oct = October; Sep = September
Yukon River Region Communities = 5 (Beaver, Galena, Livengood, Rampart, and Stevens Village)
Each cell contains the number of communities reporting subsistence activity or harvests during each month, based on the most recent data source for each community. Months with only one community report harvests or activity are not included in the table. Resources with no subsistence activity data available are not included in the table. No timing data exist for Livengood.

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5.5.4 Travel Method

A recent subsistence mapping study (SRB&A 2016a) collected data on travel methods one of the Yukon River study communities (Stevens Village). In addition, previous research has documented travel methods and routes for Beaver (SRB&A 2007). For Stevens Village, the data show that a majority of use areas are accessed by boat with a much smaller percentage accessed by snowmachine, truck/car, or foot. Many use areas are accessible directly from the community. Primary travel methods used to search for resources within use areas are boat, snowmachine, with lesser use of foot and ATV (SRB&A 2016a). Based on SRB&A (2007), the community of Beaver accesses the highest percentage of their use areas by boat (51 percent), followed by snowmachine (33 percent), four-wheeler (15 percent), and foot (10 percent). Travel routes for Beaver occur along the Yukon River and overland alongside the Yukon River between the community and Stevens Village (SRB&A 2007).

5.5.5 Resource Importance

The relative importance of subsistence resources to the individual Yukon River Region study communities, based on selected variables, is provided in Table 37 through Table 40 (see Section 4.3 for discussion of methods). Based on this analysis, moose, salmon, and vegetation are of high importance in all Yukon River Region study communities. Other resources of high importance in Yukon River Region study communities include migratory birds (two study communities), non-salmon fish (two study communities), and small land mammals (one study community). Marine mammals are of moderate importance in several study communities due to sharing and distribution networks from coastal communities; upland birds are also of moderate importance.

Table 37. Relative importance of subsistence resources based on selected variables, Beaver

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	27	28	25	H
2	Caribou	2	N/A	N/A	L
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	3	M
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/furbearers	64	31	5	H
7	Marine mammals	N/A	4	N/A	L
8	Migratory birds	78	41	6	H
9	Upland birds	53	19	0.4	M
10	Bird eggs	4	N/A	N/A	L
11	Salmon	41	68	50	H
12	Non-salmon fish	56	38	7	M
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	84	56	N/A	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 38. Relative importance of subsistence resources based on selected variables, Galena

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	64	55	26	H
2	Caribou	5	10	1	L
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	1	L
5	Other large land mammals	1	1	0.3	L
6	Small land mammals/furbearers	29	23	2	M
7	Marine mammals	N/A	10	N/A	L
8	Migratory birds	30	19	1	M
9	Upland birds	49	9	1	M
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	49	56	58	H
12	Non-salmon fish	48	38	10	H
13	Marine invertebrates	3	6	0.1	L
14	Vegetation	79	19	1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 39. Relative importance of subsistence resources based on selected variables, Rampart

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	57	86	27	H
2	Caribou	N/A	14	N/A	L
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	N/A	I
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/furbearers	57	29	1	M
7	Marine mammals	N/A	57	N/A	M
8	Migratory birds	43	57	2	M
9	Upland birds	29	29	0.2	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	71	100	61	H
12	Non-salmon fish	86	71	8	H
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	57	86	0.2	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

Table 40. Relative importance of subsistence resources based on selected variables, Stevens Village

Number	Resource	% of HH trying	% of HHs receiving	% of total harvest	Final resource importance evaluation
1	Moose	52	47	2	H
2	Caribou	N/A	2	N/A	L
3	Dall sheep	N/A	N/A	N/A	I
4	Bear	N/A	N/A	0.4	L
5	Other large land mammals	N/A	N/A	N/A	I
6	Small land mammals/furbearers	50	25	3	M
7	Marine mammals	N/A	25	N/A	M
8	Migratory birds	75	23	1	H
9	Upland birds	25	5	0.2	L
10	Bird eggs	N/A	N/A	N/A	I
11	Salmon	61	29	81	H
12	Non-salmon fish	50	5	11	M
13	Marine invertebrates	N/A	N/A	N/A	I
14	Vegetation	75	25	1	H

Source: See Table 2
Notes: H = High; HH = Households; I = Indeterminate; L = Low; M = Moderate; N/A = Not Available

5.6. Subsistence Uses of the Western Arctic Herd

Table 41 provides caribou use and harvest averages across all available study years for the 42 caribou study communities listed in Table 1 and shown on Map 1. The 42 caribou study communities are members of the WAHWG and are subsistence users of the WAH. Caribou is a key subsistence resource for many of the WAHWG study communities. With few exceptions, use of caribou among the 42 study communities is high, with over 50 percent of households in 30 of the 42 study communities using caribou. The contribution of caribou toward the total subsistence harvest is highest in the communities of Anaktuvuk Pass, Ambler, Shungnak, Deering, Koyuk, Noatak, and Buckland. Caribou contributes an average of at least one-third of the total harvest in those communities. Caribou sharing ranges widely, with between 2 and 71 percent of WAHWG households giving caribou, and between 3 and 84 percent receiving caribou. On average, caribou contribute approximately 25 percent toward the total harvest for the study communities. Nearly half of households (48 percent) participate in caribou hunting, and residents harvest an average of 101 pounds of caribou annually.

Some of the caribou study communities with the highest average per capita harvests are those with use areas overlapping or close to the project area. These include Ambler, Buckland, Shungnak, Anaktuvuk Pass, Noorvik, Selawik, Noatak, and Kiana. Other caribou study communities with high average per capita harvests (over 100 pounds) include Kobuk, Kivalina, Deering, Wainwright, Atqasuk, Nuiqsut, Point Lay, and Koyuk. Several of these communities, including Anaktuvuk Pass and Nuiqsut, rely more heavily on other caribou herds such as the Teshekpuk Herd (TH) and Central Arctic Herd (CAH). While harvest data are only available for a limited number of study years for each community and therefore may not capture wide variations in annual harvests, review of individual study years suggest declining caribou harvests in several study communities. These include Elim, Kivalina, Kobuk, Kotzebue, Noatak, Selawik, and Shungnak. Thus, a number of study communities in the western portion of the project area may have experienced declines in caribou harvests in recent years. In contrast, several communities have seen a recent increase in caribou harvests in recent years, including Allakaket, Ambler, Deering, Hughes (based on two data points), Shishmaref, and Wainwright (based on two data points). A decline in resource harvests does not necessarily equate to a decline in resource dependence. Harvest declines could be a result of changes which are out of a community's control, such as the availability of caribou within communities' traditional harvesting areas; ability to access caribou herds due to increasing gas prices; and changes in the timing of the fall caribou migration (Watson 2018). Many communities that are located within the current "peripheral" range of the WAH were established in their present-day locations because of their proximity to key subsistence resources, including caribou. The centralization of previously semi-nomadic peoples reduced their ability to adapt to the changing distribution and migration patterns of the WAH and other caribou herds. Strong sharing networks between communities and regions ensure that residents of the study communities continue to receive and consume caribou, and the resource remains culturally important to all study communities regardless of current harvest levels. These networks extend from the study communities to other communities and regions throughout the state of Alaska.

Table 41. Caribou subsistence harvest and use data, caribou study communities

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Allakaket	1981–82	N/A	N/A	6	N/A	6	6	724	19	5	0.5
Allakaket	1982–83	N/A	N/A	0	N/A	N/A	0	0	0	0	0.0
Allakaket	1983–84	N/A	N/A	4	N/A	N/A	4	471	8	3	0.4
Allakaket	1997	42	15	6	10	39	11	1,375	25	8	N/A
Allakaket	1998	100	55	26	20	86	43	5,623	92	29	N/A
Allakaket	1999	93	34	12	15	86	13	1,719	29	10	N/A
Allakaket	2001	21	7	7	3	15	9	1,170	19	7	N/A
Allakaket	2002–03	96	68	44	32	68	106	13,728	312	53	N/A
Allakaket	2011	76	48	33	48	62	95	12,350	217	84	16.0
Allakaket	Average	72	38	15	21	52	32	4,129	80	22	4.2
Ambler	2003	95	74	69	53	50	325	44,237	660	176	N/A
Ambler	2009	78	78	76	52	44	456	61,962	925	260	N/A
Ambler	2012	91	70	62	62	60	685	93,220	1,227	330	54.6
Ambler	Average	88	74	69	56	51	489	66,473	937	255	54.6
Anaktuvuk Pass	1990–91	N/A	N/A	55	N/A	N/A	592	69,964	985	223	N/A
Anaktuvuk Pass	1991–92	N/A	N/A	51	N/A	N/A	545	66,712	940	245	N/A
Anaktuvuk Pass	1992	N/A	74	N/A	N/A	N/A	600	70,222	889	260	82.6
Anaktuvuk Pass	1993–94	N/A	N/A	43	N/A	N/A	574	67,713	846	219	N/A
Anaktuvuk Pass	1994–95	N/A	N/A	N/A	N/A	N/A	322	43,846	516	153	83.5
Anaktuvuk Pass	1996–97	N/A	N/A	N/A	N/A	N/A	210	28,587	362	93	90.5
Anaktuvuk Pass	1998–99	N/A	N/A	N/A	N/A	N/A	500	68,000	756	220	91.3
Anaktuvuk Pass	1999–00	N/A	N/A	N/A	N/A	N/A	329	44,785	560	143	89.6
Anaktuvuk Pass	2000–01	N/A	N/A	N/A	N/A	N/A	732	99,579	1,071	353	90.8
Anaktuvuk Pass	2001–02	N/A	N/A	N/A	N/A	N/A	271	36,910	415	122	78.2
Anaktuvuk Pass	2002–03	N/A	N/A	N/A	N/A	N/A	436	59,310	666	193	92.2
Anaktuvuk Pass	2006–07	92	61	53	47	63	696	81,490	1,000	299	N/A

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Anaktuvuk Pass	2011	95	63	53	52	73	616	77,706	914	251	79.2
Anaktuvuk Pass	2014	89	45	40	47	68	770	104,664	1,057	330	84.2
Anaktuvuk Pass	Average	92	61	49	49	68	514	65,678	784	222	86.2
Atqasuk	1994	N/A	N/A	N/A	N/A	N/A	282	38,352	685	167	61.7
Atqasuk	1996	N/A	N/A	N/A	N/A	N/A	398	54,182	860	241	65.0
Atqasuk	1997	N/A	N/A	N/A	N/A	N/A	266	36,176	613	152	65.3
Atqasuk	2003	93	66	61	66	66	189	N/A	N/A	N/A	N/A
Atqasuk	2004	100	79	79	69	74	314	N/A	N/A	N/A	N/A
Atqasuk	2005	96	70	59	74	63	203	N/A	N/A	N/A	N/A
Atqasuk	2006	95	67	60	76	57	170	N/A	N/A	N/A	N/A
Atqasuk	Average	96	70	65	71	65	260	42,903	719	187	64.0
Bettles	1982	N/A	N/A	0	N/A	0	14	1,788	72	28	10.6
Bettles	1983	N/A	N/A	10	N/A	N/A	5	644	25	8	4.4
Bettles	1984	N/A	N/A	6	N/A	N/A	3	451	12	5	4.4
Bettles	1998	60	40	40	60	20	25	3,276	364	107	N/A
Bettles	1999	67	44	44	33	33	21	2,773	173	52	N/A
Bettles	2002	58	8	0	12	58	0	0	0	0	N/A
Bettles	2011	63	25	25	25	50	6	780	98	65	37.1
Bettles	Average	62	29	18	32	32	11	1,387	106	38	14.1
Brevig Mission	1984	18	N/A	0	7	18	N/A	N/A	N/A	N/A	N/A
Brevig Mission	1989	27	0	0	0	27	0	0	0	0	0.0
Brevig Mission	2000	85	24	20	29	71	76	10,369	153	35	N/A
Brevig Mission	2005	16	15	15	13	8	43	5,835	83	18	N/A
Brevig Mission	2015–16	92	29	19	31	78	65	8,840	136	45	N/A
Brevig Mission	Average	47	17	11	16	40	46	6,261	93	24	0.0
Buckland	2003	86	61	58	54	48	637	86,660	985	212	38.3
Buckland	2005	99	86	83	72	81	693	94,217	942	179	N/A
Buckland	2009	67	67	64	46	44	535	72,797	818	168	N/A

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Buckland	2016-17	99	86	83	72	81	693	94,217	942	179	N/A
Buckland	Average	88	75	72	61	63	639	86,973	922	184	38.3
Deering	1994	78	57	54	43	57	142	19,246	437	131	19.4
Deering	2007	87	55	45	55	74	182	24,743	526	162	N/A
Deering	2013	100	44	38	56	72	404	54,978	1,250	430	64.8
Deering	Average	88	52	46	51	68	243	32,989	738	241	42.1
Elim	1999	96	70	66	60	81	227	30,817	380	99	N/A
Elim	2005	96	79	58	65	85	150	20,421	319	77	N/A
Elim	2010	85	39	28	42	66	83	11,294	128	35	N/A
Elim	Average	92	63	51	56	77	153	20,844	276	70	N/A
Galena	1985	34	10	7	7	28	40	8,383	40	12	1.5
Galena	1996	12	10	10	8	4	40	5,224	29	10	N/A
Galena	1997	16	7	6	8	12	39	5,008	27	9	N/A
Galena	1998	15	4	3	4	12	7	936	5	2	N/A
Galena	1999	9	2	2	2	8	8	999	5	2	N/A
Galena	2001	5	0	0	0	5	0	0	0	0	N/A
Galena	2002	6	2	2	2	4	8	1,091	5	2	N/A
Galena	2010	8	3	1	1	6	6	770	5	2	0.7
Galena	Average	13	5	4	4	10	18	2,801	15	5	1.1
Hughes	1982	N/A	N/A	0	N/A	21	0	0	0	0	0.0
Hughes	2014	31	27	12	4	15	21	2,720	80	30	8.4
Hughes	Average	31	27	6	4	18	10	1,360	40	15	4.2
Huslia	1983	N/A	N/A	25	23	18	53	6,880	121	36	3.3
Huslia	1997	47	21	16	14	31	56	7,343	94	34	N/A
Huslia	1998	97	65	58	42	40	264	34,320	429	140	N/A
Huslia	1999	81	33	30	18	51	78	10,152	124	40	N/A
Huslia	2002	75	42	35	19	50	82	10,703	141	49	N/A
Huslia	Average	75	40	33	23	38	107	13,880	182	60	3.3

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Kaltag	1996	30	17	11	13	23	16	2,095	34	9	N/A
Kaltag	1997	20	4	4	7	18	8	1,075	17	4	N/A
Kaltag	1998	19	10	9	7	10	6	807	13	4	N/A
Kaltag	2001	2	0	0	0	2	0	0	0	0	N/A
Kaltag	2002	0	0	0	0	0	0	0	0	0	N/A
Kaltag	Average	14	6	5	5	10	6	795	13	3	N/A
Kiana	1999	97	68	65	52	75	488	66,316	691	174	N/A
Kiana	2006	94	62	57	N/A	N/A	306	41,612	438	109	31.2
Kiana	2009	77	80	75	54	55	414	56,337	547	149	N/A
Kiana	Average	89	70	66	53	65	403	54,755	559	144	31.2
Kivalina	1964	N/A	N/A	N/A	N/A	N/A	256	36,338	1,398	209	15.6
Kivalina	1965	N/A	N/A	N/A	N/A	N/A	1010	144,434	5,555	830	53.6
Kivalina	1982	N/A	N/A	N/A	N/A	N/A	346	48,202	1,026	179	22.9
Kivalina	1983	N/A	N/A	N/A	N/A	N/A	564	76,652	1,631	284	30.2
Kivalina	1992	97	77	74	53	68	351	47,539	660	138	18.2
Kivalina	2007	93	64	64	67	69	268	36,458	450	85	13.9
Kivalina	2010	79	67	29	51	73	86	11,657	130	32	N/A
Kivalina	Average	90	69	56	57	70	412	57,326	1,550	251	25.7
Kobuk	2004	89	82	61	46	64	134	18,224	651	148	N/A
Kobuk	2009	86	86	82	68	50	210	28,531	865	194	N/A
Kobuk	2012	93	67	57	57	73	119	16,173	449	98	31.8
Kobuk	Average	89	78	66	57	63	154	20,976	655	147	31.8
Kotlik	1980	N/A	N/A	7	N/A	N/A	8	1,600	29	4	N/A
Kotlik	Average	N/A	N/A	7	N/A	N/A	8	1,600	29	4	N/A
Kotzebue	1986	88	50	45	40	58	1917	260,645	341	97	24.4
Kotzebue	1991	93	70	63	59	62	3782	514,362	636	141	23.8
Kotzebue	2012	82	44	39	49	59	1804	245,287	301	80	N/A
Kotzebue	2013	84	43	34	42	71	1680	228,438	274	75	N/A

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Kotzebue	2014	84	39	29	47	72	1286	174,823	212	59	28.8
Kotzebue	Average	86	49	42	47	64	2094	284,711	353	90	25.7
Koyuk	1998	97	66	59	53	64	263	35,799	484	129	N/A
Koyuk	2004	97	77	72	72	72	425	57,737	671	153	N/A
Koyuk	2005	89	51	46	36	67	143	19,424	221	58	N/A
Koyuk	2006	N/A	N/A	N/A	N/A	N/A	447	60,759	683	168	40.0
Koyuk	2010	95	72	47	48	53	184	24,990	312	84	N/A
Koyuk	2016-17	89	51	46	36	67	143	19,424	221	58	N/A
Koyuk	Average	93	63	54	49	65	267	36,355	432	108	40.0
Noatak	1994	84	84	91	71	50	615	996	83,664	221	47.8
Noatak	1999	95.6	74.4	72	61.1	62.2	683	92,902	938	224	N/A
Noatak	2002	91	76	71	61	64	410	55,733	552	120	N/A
Noatak	2007	97	73	66	78	88	442	60,061	505	114	31.4
Noatak	2010	56	21	21	4	45	66	8,937	78	16	N/A
Noatak	2010–1	95	62	50	51	78	360	48,918	391	90	N/A
Noatak	2016–17	96	70	51	56	84	337	45,783	358	80	N/A
Noatak	Average	88	66	60	54	67	416	44,761	12,355	124	39.6
Noorvik	2002	95	72	71	60	59	988	134,373	873	182	N/A
Noorvik	2008	94	70	70	37	56	767	104,289	724	174	N/A
Noorvik	2012	95	60	59	47	65	851	115,758	857	198	32.8
Noorvik	Average	95	67	67	48	60	869	118,140	818	184	32.8
Nuiqsut	1985	98	90	90	80	60	513	60,021	790	150	37.5
Nuiqsut	1992	N/A	81	N/A	N/A	N/A	278	32,551	N/A	N/A	21.7
Nuiqsut	1993	98	74	74	79	79	672	82,169	903	228	30.7
Nuiqsut	1994–95	N/A	N/A	N/A	N/A	N/A	258	30,186	N/A	N/A	36.3
Nuiqsut	1995–96	N/A	N/A	N/A	N/A	N/A	362	42,354	N/A	N/A	23.1
Nuiqsut	2000–01	N/A	N/A	N/A	N/A	N/A	496	57,985	N/A	N/A	31.6

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Nuiqsut	2002–03	95	47	45	49	80	397	N/A	N/A	118	N/A
Nuiqsut	2003–04	97	74	70	81	81	564	N/A	N/A	157	N/A
Nuiqsut	2004–05	99	62	61	81	96	546	N/A	N/A	147	N/A
Nuiqsut	2005–06	100	60	59	97	96	363	N/A	N/A	102	N/A
Nuiqsut	2006–07	97	77	74	66	69	475	N/A	N/A	143	N/A
Nuiqsut	2010	94	86	76	N/A	N/A	471	55,107	593	N/A	N/A
Nuiqsut	2011	92	70	56	49	58	498	58,226	619	134	N/A
Nuiqsut	2012	99	68	62	65	79	501	58,617	598	147	N/A
Nuiqsut	2013	95	79	63	62	75	586	68,534	692	166	N/A
Nuiqsut	2014	90	66	64	67	59	774	105,193	974	253	N/A
Nuiqsut	2015	96	84	78	74	72	628	73,527	728	180	N/A
Nuiqsut	2016	96	76	67	79	81	481	56,277	592	132	N/A
Nuiqsut	2014	90	66	64	59	67	774	105,193	974	253	28.3
Nuiqsut	Average	96	72	67	71	75	507	63,281	746	165	29.9
Nulato	1996	7	5	5	5	4	13	1,642	18	5	N/A
Nulato	1997	6	4	2	2	4	3	407	5	1	N/A
Nulato	1998	9	8	6	5	6	5	711	10	3	N/A
Nulato	2001	1	0	0	0	1	0	0	0	0	N/A
Nulato	2010	2	0	0	0	2	0	0	0	0	0.0
Nulato	Average	5	3	3	2	3	4	552	7	2	0.0
Point Hope	2014	91	53	30	51	80	185	25,156	143	34	7.6
Point Hope	2015	N/A	56	N/A	N/A	N/A	422	49,374	N/A	N/A	N/A
Point Hope	Average	91	53	30	51	80	185	25,156	143	34	7.6
Point Lay	1987	94	72	72	63	73	157	18,418	428	153	17.2
Point Lay	1994	N/A	N/A	N/A	N/A	N/A	223	30,260	522	171	31.3
Point Lay	2002	N/A	N/A	N/A	N/A	N/A	154	20,944	322	85	22.1
Point Lay	2012	93	64	60	71	76	356	48,380	705	186	31.3

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Point Lay	2015	N/A	63	N/A	N/A	N/A	224	N/A	N/A	N/A	N/A
Point Lay	Average	94	66	66	67	75	223	29,501	494	149	25.5
Selawik	1999	97	61	61	75	84	1289	175,335	1,124	249	N/A
Selawik	2006	N/A	65	63	N/A	N/A	934	127,120	757	165	N/A
Selawik	2011	97	70	54	59	80	683	92,947	550	109	20.4
Selawik	Average	97	65	59	67	82	969	131,801	810	174	20.4
Shaktoolik	1998	94	59	53	51	88	167	22,699	405	97	N/A
Shaktoolik	1999	94	47	45	29	78	125	16,992	288	73	N/A
Shaktoolik	2003	98	58	58	56	77	198	26,991	450	122	N/A
Shaktoolik	2009	51	51	47	35	25	133	18,100	302	81	N/A
Shaktoolik	Average	84	54	51	43	67	156	21,196	361	93	N/A
Shishmaref	1982	N/A	12	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shishmaref	1989	48	19	19	19	38	197	26,747	227	57	N/A
Shishmaref	1995	78	33	31	56	67	342	46,542	332	83	10.5
Shishmaref	2000	85	39	34	36	69	299	40,651	271	73	N/A
Shishmaref	2009	72	72	65	55	52	339	46,049	374	81	N/A
Shishmaref	2014	92	51	47	57	69	487	66,197	473	107	17.0
Shishmaref	Average	75	38	35	44	59	333	45,237	335	80	13.7
St. Michael	2003	68	29	18	16	57	48	6,460	68	16	N/A
St. Michael	2006	N/A	N/A	N/A	N/A	N/A	17	2,366	25	5	N/A
St. Michael	Average	68	29	18	16	57	33	4,413	47	10	N/A
Stebbins	2013	9	3	3	3	6	26	3,482	26	6	1.8
Stebbins	2006	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A
Stebbins	2002	5	6	0	0	5	0	0	0	0	N/A
Stebbins	1980	N/A	N/A	0	N/A	N/A	0	0	0	0	0.0
Stebbins	Average	7	5	1	2	5	9	1,161	9	2	0.9
Teller	2000	59	8	6	6	54	21	2,823	40	12	N/A
Teller	2005	9	0	0	0	9	0	N/A	0	0	N/A

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Teller	2006	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A
Teller	2015–16	47	18	17	13	39	29	3,944	51	16	N/A
Teller	Average	34	4	3	3	32	11	2,823	20	6	N/A
Unalakleet	2002	78	20	15	15	66	167	22,741	96	30	N/A
Unalakleet	2004	88	63	59	50	62	723	98,348	477	140	N/A
Unalakleet	2006	N/A	N/A	N/A	N/A	N/A	554	75,314	378	108	N/A
Unalakleet	Average	83	42	37	32	64	481	65,468	317	93	N/A
Utqiagvik	1987	N/A	N/A	26	N/A	N/A	1595	186,669	199	62	30.1
Utqiagvik	1988	N/A	N/A	27	N/A	N/A	1533	179,314	191	59	29.2
Utqiagvik	1989	N/A	N/A	39	N/A	N/A	1656	193,744	207	64	22.2
Utqiagvik	1992	N/A	46	N/A	N/A	N/A	1993	233,206	N/A	N/A	17.1
Utqiagvik	1995–96	N/A	N/A	N/A	N/A	N/A	2155	293,094	N/A	N/A	24.5
Utqiagvik	1996–97	N/A	N/A	N/A	N/A	N/A	1158	157,420	N/A	N/A	13.3
Utqiagvik	2000	N/A	N/A	N/A	N/A	N/A	3359	456,851	N/A	N/A	29.3
Utqiagvik	2001	N/A	N/A	N/A	N/A	N/A	1820	247,520	N/A	N/A	22.9
Utqiagvik	2002–03	92	61	55	80	78	5641	659,997	N/A	123	N/A
Utqiagvik	2003	N/A	N/A	N/A	N/A	N/A	2092	284,444	N/A	N/A	22.8
Utqiagvik	2003–04	87	52	45	73	69	3548	415,116	N/A	82	N/A
Utqiagvik	2004–05	85	51	48	62	64	4338	507,546	N/A	94	N/A
Utqiagvik	2005–06	90	50	47	81	78	4535	530,595	N/A	103	N/A
Utqiagvik	2006–07	92	65	59	65	70	5380	629,460	N/A	111	N/A
Utqiagvik	2014	70	38	33	38	52	4323	587,897	371	111	30.6
Utqiagvik	Average	86	52	42	67	68	3008	370,858	242	90	24.2
Wainwright	1989	N/A	N/A	66	N/A	N/A	711	83,187	699	178	23.7
Wainwright	2009	97	64	61	62	84	1231	167,356	1,073	284	41.7
Wainwright	Average	97	64	64	62	84	971	125,271	886	231	32.7
Wales	1993	24	7	2	5	21	4	486	10	3	0.4

Study community	Study year	% of HH using	% of HH trying	% of HH harvesting	% of HH giving	% of HH receiving	Estimated number harvested	Estimated total pounds	Estimated mean HH pounds	Estimated per capita pounds	% of total harvest
Wales	2000	21	2	0	7	23	0	0	0	0	N/A
Wales	2010	13	0	0	3	13	0	0	0	0	N/A
Wales	Average	19	3	1	5	19	1	162	3	1	0.4
White Mountain	1999	65	36	33	29	42	93	12,654	183	60	N/A
White Mountain	2006	80	29	20	20	69	50	6825	114	35	8.8
White Mountain	2008	85	46	33	34	70	99	13,477	207	69	N/A
White Mountain	2015-16	92	29	19	31	78	65	8,840	136	45	N/A
White Mountain	Average	80	35	26	28	65	77	10449	160	52	8.8
Wiseman	1991	N/A	N/A	N/A	N/A	N/A	10	1,260	N/A	N/A	28.2
Wiseman	2011	80	80	60	60	20	4	520	104	40	13.6
Wiseman	Average	80	80	60	60	20	7	890	104	40	20.9
All Communities	Average	72	46	38	39	53	352	47,201	703	98	26.5

Source: See Table 2
Notes: HH = Households; N/A = Not available
Harvest data not available for Livengood, Fairbanks, and Koyukuk.

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6. Potential Impacts of Proposed Project to Subsistence Uses

6.1. Impact Methods

The potential impacts of the AMDIAR to subsistence uses are discussed under two primary headings: 1) Road Impacts and 2) Other Indirect and Cumulative Impacts/Indirect and Cumulative Impacts of Growth. The first section, Road Impacts, discusses the direct and indirect impacts of construction and operation of the Ambler Road. This section does not address potential impacts from development and activities that will result from operation of the road. The second section, Other Indirect and Cumulative Impacts/Indirect and Cumulative Impacts of Growth, addresses potential impacts associated with future mining development scenarios (facilitating access to the Ambler Mining District is a primary purpose of the road), in combination with other past, present, and reasonably foreseeable actions in the region.

The proposed subsistence impact analysis approach is organized as follows:

- Identify Potential Impact Categories
- Identify Impact Indicators
- Analyze Potential Impacts of the Road on Subsistence Uses
- Summarize Impact Indicators
- Discuss Other Indirect and Cumulative Impacts/Indirect and Cumulative Impacts of Growth

6.2. Impact Categories

Under both Construction and Operation headings, impacts are discussed under the following three subsistence impact categories:

1. Resource Abundance – Successful subsistence harvests depend on an adequate number of animals being available for harvest within a reasonable distance from one's community. While overall population levels within a region may appear stable, if a resource experiences a decline within a community's harvesting area (e.g., within a specific stream used commonly by the community) due to direct mortality or decreased egg or calf survival rates in the area, this would indicate a decrease in resource abundance for that community for that resource. While this section references the conclusions of the wildlife chapters in regards to potential population-level effects, more localized effects from a biological perspective may still affect resource abundance for an individual subsistence community.
2. Resource Availability - Successful subsistence harvests depend on continued availability of resources, of adequate quality and health, in traditional use areas. Subsistence availability can be affected by changes in resource health, resource displacement from traditional harvest locations due to altered distribution or migration, or resource contamination (including actual and/or perceived contamination of resources and habitat or habituation of resources to development activities). Similar to resource abundance, while this section references the conclusions of the wildlife chapters in regards to disturbance or displacement of subsistence resources, impacts which may be minimal from a biological perspective may have larger effects on individual subsistence users, and these impacts are also discussed under Resource Availability.
3. User Access - Successful subsistence harvests depend on continued access to subsistence resources and use areas without physical, regulatory, or social barriers. Avoidance of an area due to

development activities, infrastructure, concerns over contamination and other project related reasons is also an impact to user access. Access could be negatively affected or enhanced by a project.

Competition, Costs and Time, and Culture are also categories of impacts and often occur as a result of changes in the above three categories of abundance, availability, or access. For example, changes in access can result in changes in harvester competition for resources. Increased access to an area may result in more competition for resources from outsiders and/or from community or nearby community residents who did not previously use the area. Other aspects of a project may result in increased or decreased competition between communities, within a community, or between local hunters and outsiders. Displacement of resources, resource population decline, competition, and economic changes (e.g., income changes, changes in employment levels) can also affect costs and effort associated with subsistence harvest activities. Harvest activity costs are often directly related to distance traveled, in addition to other factors (e.g., gas prices, time spent away from home). Indirect effects of increased travel distances or time required to locate and harvest subsistence resources include increased safety risks. Finally, disruption of harvest activities can also disrupt learning and transmission of subsistence skills, which are key components of Alaska Native cultural identity. Harvesting activities, including distribution and processing of harvest products, foster and maintain social ties that are also important to overall wellbeing. Disruption of harvest activities can weaken those social ties by reducing social interactions. In addition, satisfaction that comes from eating traditional foods is also important to overall wellbeing, and disruptions to harvests of resources can affect the ability to consume subsistence foods. Other potential impacts to culture include avoidance of traditional use areas, loss of the integrity of a culturally significant place, and decreased autonomy (i.e., control over traditional lands, tribal government, development activities). Impacts to competition, costs and time, and culture are identified under the abundance, availability, and user access headings where applicable, and summarized in a separate section following the discussions of impacts to resource abundance, resource availability, and user access.

6.3. Impact Indicators

The study team identified two primary impact indicators that could be quantitatively measured for the subsistence study communities. These indicators are 1) Resource Importance (discussed above under Section 4.3) and 2) Subsistence Use Areas. These impact indicators are based on NEPA guidance, which requires consideration of both context and intensity when assessing significant impacts (40 CFR 1508.27). By understanding the relative importance of each subsistence resource (i.e., Resource Importance) and the location of where these uses occur (i.e., Subsistence Use Areas), the study team can better analyze the context and intensity of impacts and which subsistence resources and activities are more vulnerable to impacts from the proposed Project.

This analysis assumes that if a project impact were to affect a resource of higher importance, then that effect would be of a greater intensity to a community compared to a similar effect to a resource of lesser importance. The rationale is based on the fact that resources of higher importance have a greater number of subsistence users who participate in the harvests of that resource, share the resource, or for which the resource contributes a higher amount to the overall subsistence diet.

Furthermore, communities whose use areas are located along the project alternative or whose use areas are bisected (e.g., intersecting in or near the middle of the use area) by the proposed Project would likely experience greater impacts versus those communities that are located farther away or only have a small portion of their use areas intersected by the proposed Project. The rationale that the intensity of an impact would be greater when the proposed Project bisects a community’s use area (versus on the periphery of a community’s use area) is based on an analysis of subsistence use area mapping studies that record the number of harvesters by use area (SRB&A 2013a, 2009b, a, 2007). These studies have shown that areas closest to the communities are generally used by more people than areas located farther from the community., Other studies have termed this use of an intensively used core area as a “central-based use area” pattern in which a core area surrounding the community supports most of the food production with larger, less frequently used subsistence use areas extending beyond the intensively-used core (Wolfe and Fischer 2003). The analysis for this report acknowledges exceptions can occur if the outer edge of a community’s use area is close to the community and limited by a regulatory boundary (e.g., community’s use along a National Park) or prominent natural feature (e.g., coastline or mountain range).

The goal of this approach to use key impact indicators (i.e., resource importance, subsistence use areas) is to rely on systematically collected quantitative data to reduce subjective impact assessments, to avoid broad generalities in those analyses in the final assessment, and to allow for replication of the findings in both the baseline and impact assessment analyses. This impact analysis is the product of years of SRB&A research and development of systematic, quantitative, and replicable impact assessment methods. Other examples of quantitative data that have been collected in other subsistence studies around the state, and which could be used as impact indicators in order to provide a more specific and focused impact assessment, include travel methods by use area (to inform user access impacts), overlapping subsistence use areas (to inform the number of subsistence users potentially affected and where), and timing of subsistence activities by use areas (to inform likelihood for potential direct impacts at same time and place). However, these data are not available or were not systematically documented in a quantitative method during past studies in the subsistence study communities in order for the study team to incorporate them into the impact analysis as impact indicators. Where applicable, they are discussed in qualitative terms.

6.4. Road Impacts

6.4.1 Impacts Common to All Alternatives

The following sections describe the potential impacts of the proposed Ambler Road which are common to all alternatives. Table 42 through Table 45 provides impact indicators and shows the number of communities whose subsistence use areas are crossed by one or more of the project alternatives, by subsistence resource. The table also shows the relative importance of each subsistence resource to each community, in terms of selected measures of material and cultural importance (see Resource Importance sections above). The project alternatives cross subsistence use areas for 16 of the 27 subsistence study communities. Subsistence use areas are most commonly crossed for small land mammals (15 communities), caribou/moose (12 communities each), and non-salmon fish/vegetation (10 communities each) (Table 45). Most of these resources (moose, caribou, vegetation, and non-salmon fish) are of high importance to a majority of potentially affected communities. In the case of small land mammals, these resources are generally of low to moderate resource importance to the study communities (see Table 42 through Table 44); while trapping and hunting of furbearers and small land mammals remains culturally important, these activities occur among a smaller subset of community harvesters and provide a minimal amount in terms of subsistence foods. The study communities with the highest numbers of resource uses crossed by the proposed project alternatives are Hughes, Kobuk, Shungnak, Allakaket, Ambler, Bettles, and Evansville (eight or more resources each out of 14 resource categories) (Table 42 through Table 44).

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Table 42. Use areas crossing project corridor and resource importance, by community, Alternative A

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Alatna	H[a]	M[a]	L[a]	L[a]	I[c]	M[b]	H[c]	H[b]	H[b]	I[c]	H[b]	M[b]	I[c]	H[b]	4
Allakaket	H[a]	H[a]	L[a]	L[a]	L[c]	M[b]	H[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	4
Ambler	M[a]	H[a]	L[b]	L[a]	L[c]	M[a]	H[b]	M[a]	M[b]	L[c]	H[a]	H[a]	L[c]	H[b]	7
Anaktuvuk Pass	M[b]	H[a]	M[b]	L[b]	L[c]	L[a]	H[c]	L[b]	L[b]	I[c]	M[b]	H[b]	I[c]	H[b]	2
Beaver	H[b]	L[b]	I[c]	M[b]	I[c]	H[b]	L[c]	H[b]	M[b]	L[b]	H[b]	M[b]	I[c]	H[b]	0
Bettles	H[a]	M[a]	L[a]	L[b]	I[c]	M[a]	I[c]	L[b]	L[a]	I[c]	M[a]	H[a]	I[c]	H[a]	8
Buckland	M[b]	H[b]	I[c]	L[b]	M[c]	L[b]	H[b]	M[b]	I[c]	M[b]	H[b]	H[b]	L[b]	H[b]	0
Coldfoot	L[a]	H[b]	I[b]	I[b]	I[c]	I[a]	I[c]	I[a]	L[a]	I[a]	L[b]	I[b]	I[c]	H[a]	6
Evansville	H[a]	H[a]	M[a]	L[b]	I[c]	L[a]	L[c]	L[a]	M[a]	I[c]	H[b]	H[a]	L[b]	H[a]	8
Galena	H[b]	L[c]	I[c]	L[c]	L[c]	M[b]	L[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	0
Hughes	H[b]	M[b]	I[a]	L[b]	I[c]	M[b]	M[c]	M[b]	M[b]	I[c]	H[b]	H[b]	I[c]	H[b]	1
Huslia	H[b]	M[b]	I[b]	L[b]	I[c]	M[b]	I[c]	M[b]	L[b]	I[c]	H[b]	H[b]	I[c]	L[b]	0
Kiana	M[b]	H[c]	L[b]	I[b]	I[c]	L[b]	M[b]	M[b]	L[c]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Kobuk	M[a]	H[a]	I[b]	L[a]	I[c]	L[a]	H[b]	M[a]	M[b]	I[c]	H[b]	H[b]	I[c]	H[a]	6
Kotzebue	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[b]	H[b]	0
Livengood	I[c]	I[c]	I[c]	I[b]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	0
Manley Hot Springs	M[b]	L[c]	I[c]	L[b]	I[c]	L[b]	I[c]	L[b]	M[b]	L[c]	H[b]	M[b]	L[c]	H[c]	0
Minto	H[b]	L[b]	L[c]	L[b]	I[c]	M[b]	I[c]	H[b]	M[b]	L[b]	H[b]	M[b]	L[c]	H[b]	0
Nenana	H[b]	L[b]	L[b]	I[b]	I[c]	L[b]	I[c]	I[b]	H[b]	I[b]	H[b]	H[b]	I[b]	I[c]	0
Noatak	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	L[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Noorvik	M[b]	H[b]	L[b]	L[b]	L[c]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Rampart	H[b]	L[b]	I[c]	I[b]	I[c]	M[b]	M[c]	M[b]	L[b]	I[c]	H[b]	H[b]	I[c]	H[b]	0
Selawik	M[b]	H[a]	I[c]	L[b]	I[c]	L[b]	H[b]	M[b]	M[b]	L[b]	M[b]	H[b]	L[c]	H[b]	1
Shungnak	M[a]	H[a]	L[a]	L[a]	I[c]	M[a]	H[b]	H[a]	L[b]	L[c]	H[a]	H[b]	L[c]	H[a]	8

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Stevens Village	H[b]	L[c]	I[c]	L[b]	I[c]	M[b]	M[c]	H[b]	L[b]	I[c]	H[b]	M[b]	I[c]	H[b]	0
Tanana	H[b]	L[b]	I[c]	L[b]	I[c]	H[b]	I[c]	M[b]	H[b]	I[b]	H[b]	M[b]	I[b]	H[b]	0
Wiseman	H[a]	H[c]	H[b]	I[b]	L[c]	M[a]	I[c]	M[a]	H[a]	I[a]	H[b]	H[b]	I[c]	H[a]	6

Source: see Map 2 through Map 27; Table 2
Notes: DS = Dall sheep; H = Resource of high importance; I = Resource of indeterminate importance (no community harvest data); L = Resource of low importance; LLM = Large land mammal; M = Resource of moderate importance; MB = Migratory bird; MM = Marine mammal; MI = Marine invertebrates; NSF = Non-salmon fish; SML = Small land mammal; UGB = Upland game bird; V = vegetation
[a]Project Crosses Community Subsistence Use Area Data.
[b]Project Does Not Cross Community Subsistence Use Area Data
[c]No community subsistence use area defined, so project impact or lack of impact cannot be determined.

Table 43. Use areas crossing project corridor and resource importance, by community, Alternative B

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Alatna	H[a]	M[a]	L[a]	L[a]	I[c]	M[a]	H[c]	H[b]	H[b]	I[c]	H[b]	M[b]	I[c]	H[b]	5
Allakaket	H[a]	H[a]	L[a]	L[a]	L[c]	M[b]	H[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	4
Ambler	M[a]	H[a]	L[b]	L[a]	L[c]	M[a]	H[b]	M[b]	M[b]	L[c]	H[a]	H[a]	L[c]	H[a]	7
Anaktuvuk Pass	M[b]	H[a]	M[b]	L[b]	L[c]	L[a]	H[c]	L[b]	L[b]	I[c]	M[b]	H[b]	I[c]	H[b]	2
Beaver	H[b]	L[b]	I[c]	M[b]	I[c]	H[b]	L[c]	H[b]	M[b]	L[b]	H[b]	M[b]	I[c]	H[b]	0
Bettles	H[a]	M[a]	L[a]	L[b]	I[c]	M[a]	I[c]	L[b]	L[a]	I[c]	M[a]	H[a]	I[c]	H[a]	8
Buckland	M[b]	H[b]	I[c]	L[b]	M[c]	L[b]	H[b]	M[b]	I[c]	M[b]	H[b]	H[b]	L[b]	H[b]	0
Coldfoot	L[a]	H[b]	I[b]	I[b]	I[c]	I[a]	I[c]	I[a]	L[a]	I[a]	L[b]	I[b]	I[c]	H[a]	6
Evansville	H[a]	H[a]	M[a]	L[b]	I[c]	L[a]	L[c]	L[a]	M[a]	I[c]	H[b]	H[a]	L[b]	H[a]	8
Galena	H[b]	L[c]	I[c]	L[c]	L[c]	M[b]	L[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	0
Hughes	H[b]	M[b]	I[a]	L[b]	I[c]	M[b]	M[c]	M[b]	M[b]	I[c]	H[b]	H[b]	I[c]	H[b]	1
Huslia	H[b]	M[b]	I[b]	L[b]	I[c]	M[b]	I[c]	M[b]	L[b]	I[c]	H[b]	H[b]	I[c]	L[b]	0

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Kiana	M[b]	H[b]	L[b]	I[b]	I[c]	L[b]	M[b]	M[b]	L[c]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Kobuk	M[a]	H[a]	I[b]	L[a]	I[c]	L[a]	H[b]	M[a]	M[b]	I[c]	H[b]	H[b]	I[c]	H[a]	6
Kotzebue	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[b]	H[b]	0
Livengood	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	0
Manley Hot Springs	M[b]	L[c]	I[c]	L[b]	I[c]	L[b]	I[c]	L[b]	M[b]	L[c]	H[b]	M[b]	L[c]	H[b]	0
Minto	H[b]	L[b]	L[c]	L[b]	I[c]	M[b]	I[c]	H[b]	M[b]	L[b]	H[b]	M[b]	L[c]	H[b]	0
Nenana	H[b]	L[b]	L[b]	I[b]	I[c]	L[b]	I[c]	I[b]	H[b]	I[b]	H[b]	H[b]	I[b]	I[b]	0
Noatak	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	L[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Noorvik	M[b]	H[b]	L[b]	L[b]	L[c]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Rampart	H[b]	L[b]	I[c]	I[b]	I[c]	M[b]	M[c]	M[b]	L[b]	I[c]	H[b]	H[b]	I[c]	H[b]	0
Selawik	M[b]	H[a]	I[c]	L[b]	I[c]	L[b]	H[b]	M[b]	M[b]	L[b]	M[b]	H[b]	L[c]	H[b]	1
Shungnak	M[a]	H[a]	L[a]	L[a]	I[c]	M[a]	H[b]	H[a]	L[b]	L[c]	H[a]	H[b]	L[c]	H[a]	8
Stevens Village	H[b]	L[c]	I[c]	L[b]	I[c]	M[b]	M[c]	H[b]	L[b]	I[c]	H[b]	M[b]	I[c]	H[b]	0
Tanana	H[b]	L[b]	I[c]	L[b]	I[c]	H[b]	I[c]	M[b]	H[b]	I[b]	H[b]	M[b]	I[b]	H[b]	0
Wiseman	H[a]	H[b]	H[b]	I[b]	L[c]	M[a]	I[c]	M[a]	H[a]	I[a]	H[b]	H[b]	I[c]	H[a]	6

Source: see Map 2 through Map 27; Table 2

Notes: DS = Dall sheep; H = Resource of high importance; I = Resource of indeterminate importance (no community harvest data); L = Resource of low importance; LLM = Large land mammal; M = Resource of moderate importance; MB = Migratory bird; MM = Marine mammal; MI = Marine invertebrates; NSF = Non-salmon fish; SML = Small land mammal; UGB = Upland game bird; V = vegetation

[a]Project Crosses Community Subsistence Use Area Data.

[b]Project Does Not Cross Community Subsistence Use Area Data

[c]No community subsistence use area defined, so project impact or lack of impact cannot be determined.

Table 44. Use areas crossing project corridor and resource importance, by community, Alternative C

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Alatna	H[a]	M[a]	L[b]	L[a]	I[c]	M[a]	H[c]	H[b]	H[b]	I[c]	H[b]	M[a]	I[c]	H[b]	5
Allakaket	H[a]	H[a]	L[a]	L[a]	L[c]	M[a]	H[c]	M[a]	M[a]	I[c]	H[b]	H[a]	L[c]	H[a]	9
Ambler	M[a]	H[a]	L[b]	L[a]	L[c]	M[a]	H[b]	M[a]	M	L[c]	H[a]	H[a]	L[c]	H[a]	8
Anaktuvuk Pass	M[b]	H[a]	M[b]	L[b]	L[c]	L[a]	H[c]	L[b]	L[b]	I[c]	M[b]	H[b]	I[c]	H[b]	2
Beaver	H[b]	L[b]	I[c]	M[b]	I[c]	H[b]	L[b]	H[b]	M[b]	L[b]	H[b]	M[b]	I[c]	H[b]	0
Bettles	H[b]	M[b]	L[b]	L[b]	I[c]	M[b]	I[c]	L[b]	L[b]	I[c]	M[b]	H[b]	I[c]	H[b]	0
Buckland	M[b]	H[b]	I[c]	L[b]	M[c]	L[b]	H[b]	M[b]	I[c]	M[b]	H[b]	H[b]	L[b]	H[b]	0
Coldfoot	L[b]	H[b]	I[b]	I[b]	I[c]	I[b]	I[c]	I[b]	L[b]	I[b]	L[b]	I[b]	I[c]	H[b]	0
Evansville	H[b]	H[b]	M[b]	L[b]	I[c]	L[b]	L[c]	L[b]	M[b]	I[c]	H[b]	H[b]	L[b]	H[b]	0
Galena	H[b]	L[c]	I[c]	L[c]	L[c]	M[b]	L[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	0
Hughes	H[a]	M[a]	I[a]	L[a]	I[c]	M[a]	M[b]	M[a]	M[b]	I[c]	H[a]	H[a]	I[c]	H[a]	9
Huslia	H[b]	M[a]	I[b]	L[b]	I[c]	M[a]	I[c]	M[b]	L[b]	I[c]	H[a]	H[b]	I[c]	L[b]	3
Kiana	M[b]	H[b]	L[b]	I[b]	I[c]	L[b]	M[b]	M[b]	L[c]	L[b]	H[b]	H[a]	L[c]	H[b]	1
Kobuk	M[a]	H[a]	I[b]	L[a]	I[c]	L[a]	H[b]	M[a]	M[a]	I[c]	H[a]	H[a]	I[c]	H[a]	9
Kotzebue	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[b]	H[b]	0
Livengood	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	0
Manley Hot Springs	M[b]	L[c]	I[c]	L[b]	I[c]	L[b]	I[c]	L[b]	M[b]	L[c]	H[b]	M[b]	L[c]	H[b]	0
Minto	H[b]	L[b]	L[c]	L[b]	I[c]	M[b]	I[c]	H[b]	M[b]	L[b]	H[b]	M[b]	L[c]	H[b]	0
Nenana	H[b]	L[b]	L[b]	I[b]	I[c]	L[b]	I[c]	I[b]	H[b]	I[b]	H[b]	H[b]	I[b]	I[b]	0
Noatak	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	L[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Noorvik	M[b]	H[b]	L[b]	L[b]	L[c]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Rampart	H[b]	L[b]	I[c]	I[b]	I[c]	M[b]	M[c]	M[b]	L[b]	I[c]	H[b]	H[b]	I[c]	H[b]	0
Selawik	M[b]	H[a]	I[c]	L[b]	I[c]	L[a]	H[b]	M[b]	M[b]	L[b]	M[b]	H[b]	L[c]	H[b]	2
Shungnak	M[a]	H[a]	L[a]	L[a]	I[c]	M[a]	H[b]	H[a]	L[b]	L[c]	H[a]	H[a]	L[c]	H[a]	9

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Stevens Village	H[a]	L[c]	I[c]	L[a]	I[c]	M[a]	M[c]	H[a]	L[a]	I[c]	H[b]	M[a]	I[c]	H[a]	7
Tanana	H[a]	L[a]	I[c]	L[a]	I[c]	H[a]	I[c]	M[b]	H[b]	I[b]	H[b]	M[b]	I[b]	H[b]	4
Wiseman	H[b]	H[b]	H[b]	I[b]	L[c]	M[b]	I[c]	M[b]	H[b]	I[b]	H[b]	H[b]	I[c]	H[b]	0

Source: see Map 2 through Map 27; Table 2
Notes: DS = Dall sheep; H = Resource of high importance; I = Resource of indeterminate importance (no community harvest data); L = Resource of low importance; LLM = Large land mammal; M = Resource of moderate importance; MB = Migratory bird; MM = Marine mammal; MI = Marine invertebrates; NSF = Non-salmon fish; SML = Small land mammal; UGB = Upland game bird; V = vegetation
[a]Project Crosses Community Subsistence Use Area Data.
[b]Project Does Not Cross Community Subsistence Use Area Data
[c]No community subsistence use area defined, so project impact or lack of impact cannot be determined.

Table 45. Use areas crossing project corridor and resource importance, by community, any alternative

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Alatna	H[a]	M[a]	L[a]	L[a]	I[c]	M[a]	H[c]	H[b]	H[c]	I[c]	H[b]	M[a]	I[c]	H[b]	6
Allakaket	H[a]	H[a]	L[b]	L[a]	L[c]	M[a]	H[c]	M[a]	M[a]	I[c]	H[b]	H[a]	L[c]	H[a]	9
Ambler	M[a]	H[a]	L[b]	L[a]	L[c]	M[a]	H[b]	M[a]	M[b]	L[c]	H[a]	H[a]	L[c]	H[a]	8
Anaktuvuk Pass	M[b]	H[a]	M[b]	L[b]	L[c]	L[a]	H[b]	L[b]	L[b]	I[c]	M[b]	H[b]	I[c]	H[b]	2
Beaver	H[b]	L[b]	I[c]	M[b]	I[c]	H[b]	L[c]	H[b]	M[b]	L[b]	H[b]	M[b]	I[c]	H[b]	0
Bettles	H[a]	M[a]	L[a]	L[b]	I[c]	M[a]	I[c]	L[b]	L[a]	I[c]	M[a]	H[a]	I[c]	H[a]	8
Buckland	M[b]	H[b]	I[c]	L[b]	M[a]	L[b]	H[b]	M[b]	I[c]	M[b]	H[b]	H[b]	L[b]	H[b]	0
Coldfoot	L[a]	H[b]	I[b]	I[b]	I[c]	I[a]	I[c]	I[a]	L[a]	I[a]	L[b]	I[b]	I[c]	H[a]	6
Evansville	H[a]	H[a]	M[a]	L[b]	I[c]	L[a]	L[b]	L[a]	M[a]	I[c]	H[b]	H[a]	L[b]	H[a]	8
Galena	H[b]	L[c]	I[c]	L[c]	L[c]	M[b]	L[c]	M[b]	M[b]	I[c]	H[b]	H[b]	L[c]	H[b]	0

Study community	Moose	Caribou	DS	Bear	Other LLM	SLM	MM	MB	UGB	Eggs	Salmon	NSF	MI	V	Number of known resource use areas crossed
Hughes	H[a]	M[a]	I[a]	L[a]	I[c]	M[a]	M	M[a]	M[b]	I[c]	H[a]	H[a]	I[c]	H[a]	9
Huslia	H[b]	M[a]	I[b]	L[b]	I[c]	M[a]	I[c]	M[b]	L[b]	I[c]	H[a]	H[b]	I[c]	L[b]	3
Kiana	M[b]	H[b]	L[b]	I[b]	I[c]	L[b]	M[b]	M[b]	L[c]	L[b]	H[b]	H[a]	L[c]	H[b]	1
Kobuk	M[a]	H[a]	I[b]	L[a]	I[c]	L[a]	H[b]	M[a]	M[a]	I[c]	H[a]	H[a]	I[c]	H[a]	9
Kotzebue	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[b]	H[b]	0
Livengood	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	I[c]	0
Manley Hot Springs	M[b]	L[c]	I[c]	L[b]	I[c]	L[b]	I[c]	L[b]	M[b]	L[c]	H[b]	M[b]	L[c]	H[b]	0
Minto	H[b]	L[b]	L	L[b]	I[c]	M[b]	I[c]	H[b]	M[b]	L[b]	H[b]	M[b]	L[c]	H[b]	0
Nenana	H[b]	L[b]	L[b]	I[b]	I[c]	L[b]	I[c]	I[b]	H[b]	I[b]	H[b]	H[b]	I[b]	I[b]	0
Noatak	M[b]	H[b]	L[b]	L[b]	L[b]	L[b]	H[b]	M[b]	L[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Noorvik	M[b]	H[b]	L[b]	L[b]	L[c]	L[b]	H[b]	M[b]	M[b]	L[b]	H[b]	H[b]	L[c]	H[b]	0
Rampart	H[b]	L[b]	I[c]	I[b]	I[c]	M[b]	M	M[b]	L[c]	I[c]	H[b]	H[b]	I[c]	H[b]	0
Selawik	M[b]	H[a]	I[c]	L[b]	I[c]	L[a]	H[b]	M[b]	M[c]	L[c]	M[b]	H[b]	L[c]	H[b]	2
Shungnak	M[a]	H[a]	L[a]	L[a]	I[c]	M[a]	H[b]	H[a]	L[b]	L[c]	H[a]	H[a]	L[c]	H[a]	9
Stevens Village	H[a]	L	I[c]	L[a]	I[c]	M[a]	M	H[a]	L[a]	I[c]	H[b]	M[a]	I[c]	H[a]	7
Tanana	H[a]	L[a]	I[c]	L[b]	I[c]	H[a]	I[c]	M[b]	H[b]	I[b]	H[b]	M[b]	I[b]	H[b]	3
Wiseman	H[a]	H[b]	H[b]	I[b]	L[c]	M[a]	I[c]	M[a]	H[a]	I[a]	H[b]	H[b]	I[c]	H[a]	6

Source: see Map 2 through Map 27; Table 2
Notes: DS = Dall sheep; H = Resource of high importance; I = Resource of indeterminate importance (no community harvest data); L = Resource of low importance; LLM = Large land mammal; M = Resource of moderate importance; MB = Migratory bird; MM = Marine mammal; MI = Marine invertebrates; NSF = Non-salmon fish; SML = Small land mammal; UGB = Upland game bird; V = vegetation
[a]Project Crosses Community Subsistence Use Area Data.
[b]Project Does Not Cross Community Subsistence Use Area Data
[c]No community subsistence use area defined, so project impact or lack of impact cannot be determined.

Table 46. Number of communities with use areas crossing the project, by alternative and resource

Resource	Number of communities crossing Alternative A	Number of communities crossing Alternative B	Number of communities crossing Alternative C	Number of communities crossing any Alternative	Affecting greatest number of communities
Moose	9	9	8	12	A/B
Caribou	9	9	10	12	C
Dall sheep	6	6	3	6	A/B
Bear	5	5	7	7	C
Other large land mammals	0	0	0	0	N/A
Small land mammals	8	9	11	15	C
Marine mammals	0	0	0	0	N/A
Migratory birds	6	5	6	9	A/C
Upland game birds	4	4	3	7	A/B
Eggs	2	2	0	2	A/B
Salmon	3	3	5	6	C
Non-salmon fish	3	3	8	10	C
Marine invertebrates	0	0	0	0	N/A
Vegetation	6	7	6	10	B
Total Number of Communities Crossed	**12**	**12**	**12**	**16**	**N/A**

Source: see Map 2 through Map 27; Table 2
Notes: A = Alternative A; B = Alternative B; C = Alternative C; N/A = Not applicable; No. = Number

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During scoping, tribal, village, and corporation entities as well as Alaska Native resource co-management entities expressed concerns regarding potential road impacts. Based on the traditional knowledge of the individuals living in the Project area, the scoping meeting participants described potential impacts to resource abundance, resource availability, and user access as well as compounded impacts resulting from changes to resource abundance and availability and user access. The traditional knowledge observations and concerns are discussed below under the various impact headings.

Resource Abundance

Construction

Whereas many large-scale projects in Alaska have distinct construction and operation phases, the AMDIAR will undergo several periods of construction (lasting approximately two years each) interspersed with longer periods of operation/exploration. Construction impacts will be greatest during Phase 1 when the majority of construction (e.g., culvert and bridge installation, primary placement of gravel) will occur. Construction activities which could affect resource abundance through removal or disturbance of habitat include blasting/mining, operation of construction equipment, excavation, placement of gravel, construction noise, human presence, water withdrawal, installation of bridges and culverts, and air and ground traffic. Construction activities may also cause direct mortality to individual animals, including caribou, moose, fish, and waterfowl through vehicle and aircraft collisions, pile driving, and blasting.

The AMDIAR could cause direct mortality to caribou resulting from construction vehicle strikes, particularly if the caribou use the road as a movement corridor or insect relief area. Individual caribou may become ill through ingestion of chemicals used during construction or mining. Fish may experience direct mortality through driving of bridge pile, and certain activities such as pile driving, construction sedimentation, and stream diversions, may alter or degrade fish habitat thereby reducing egg survival downstream. Water withdrawal may kill individual fish but would likely not have population-level effects.

During the scoping period, the traditional knowledge provided by the Native Village of Kotzebue indicated that silt and contaminants as well as changes to water flows in the Kobuk River region watersheds may lead to decreased health and abundance of sheefish, salmon, whitefish, and Dolly Varden char populations. The Native Village commented that these resources are essential to the livelihood of the community of Kotzebue, particularly due to the fact that they are inexpensive to harvest and are available throughout the year:

> Healthy and abundant sheefish and salmon require pristine watersheds free from silt and contaminants, in addition to sufficient water flows and unfettered access to the most remote parts of the Kobuk River for their annual spawning runs. Salmon are critical to our members, representing a major source of income and subsistence resources necessary for their continued quality of life and livelihood. Sheefish are a major part of the annual cycle of subsistence for our members as they are commonly harvested near Kotzebue for the majority of the year. They somewhat uniquely represent an egalitarian resource, in that they are easily harvested for much of the year by the entire community because of their proximity and without requiring scarce, or expensive, methods and means. Whitefish that feed in the summer in coastal lagoons of Kotzebue Sound and continue to be harvested as a treasured food by our members, also use the Kobuk River and its tributaries for spawning and overwintering purposes, as do Dolly Varden char. (Native Village of Kotzebue 2018)

Waterfowl nesting and feeding near the road corridor or gravel sites may also experience direct habitat loss or may ingest chemicals associated with construction activities and dust deposition. Some individual mortalities of waterfowl would likely occur as a result of increased air traffic in the region. Direct loss of vegetation resulting from gravel mining, gravel placement, and fugitive dust would cause decreased abundance of vegetation (e.g., berries, wild greens) along the road corridor. In addition, clearing and grading along the road ROW could cause an increase in wildlife mortality (e.g., destruction of dens, clearing of habitat), particularly for resources such as small land mammals.

Operation

Operation activities which could affect resource abundance include the presence of roads and bridges (e.g., habitat fragmentation), the presence of other infrastructure such as communications towers and culverts, fuel or other contaminant spills, dust deposition, road and air traffic, and human activity. The presence of the road in addition to related culverts, bridges, and gravel infrastructure would alter and degrade fish habitat both upstream and downstream from the road, which could affect fish abundance for subsistence users in certain waterways crossed by the road corridor. It is not possible to predict the location and magnitude of such changes, although key sheefish spawning areas in the Kobuk River drainage and whitefish spawning in the Alatna River may be particularly vulnerable to population-level impacts.

Habitat fragmentation resulting from sustained disturbances could result in decreased abundance of certain resources over time. In the case of caribou, other Alaskan herds such as the Central Arctic Herd have maintained habitat connectivity and general migration patterns despite being intersected by highways and roads. Fragmentation of the WAH and RMH range resulting from a road may be more pronounced because the WAH and RMH ranges have less development and therefore have had less opportunity to habituate to human activity. The likelihood of longer term impacts on resource abundance vary by resource and are discussed below under the individual alternatives, under Indirect and Cumulative Impacts, and in individual biological resources discussions.

As with construction, some direct mortalities may occur as a result of collisions with vehicles, aircraft, or infrastructure during operations, particularly if animals such as moose are attracted to the road ROW as a movement corridor. Ingestion of contaminated water or vegetation as a result of spills could also cause illness in individual animals; larger spills into waterways would have larger effects on fish abundance, particularly in spawning streams.

Concerns about potential contamination of sheefish and chum salmon spawning grounds have already been voiced in the study communities (Watson 2014). The Kobuk River supports the largest population of spawning sheefish in Alaska, and the Alatna River is the only spawning habitat for sheefish in the upper Koyukuk River drainage. In addition, sheefish spawning grounds are particularly sensitive to changes in water velocity, temperature, pH, and other factors. Thus, any impacts to sheefish spawning grounds along the Alatna and Kobuk rivers could have much larger effects on the abundance of sheefish within the Kobuk and Koyukuk river drainages.

Over time, fugitive dust along road corridors may increase the affected area of vegetation which could in turn affect caribou, waterfowl, and other animals feeding in the vicinity of the road but would likely not result in population-level effects. Illegal use of the road by hunters may result in increased mortality of moose and caribou along the road corridor, although likely not to the level of reducing overall population numbers.

Ingestion of contaminated water or vegetation as a result of spills could also cause illness in individual animals. Mines would use the road to transport fuel and other chemicals and toxic materials. Key sheefish, whitefish, and salmon spawning streams crossed by the proposed road corridors and therefore vulnerable to spills and other contamination include the Kobuk River, Alatna River Henshaw Creek, South Fork Koyukuk River, and Hogatza River. Larger spills into waterways would have larger effects on fish habitat and abundance, particularly if spills occur in sheefish, whitefish, or salmon spawning streams, and could have population-level effects. A large-scale spill could result in reduced harvests of aquatic resources in addition to marine resources, including marine mammals, farther downstream from the proposed road and mines, as a result of local harvester concerns about contamination. In addition to spills, leaching of acid rock into waterways would affect aquatic habitat quality for sheefish, whitefish, Chinook and chum salmon, and other aquatic resources. Small changes in water quality could have substantial impacts on fish populations.

Resource Availability

Many of the subsistence study communities have high unemployment rates, incomes below the poverty line, and high food insecurity (Guettabi, Greenberg, Little, and Joly 2016). Despite these factors, community populations are stable. Subsistence activities and harvests are a key component in maintaining residents' ability to remain in their communities (Guettabi et al. 2016). Because of the importance of subsistence to maintaining the stability of the mixed economy and resilience of the study communities, these communities are also particularly vulnerable to impacts on subsistence harvests and subsistence resource availability. Furthermore, many of the subsistence study communities do not currently have road access and have majority Alaska Native populations which have specific cultural, social, and spiritual identities and needs that are inextricably linked to subsistence, which adds to their vulnerability associated with change introduced through an industrial road. These communities would be most vulnerable to potential impacts subsistence resource availability resulting from the project.

Harvest amounts are dependent on the availability and abundance of subsistence resources within a community's subsistence land use area and are not necessarily reflective of a community's dependence on or preference for a given resource. In prehistoric times, when the Athabascans and Iñupiat of the area lived semi-nomadic lifestyles, the response to a decline in resource availability may be to move to a more suitable location. With today's communities established in permanent locations, relocating to a more productive area, at least on a permanent or semi-permanent basis, is not an option for most individuals. Thus, today, communities adapt to the availability of resources within their subsistence use areas, and when one resource declines or is not available when harvesters can access them, residents may increase their harvest of a different resource in response. An example of this is the declining harvests of caribou within the Upper Koyukuk Region and corresponding increase in moose harvests starting in the late twentieth century. This shift in harvests was in response to changes in the distribution of caribou away from traditional land use areas, and the gradual appearance of moose within those areas. Other recent trends within the region observed by local residents and wildlife biologists include declining chum salmon and Chinook salmon runs; changes in the distribution of the WAH and reduced availability for certain communities; and recent declines in the availability of moose in the Upper Koyukuk region, with increased availability in the Kobuk River region (Watson 2018; Braem et al. 2015). A decline in multiple resources at once would reduce a community's ability to adapt to these changes and to find suitable substitutions for the declining harvests.

Construction

Construction activities that may affect resource availability for subsistence users include excavation, blasting, mining, ROW clearing, gravel placement, operation of construction equipment, general construction noise, human activity, vehicle and air traffic, sedimentation from construction activity, and fuel or other contaminant spills. Infrastructure such as the pioneer road, material sites, culverts, and bridge piles may also pose as physical obstructions for terrestrial mammals and fish. The 16 communities who have use areas overlapped by the project alternatives would experience direct impacts to resource availability; larger impacts to resource behavior, migration, or distribution could result in indirect impacts to resource availability for all 27 subsistence study communities, and in the case of caribou, the 42 caribou study communities.

In the short term, blasting may displace or divert resources such as large land mammals, small land mammals, and waterfowl, due to the noise associated with such activities (Section 3.2.6). Blasting also destroys vegetation and surrounding habitat for resources such as caribou, moose, and waterfowl. Clearing of trees and brush for the ROW and stripping of topsoil and organic material may alter or degrade resource habitat, particularly for herbivores that depend on surface vegetation or for fish in streams or rivers affected by erosion and sedimentation. In addition, these activities would remove berry, wild plant, and wood harvesting areas for study communities along the road corridor. Habitat alteration can affect resource distribution, thereby reducing the availability of those resources to subsistence users in traditional hunting or harvesting areas. Resource movement, particularly for migratory animals such as caribou, may be diverted due to increased human and material presence, air and ground traffic, noise, and/or contamination and dust from construction activities (see detailed discussion below, under “Caribou”). This general disturbance of wildlife could result in subsistence resources being unavailable at the time and place that subsistence users are accustomed to finding them.

Noise from construction equipment, gravel placement, blasting, mining, vehicle traffic, aircraft and helicopters, and human activity, would likely displace or divert certain resources (Section 3.2.6). Traffic itself causes a physical barrier for migratory animals, particularly caribou, and can also displace or divert resources when herds are separated (Vistnes and Nellemann 2007). Some animals, such as certain species of small land mammals and caribou, can become habituated to certain development activities over time; however, this habituation can result in changes to resource distribution and may also cause increased mortalities due to vehicle strikes. During the construction years, estimated air traffic volumes are 5 to 9 fixed wing aircraft trips each week, and one helicopter trip per week. Ground traffic would increase over the three phases of the AMDIAR but would be less during the construction phases.

Potential effects of construction activities on resource availability also include contamination resulting from fuel and other chemical spills, dust deposition, sedimentation due to erosion along river and stream banks, and increased emissions. Construction activity may lead to concerns by local residents about contamination of subsistence resources, particularly plants and berries, which are of high importance to nearly all potentially affected communities (see Resource Importance sections) and which could be directly affected by fugitive dust along the road corridors. This concern would be especially elevated in areas where naturally occurring asbestos is exposed during construction or contained in the gravel fills used for the project. Fuel spills and erosion may also result in contamination of waterways, affecting fish and other animals who ingest contaminated water. Contamination or perceived contamination can have indirect effects on subsistence, as subsistence users may reduce their consumption of a resource if there is a fear of contamination; thus, resources perceived as unhealthy or contaminated are considered unavailable to local residents.

The influx of workers during the multi-year construction period would also cause a substantial increase in human disturbance and activity within the region, which would likely result in decreased availability of certain resources in the vicinity of construction areas The potential for impacts to resource availability resulting from hunting or fishing by temporary construction workers is a key concern which has been raised by the study communities. This analysis assumes that no road users authorized by AIDEA (including construction workers) will be allowed to also hunt or fish from the road. In other words, construction workers or truck drivers will not be allowed to stop and hunt or fish using the road for access. However, it is possible that workers may choose to return to the area after construction is complete to engage in harvesting activities within the area, which could increase the number of hunters in the area over time and reduce resource availability for local residents.

The following sections provide a more in-depth discussion of potential impacts to the resources which are most commonly harvested by the study communities along the proposed road corridors and which are of high importance to a majority of those study communities. These resources include caribou, moose, fish, and vegetation.

Caribou

As noted above, the proposed road routes cross through community caribou hunting areas for 12 communities: Hughes, Kobuk, Shungnak, Allakaket, Ambler, Bettles, Evansville, Alatna, Huslia, Anaktuvuk Pass, Selawik, and Tanana. For seven of these communities, caribou are a resource a high importance (see Table 45), while for the remaining five communities, caribou are of moderate or low importance based on selected measures. While caribou are harvested in lesser quantities than in the past for a number of the study communities, changes to subsistence uses of caribou are often a result of changes in caribou migration or distribution which are out of a community's control. In many cases, communities were originally situated in areas known to be productive for caribou harvests, only to witness shifts in the distribution of the caribou herds which made them difficult to access. In more recent years, construction of TAPS and the Dalton Highway was reported by local residents to shift the distribution of caribou, and residents within the eastern portion of the proposed road corridors, such as Bettles, Alatna, and Allakaket, experienced a decline in harvests. Today, some residents from the northern and eastern portions of the project area travel to the southwest of the community toward Buckland into the WAH wintering grounds to harvest caribou (see Sections 5.1 and 5.3). Without the means (e.g., transportation, funds) to access caribou herds, communities rely on sharing networks for their dependence on caribou and may shift their resource focus to other resources which are more available, such as moose. This does not mean that caribou is no longer culturally important to these communities, and if migration or distribution of the herds change in the future such that they are available, communities would likely resume previous levels of harvesting. In addition to the communities who have documented use of the proposed corridors, additional subsistence study communities and caribou study communities may experience impacts to caribou availability if the road causes larger impacts on caribou movement However, such large-scale changes in caribou movement and distribution are not expected to occur (Section 3.3.4, Mammals).

Impacts on the resource availability of caribou may result from changes in caribou migration, distribution, behavior, and health. In addition, changes in harvester access can affect resource availability by reducing or delaying access to productive hunting areas; these impacts are discussed in the section below, "User Access." Impacts to the abundance of caribou, in terms of overall population, are discussed above, under "Resource Abundance." This section addresses the potential for impacts to the availability of caribou within traditional harvesting areas. While certain local changes to caribou movement or distribution may seem minimal from a biological perspective (i.e., not affecting overall population levels, body condition, herd ranges, etc.), local changes can have much larger impacts on resource availability to local hunters. It is important to a harvester's success that caribou are available within traditional hunting areas at the expected time during the seasonal round, and that the resources are accessible via available forms of transportation. Small changes can result in decreased hunting success due to a variety of factors. For example, a later arrival of caribou into one's hunting area could reduce harvest success if the caribou arrive during freeze-up, when neither river nor overland travel is possible, or at a time when other resource harvesting activities are at their peak. In addition, behavioral responses to stimuli, such as caribou acting skittish or running away from riversides, can result in hunters not being able to harvest caribou within a reasonable hauling distance, thus forcing them to abandon a hunt (SRB&A 2018). Thus, while conclusions related to impacts on caribou availability draw on the conclusions of the terrestrial mammals sections of the EIS, there are many additional impacts which are not addressed in the biological analysis.

Future changes in the distribution or migration of the caribou resulting from the road and other factors may result in changes to boundaries for the winter, migratory, and peripheral ranges of the herd, thus affecting the availability of the herd to communities in different ways. Currently, the project area crosses through the winter, migratory (fall and spring), and peripheral range for the Western Arctic Herd (WAH); the total range, including calving grounds, for the Ray Mountain Herd (RMH); and the peripheral range of the Hodzana Hills caribou herd (HHH). The Native Village of Kotzebue commented on the supreme importance of caribou to their community and the profound cultural impacts that a decrease in the presence of the WAH would have on the community of Kotzebue. They commented that it is essential that the WAH be able to migrate freely:

> It is impossible to overstate the importance of caribou to our members. Their absence in the annual subsistence cycle would irreversibly change the character of the culture and impose major hardship on the people as it would be impossible to replace the quantity and quality of food that caribou currently provide. (Native Village of Kotzebue 2018)

The primary construction activities which may affect caribou availability to local communities include air and ground traffic, construction noise (e.g., blasting, machinery), the presence of linear infrastructure (e.g., pioneer road), and human activity. Air traffic has been a commonly reported and observed impact on caribou on the North Slope and in Northwest Alaska (SRB&A 2009b, 2018, Georgette and Loon 1988, Sullender 2017). Air traffic is observed to cause behavioral changes, skittish behavior, and delayed or diverted crossing behavior, which in turn has impacts on caribou hunting success for local hunters. These types of behaviors are most commonly observed in response to helicopter traffic, although fixed-wing aircraft have also been observed to elicit similar responses. In addition to changes in behavior, increased exposure to aircraft disturbance may also affected body condition through increased energy expenditures (e.g., more time fleeing versus feeding or resting) (Sullender 2017). Furthermore, increased energy expenditures may result in reduced foraging rates and, ultimately, decreased mating success/pregnancy rates.

Roads and road traffic are also believed to cause behavioral and migratory changes in caribou which can affect hunting success. Deflections or delays of caribou movement from roads and associated ground traffic and human activity have been documented in the traditional knowledge of harvesters (SRB&A 2009b, SRB&A 2014, SRB&A 2018) and during behavioral studies on caribou, particularly for maternal caribou (displacement of between 1.24 and 2.5 miles [2 and 4 km] from roads) (ABR and SRB&A 2014). In recent years, reports of ground traffic–related impacts on the North Slope caribou hunting, particularly in the vicinity of Nuiqsut, have increased with the construction of gravel roads in the area (SRB&A 2016b, 2017, 2018). Impacts and road have also been observed by Noatak and Kivalina caribou hunters in regards to the Red Dog DMTS (SRB&A 2014). Residents have observed that some caribou will stop once they reach the DMTS, sometimes traveling alongside the road before crossing, and other times bypassing the road altogether. Such behavior has also been documented through radio collar observation. A study conducted by (Wilson, Parrett, Joly, and Dau 2016), found that the DMTS influenced the movements of approximately 30 percent of radio-collared WAH caribou, and of those individuals, the average delay in crossing was 33 days. Caribou from the Teshekpuk Herd (TH) were not similarly affected, which could be due to greater exposure of the TH to industrial development in the eastern portion of its range. In general, observed caribou behavior in response to the DMTS is variable: in some cases caribou cross seemingly without delay, while in other cases herds scatter and migration is delayed for multiple days

(Wilson et al. 2016, ABR and SRB&A 2014). Responses to roads also seem to vary from year to year based on the context in which roads are encountered.

In addition to impacts to resource abundance, the Alaska Native entities present at the scoping meetings also described potential impacts to resource availability in traditional use areas. A majority of the traditional knowledge comments noted the potential for altered migration, particularly in regards to caribou as well as aquatic resources. The Western Interior Alaska Subsistence Regional Advisory Council noted that noise disturbances resulting from increased traffic will decrease availability of key terrestrial and aquatic resources within at least a 50 mile radius of the Project:

> The Council emphasizes that the impacts of developing the Ambler Road Project will have adverse and far reaching effects within at least 50 miles of each side of the road. These impacts include noise disturbance to terrestrial and aquatic wildlife resulting from increased motorized off-road vehicle traffic and boat use extending up the coast and into the Kobuk River Drainage. The increased motorized off-road vehicle traffic and boat use resulting from development of the Amber Road will also have significant adverse impacts up and down the Koyukuk River, John River, and Alatna River drainages. (Western Interior Alaska Subsistence Regional Advisory Council 2018)

The tendency for caribou to divert around areas of disturbance is evidenced by traditional hunting methods which are still observed today. According to the (WAHWG 2017), caribou hunting traditions ensure that caribou migratory paths are well established before hunting begins:

> Hunters in Kiana were instructed to wait two days after the first caribou passed through for the migration to be established. By waiting to harvest caribou, the community protected the migration for years to come.

Other traditions indicate that residents should camp and hunt on the south sides of rivers in the fall so that caribou cross these linear features before encountering hunters. This reduces the likelihood of further deflection away from the river and overall changes in migratory paths.

Both large and small changes and delays in caribou movement could have substantial impacts to hunters waiting for the caribou migration. In the case of the proposed Ambler Road, WAH caribou typically migrate through the Kobuk River Valley area twice a year (fall and spring migration) and some WAH caribou winter in the area as well. The fall migration is the most intensive caribou hunting season for most communities, although residents may also hunt small groups of overwintering caribou or during their spring migration (Braem et al. 2015) Table 6). In general, the westernmost subsistence study communities have more access to the WAH, while communities on the periphery of the herd's range (e.g., Alatna, Allakaket) may be more vulnerable to smaller changes in the herd's annual movements (Guettabi et al. 2016). In 2017, residents from Allakaket noted that a poor snow year in combination with few caribou migrating near their village had resulted in low caribou hunting success rates that year (WAHWG 2017). Despite their greater proximity to the WAH migratory range, communities along the western end of the proposed road corridors (e.g., Ambler, Kobuk, and Shungnak) have indicated that the WAH has altered its migratory path farther west toward Buckland, which has caused community residents to shift their hunting focus to the west and south of their communities (Watson 2018). Thus, further changes to this migration could cause other shifts in the availability of caribou to these communities. Larger changes to the migration of the WAH or reduced availability or large diversions in individual study years could affect resource availability to any of the 42 caribou study communities. However, because the overall migratory patterns of the WAH are expected to remain intact (see Section 3.3.4, Mammals), it is unlikely that resource availability will be affected within the use areas for communities farther removed from the AMDIAR.

The Native Village of Kotzebue traditional knowledge comments during scoping emphasized the point that changes in resource availability will affect subsistence communities that are not located within the path of, or directly adjacent to, the Project. They noted that this is particularly true when considering the migratory nature of certain key species, particularly caribou which are essential to the health and wellbeing of the community of Kotzebue:

> While the area in question is only infrequently visited by our tribal members, sheefish, salmon and caribou - three of the most critical resources to the Tribe, are dependent on the continued health and wellbeing of this area.... Caribou which are the mainstay for Kotzebue cultural, nutritional and spiritual connection to the country use the entire Region at various times of the year. The migratory nature of these species should be taken into account so that communities not located directly adjacent to the proposed road (like Kotzebue), but who rely on the migratory resources using this area, are overtly acknowledged as directly impacted with a vested interest in this project and are included alongside the affected communities with closer proximity to the actual road for the purpose of impacts. (Native Village of Kotzebue 2018)

The Native Village of Kotzebue also provided their traditional knowledge on the ways in which a road corridor can affect caribou migration, noting that caribou are sensitive to noise and development and are able to see, hear, and feel development long before they reach a road or construction area. The Native Village used Red Dog Road (i.e., DMTS) as an example to illustrate the effects that development of roads has had on the WAH. They noted that while the Red Dog Road is shorter and therefore not directly comparable to the proposed Ambler Road, it can still be used as an example to demonstrate impacts to caribou including habitat fragmentation and disruption of migration paths.

> The major consideration with the road and the route selection would be to minimize the impact to their ability to freely migrate from the northern Brooks Range in the fall to their southern wintering habitat and back again in the spring and a road running east to west in the middle of this migratory route is a serious cause for concern. This type of migration impact has already been documented in regards to the much shorter Red Dog road. The related issue of habitat fragmentation is also detrimental to caribou and development and this road and the expected related spur roads, along with the increasing ability to develop future roads connected to this road in the future, is of serious concern for the long-term health of the western Arctic caribou herd. It has also to be kept in mind that even with the proactive approach taken along the relatively short Red Dog road in regards to stopping traffic while caribou are near the road there are still demonstrable impacts. It is unknown if such a strategy will, or even could, be put in place on the Ambler road, given the differing ownership and political affiliations of the mine developers in the Ambler District, in addition to the totally different logistical challenges in regards to the hauling season and distances that would be covered by the trucks. It also needs to be kept in mind that while it is practical to stop trucking on the Red Dog road due to its short length and nearby facilities on both ends, which would be totally different on the Ambler road, it also is exclusively tundra/willow habitat and herds of caribou can be relatively easily spotted at a distance. This will not be the case on the Ambler road, where both the topography and the spruce dominated areas will make it impossible in many places along the road to even observe caribou until they are right next to the road, but of course the caribou will still be able to smell, feel and hear the road and its associated traffic well before they reach it. (Native Village of Kotzebue 2018)

Effects on caribou movement are most likely to occur when linear structures are placed parallel to the herd's primary movement (Wilson et al. 2016). Perpendicular roads may also intercept caribou and cause delayed crossing (CPAI 2018, BLM 2018a). In the case of the proposed Ambler Road, Alternatives A and B are located perpendicular to the WAH's primary north-south movement and will thus likely cause deflections or delays in caribou movement at least during peak migratory periods. Alternative C would be less likely to intercept caribou because it is outside the main migratory range. While temporary disruptions to caribou movement in the WAH range have not been shown to alter overall migration patterns or reduce connectivity between seasonally-important ranges, the frequency and magnitude of caribou responses to roads would likely increase as the density of roads increases. In addition, even small changes in caribou distribution and movement from a biological perspective can have large impacts on hunter success.

Louden Tribal Council in Galena provided their traditional knowledge comments and summarized many of the above described impacts regarding the potential impacts of the Project on the migratory behavior and overall health of the WAH, noting that the ambient stress created by roads may cause migration route changes, avoidance, decreased populations, and habitat fragmentation. The Tribal Council also commented on the potential impacts that the road and road corridor may present including increased hunting pressure, increased predation, and increased mortality by traffic collisions:

> BLM needs to consider the full range of potentially serious impacts a project of this scale could have on the migratory behavior, habitat, and health of the Western Arctic Caribou Herd. The proposed road would cut east to west through a significant portion of the migratory range of the Western Arctic Caribou Herd, one of North America's largest existing wild caribou herds. Risks to caribou from roads include impeding migration routes, habitat fragmentation, and possibly local extinctions. Increased noise levels from road and air traffic in the region may lead to caribou avoidance of the road and displacement from their historical range. Roads create ambient stress in caribou, which results in less energy available for feeding, mating, and calving. Further, caribou may suffer direct mortality by traffic collisions, increased pressure from recreational hunting, and increased predation risk by wolves due to clear cutting in the road corridor and more efficient travel routes into caribou range. (Louden Tribal Council 2018)

Moose

The proposed road corridors cross moose hunting areas for 12 communities and are of high importance to eight of these communities. In some subsistence study communities located within the WAH's peripheral range (e.g., Alatna and Allakaket), moose has supplanted caribou as the primary large land mammal harvested, as caribou have become less available and moose have become more available in the region (Watson 2018).

Impacts to moose availability would generally be on a smaller geographic scale than for caribou, as moose have smaller ranges and residents do not rely on seasonal migratory movements when hunting them. Thus, impacts to moose hunting would occur primarily in the vicinity of the road where moose could exhibit avoidance or other behavioral changes. Because a majority of moose hunting in the region occurs along rivers during the fall months, impacts would be most likely to occur in areas where the road corridor crosses key moose hunting rivers such as the Koyukuk and Kobuk rivers and smaller drainages such as the Alatna, John, and Wild Rivers. Residents may experience decreased success in these areas due to moose remaining farther from the riversides or in deeper brush. However, impacts to moose availability would be localized.

While moose may initially exhibit avoidance of the road corridor, they also tend to habituate relatively quickly to human activity (Section 3.3.4). Moose may also be attracted to the ROW as a movement corridor or because of the availability of new vegetation in maintained areas of the ROW (Section 3.3.4). This could increase their availability to hunters in those areas but could also result in higher rates of injury or mortality due to traffic collisions.

Fish

As noted above, the proposed road routes cross through community non-salmon fishing areas for 10 communities: Hughes, Kobuk, Shungnak, Allakaket, Ambler, Bettles, Evansville, Alatna, and Kiana. For eight of these 10 communities, non-salmon fish are a resource a high importance (see Table 45), while for the remaining two communities, non-salmon fish are of moderate importance based on selected measures. Key fish species for these study communities include chum salmon, sheefish, and humpback and broad whitefish and, to a lesser extent, cisco, northern pike, grayling, burbot, and trout. The AMDIAR crosses streams and rivers which support spawning habitat for both sheefish and chum salmon. In particular, the Kobuk and Alatna rivers are key spawning grounds for sheefish and are also important fishing areas for the subsistence study communities. Both of these drainages are crossed by proposed project corridors. In addition to the communities who have documented use of the rivers crossed by the project corridors, communities upstream and downstream from the project corridors could experience impacts on fish availability if larger impacts to fish movement or health occur.

Construction activities which may affect fish availability to subsistence communities include installation of bridges and culverts, related pile installation, stream diversions, and stream excavation, water withdrawal, blasting at material sites, and contamination. Fish could be temporarily diverted, displaced, or obstructed due to culvert placement, excavation, or stream diversion. While impacts to fish resulting from construction activities are expected to be localized, subsistence users often harvest fish in specific locations along rivers; thus, localized changes in fish distribution could have impacts on resource availability for individual harvesters. Construction activities in waterways could also increase stream turbidity that could affect downstream harvesting areas or make these areas less desirable for fishing in the short-term.

The introduction of invasive species (both fish and/or aquatic plants) could also impact fish habitat and/or productivity and impact fish availability to subsistence users. Unlike other construction impacts that are expected to be more short-term, the introduction of invasive species could become a long-term impact if their spread is uncontrolled, reducing fish availability for subsistence users along the AMDIAR. If fuel or other contaminant spills occur near fish bearing streams, subsistence harvesters along may avoid harvesting fish if they are perceived (or confirmed) to be contaminated or unhealthy. In the case of larger spills, contamination concerns and avoidance may extend to communities located downstream from the AMDIAR (e.g., Huslia, Noorvik, and Kiana). A study in six communities on the North Slope found that between 22 and 54 percent of household heads had avoided eating certain subsistence foods in the previous year because of concerns about contamination (SRB&A 2017).

Vegetation

The proposed road corridors cross vegetation harvesting areas for 10 communities (see Table 45) and are of high importance to all of these communities. Construction activities which may affect the availability of vegetation, including berries, wild plants, and wood, include clearing of the ROW, fugitive dust resulting from the road and ore concentrate trucks, and contamination from fuel spills.

AMDIAR construction will result in the removal of vegetation harvesting areas for local residents and the introduction of invasive plants along roadways which may reduce the availability of native plant and berry species. In addition, a larger area surrounding the road will likely be removed from use for some individuals due to concerns about contamination. Impacts to vegetation harvest areas resulting from roads has been documented in relation to the Red Dog DMTS (SRB&A 2009b). Residents form Kivalina have reported observing dust on vegetation and changes in the taste or appearance of berries. In addition, some individuals have reported that they no longer use traditional vegetation harvesting areas along the DMTS due to concerns about contamination. Communities along the proposed road corridors may also experience reduced availability of vegetation in traditional harvesting areas during and after construction of the road. Because core harvesting areas for vegetation often occur in close proximity to communities, those communities in closest proximity to the road corridor would be most likely to experience impacts on their vegetation harvesting areas. Dust deposition could eliminate vegetation within 16 feet of roads and may cause avoidance of vegetation harvesting at greater distances (Section 3.3.1).

Operation

Disturbance, displacement, or contamination of subsistence resources during operations could result in these resources being unavailable at the time and place that local harvesters are accustomed to finding them. In general, impacts would be similar to the construction impacts (discussed above) pertaining to traffic, dust deposition, human activity, contamination, and infrastructure. However, the impacts would occur over a longer time frame and would occur with either greater or lesser frequency or intensity depending on the impact source. Under Phase 3, the final road would be larger and access roads and maintenance stations would be in place.

During operation, the availability of subsistence resources could be affected through human activity, air and ground traffic, and maintenance activities, resulting in skittish behavior, changes in local distribution of resources, and/or diversion from usual migration routes. In addition, road and other infrastructure may physically divert certain animals. Spills or other contamination could also affect the local distribution of resources such as fish and vegetation or may result in resources being considered unavailable to local harvesters due to concerns of contamination.

Sources of noise from maintenance and operation of the road would include vehicle traffic, small fixed-wing aircraft, helicopters, maintenance equipment and activities (grading, sanding, plowing, gravel placement), and human activity. Noise above ambient levels may displace or divert resources from traditional areas (see discussion above, under Construction) (Section 3.2.6). The frequency of truck traffic would increase over the three phases of the AMDIAR, and would be substantially higher once mine production began, with up to 200 trips per day at peak mine production. Increased traffic along the Dalton Highway may also displace caribou from the HHH thus affecting resource availability to users of that herd, although documented harvests from the HHH by local residents are relatively limited. While the road under Phase 2 would be a single-lane road and traffic would occur in one-way convoys, the road would be upgraded to a two-lane road under Phase 3 and traffic would not occur in convoys. Air traffic would decline slightly during operations, with an estimated two to six aircraft trips weekly (one to two to each maintenance station) and an additional helicopter trip per week. While overall ground traffic would be higher during mine production, human activity would be lower once construction is complete.

The cleared area within the ROW and road may create a travel corridor for large land mammals which could lead to a two-fold effect on resource availability. First, if the cleared area draws large land mammals to the corridor there could be a corresponding decline in large land mammals in areas they were previously found. Furthermore, a cleared area within the ROW with a high concentration of large land mammals could be a draw for local hunters traveling overland in the winter by snowmachine or by off-road vehicle during other times of the year. This could cause a reduction in the availability of certain resources in other traditional harvest areas. In addition, in the long-term, if the road facilitates access into the area after reclamation, the availability of moose in the area may decrease due to increased hunting.

During operations, the final two-lane road combined with an increase in traffic would likely increase the potential for deflection or delay of caribou movements, particularly during the fall migration south (see above under Construction). Over time, local caribou distribution may be altered to the extent that residents no longer find caribou within their usual hunting areas or experience reduced hunting success in those areas. Some industrial road projects in the state of Alaska provide for access to roads for local residents. In other communities where roads have been built, access to private roads has in some way offset some of the impacts to resource availability; however, lack of access to local hunters for the AMDIAR would introduce subsistence impacts with no offsetting subsistence benefit.

Stream and riverbeds may experience increased sedimentation or alteration over time due to the presence of culverts and bridge piers. If culverts and bridges are not properly maintained or if erosion control measures are not taken, fish migrations could be temporarily disrupted or blocked, which could reduce fish availability for subsistence users. The risk of contamination from dust deposition and fuel would continue through the life of the project and depending on the magnitude of spills could have far-reaching impacts on upstream and downstream subsistence users. Gravel mining and associated blasting will continue throughout operations for roadway maintenance, and thus some individual loss or displacement of fish will continue during operations.

User Access

Construction

Sixteen of the 27 subsistence study communities have subsistence use areas crossing one or more of the proposed road corridor alternatives (Table 45). These communities would be the most likely to experience direct impacts to user access resulting from the proposed road. Of these communities, five have use areas which are bisected by one or more of the road alternatives, meaning that access to a large portion of their hunting, fishing, and gathering areas would require crossing the road corridor (depending on the chosen alternative). These communities are Bettles, Evansville, Hughes, Kobuk, and Shungnak. Alatna, Allakaket, and Ambler are also bisected but to a lesser degree (i.e., the road crosses more on the periphery rather than through the center of their use areas) than the above five communities. As shown in Table 45 above, the subsistence activities which most commonly occur in the vicinity of the proposed corridors include hunting and trapping of small land mammals and furbearers, hunting of moose and caribou, vegetation harvesting, non-salmon fish harvesting, and migratory bird hunting. Other resource harvesting activities that could be affected include hunting of other large land mammals (Dall sheep and bear), hunting of upland game birds, salmon fishing, and to a lesser extent, egg harvesting.

Impacts to harvester access would occur within the vicinity of the road corridor, where harvesters could be faced with physical obstructions to access or by causing harvesters to avoid construction work areas. Construction infrastructure such as the pioneer road, construction laydown materials, and heavy equipment could present physical barriers to subsistence users. In addition, individuals traveling overland may have to divert around material sites and other areas which are unsafe for travel. Although the road will include crossing ramps for local residents to use when traveling overland, hunters may not be permitted to cross construction-phase roads until crossing areas are established, thus obstructing travel altogether for a period of time. Potential impacts of the physical road to user access are discussed in further detail under Operation.

Physical obstructions to access would be most common for residents traveling overland by snowmachine or off-road vehicle. Harvesters traveling overland to access use areas for caribou, furbearers, and geese may be diverted around construction areas if there are physical obstructions. Overland trails, routes, or traplines would be bisected by the project. In these cases, residents may abandon or alter traplines to avoid regular crossing of the project corridor. In addition, there may be periods of time during construction where access along certain river drainages, which can serve as both winter and summer travel corridors, is obstructed due to bridge construction activities (e.g., installation of bridge pilings).

The degree of impacts from construction would depend on whether the timing of construction activities conflicts with subsistence use areas and activities for a community. Because construction would occur year-round, it is likely that there would be direct conflicts with construction activities for certain subsistence use areas. According to data collected for several communities whose use areas are bisected by the AMDIAR (Hughes, Bettles, and Evansville), in addition to several additional communities whose use areas overlap with portions of the AMDIAR (Alatna, Allakaket, and Wiseman/Coldfoot), residents of the region primarily use boats and snowmachines to access hunting and gathering areas, although road-connected communities (Wiseman/Coldfoot) also commonly use road vehicles to access harvesting areas (see travel method discussions above). Subsistence activities occur year-round, peaking in the fall (August and September) and again in the mid-winter and early spring (February through April) for most study communities with available data. The project corridors cross areas used for both riverine and overland travel, and construction activities would occur year-round; thus, residents may experience impacts to construction during all subsistence seasons and activities which are overlapped by the AMDIAR.

In addition to physical barriers to subsistence users during construction, residents may also experience reduced access due to security restrictions around construction work areas or general avoidance of development areas. Even if regulatory and physical barriers do not exist in certain areas of the project area, subsistence users may choose not to access nearby subsistence use areas any longer because construction-related sites, smells, lights, noises, and activities can disturb resources, reduce the potential for a successful harvest, and negatively affect the harvester's experience (Section 3.2.6). In addition, residents may avoid hunting in the vicinity of the road due to concerns about shooting near infrastructure and human activity, or because of a lack of knowledge regarding security protocols. Any incidences of spills or other forms of uncontrolled hazardous waste discharge that occur during construction could lead to harvester concerns of contamination (real or perceived) and result in users avoiding subsistence use areas near the contaminated areas, thereby reducing user access. Finally, subsistence users may avoid hunting near construction work areas due to a general discomfort with conducting traditional subsistence activities near non-local workers and industrial activity.

Avoidance of industrial areas by subsistence users has been documented on the North Slope of Alaska, particularly for the community of Nuiqsut. In a recent study monitoring the impacts of oil and gas development on Nuiqsut caribou hunters, between 51 percent and 61 percent of caribou harvesters reported avoidance of any subsistence use area during four years of the Nuiqsut Caribou Subsistence Monitoring Project, and between 33 percent and 46 percent did so for development reasons (CPAI 2018, SRB&A 2018). Residents have noted that avoidance of industrial areas varies from year to year depending on activity levels within a given area and other factors. Thus, it is likely that a proportion of hunters from the subsistence study communities will avoid certain areas of the proposed road corridor at some point during the life of the AMDIAR. Avoidance may be higher during construction due to the higher activity and noise levels.

Operation

As noted above, 16 of the 27 subsistence study communities have subsistence use areas crossing one or more of the proposed road corridor alternatives, and the road and other project related infrastructure will represent a direct loss of traditional subsistence hunting and harvesting areas for these communities. During AMDIAR operation, residents would continue to experience physical barriers to access resulting from infrastructure such as roads, although the presence of crossing ramps would help reduce those impacts. Harvesters traveling overland to access use areas for caribou, furbearers, and geese may be diverted around operational infrastructure if there are physical obstructions. Physical obstructions to harvesters traveling by boat along river channels would be unlikely during operation. In addition to physical obstructions, residents from the subsistence study communities will also experience reduced access resulting from road use policies, user avoidance, and contamination concerns throughout the life of the project.

Scoping comments shared concerns regarding user access to traditional subsistence use areas. They noted that user access may be decreased due to a tendency for subsistence hunters to avoid areas of development:

> Subsistence harvesters often avoid areas of development. As a result, avoidance areas will extend far beyond the immediate footprint of the road, causing the loss of subsistence use areas across a broad area. (Louden Tribal Council 2018)

> A proposed Ambler Mining Road that severs Evansville Incorporated's land base would create a physical encumbrance that would adversely impact management and enjoyment of the land. (Evansville Inc. 2017)

As noted above, the AMDIAR will not permit access to local residents for subsistence purposes but will allow for residents to cross the road at established crossing areas. AIDEA has indicated they will establish a committee which will help identify appropriate locations for crossings. The efficacy of crossing ramps to reduce access impacts for local hunters will depend on the location, design, and frequency of the ramps. Because subsistence users do not always use or follow established trails when pursuing resources overland, instead traveling in various directions based on environmental factors (e.g., weather, snow and ice conditions) and traditional knowledge of resource distribution and behavior, the presence of crossing ramps will not eliminate impacts to user access. Subsistence users may have to travel additional distances when pursuing resources in order to locate approved crossing areas, or they may take safety risks by crossing in areas not approved for crossing. In addition, despite the presence of crossing ramps, some individuals may still have difficulty using crossing ramps, especially when hauling sleds. Subsistence users in the community of Nuiqsut have reported difficulty under certain conditions when using crossing ramps on industrial roads near their community (SRB&A 2018).

While road access for local subsistence users will not be permitted, it is possible that residents from nearby study communities will use the cleared area within the ROW alongside the road as a travel corridor for overland (snowmachine or off-road vehicle) travel, particularly if resources such as moose concentrate in these corridors. Use of the ROW may facilitate access to hunting areas farther from the community as well as between communities. AIDEA indicates that ROW travel will be prohibited, and security will patrol the roads to prevent violations. Enforcement measures will reduce but not eliminate use of the ROW. Restrictions on use of the ROW, particularly by local residents when certain areas of the road will be crossable, may be difficult to enforce. Increased non-local access would be less likely but may affect subsistence uses for residents of the subsistence study communities by increasing human activity and competition in the area.

Competition from non-local hunters, facilitated by guiding and air charter services, is an existing source of impacts to subsistence users within the region. Sport hunting of the WAH has increased substantially since 2000, and conflicts between locals and sport hunters related to aircraft disturbances are commonly reported (see Section 3.3.4, Mammals). Residents have reported actions from non-local hunters which are inconsistent with traditional Athabascan and Iñupiaq values, such as hunting for sport, wasting meat, hunting in key migration corridors, or targeting the “lead caribou” in a herd, thus deflecting them from their usual routes (Braem et al. 2015). A potential for increased access by outside hunters is a primary concern which has been voiced by a number of subsistence study communities (Watson 2014). Local harvesters are often at a disadvantage when in direct competition with non-local harvesters, as they do not have the financial means to cover large areas using planes and other modes of travel in search of subsistence resources, and their cultural values preclude them from harvesting resources in way that benefits only themselves (e.g., intercepting a migrating herd). The magnitude of impacts related to competition will depend on the ability to control access along roads and ROWs. The likelihood of non-local hunters accessing the ROW would depend on policies regarding ROW use in addition to measures taken to prevent or limit access to the ROW (e.g., boulders, berms, or fencing near entry points). Preventative measures would help lessen the impact of increased use along the ROW but would likely not eliminate the impact, as some individuals would likely use the ROW regardless of use policies. The use of cleared ROWs regardless of use policies has been documented by rural residents throughout the state of Alaska associated with TAPS and other local development and transportation projects (SRB&A 2016a). While less likely, it is also possible that individual hunters, including local and non-local hunters, may trespass and use the road itself to access hunting areas during periods of low activity on the road. Security gates at the road entrance will reduce the likelihood of trespassing with road vehicles; however, trespassing with off-road vehicles may still occur. Several Alaska Native entities expressed similar concern regarding the potential for increased access to traditional subsistence use areas by non-local hunters. They indicated that increased competition and hunting pressure will decrease resource abundance and availability and negatively impact subsistence harvesting success by local residents. While the proposed Road will be commercial access only, scoping meeting participants highlighted the lack of specific information on how public access will be restricted and indicated that restricting all public access will be impossible.

> The potential for unauthorized use of the road and right-of-way, as well as possible future authorized public use of the road, presents additional concerns. For instance, unauthorized individuals could use the road to access areas that would not otherwise be accessible, and compete for subsistence resources traditionally used and relied on by residents of the local community. (Doyon Ltd. 2018)

> BLM should assume the public will be able to access the road, because there is no information on how public access will be restricted. Unrestricted access and illegal road use may lead to increased hunting pressure. Further, poaching by construction and mining workers should be considered. Even if road use is limited to industrial access and poaching is limited, the estimated 400 trucks per day on a long industrial road has the potential to greatly impact subsistence hunting and harvesting success. (Louden Tribal Council 2018)

During operations, harvester avoidance of the project area may be reduced from construction levels due to decreased noise and human activity disturbances, although avoidance responses would likely continue throughout the life of the project for certain individuals. In general, the total area of infrastructure would be greater under operations and would include a two-lane road, bridges, road maintenance stations, vehicle turnouts, material sites, water source access roads, road maintenance access roads, air strips, and communications towers. Thus, the area of infrastructure-related avoidance by local residents would be larger during operations. For some individuals, avoidance may extend to a larger area than the footprint if they perceive that resources are less available due to noise, traffic, and human activity associated with road operation. As with construction, any spills or other forms of uncontrolled hazardous waste discharge that occur during operations could lead to harvester concerns of contamination (real or perceived). These concerns could result in users avoiding subsistence use areas near contaminated areas, thereby reducing user access and also impacting resource availability.

Because the road corridor bisects subsistence use areas for a number for communities (Bettles, Evansville, Hughes, Kobuk, and Shungnak), residents from these communities may not have the option to avoid the road altogether to continue accessing traditional subsistence use areas. Thus, total avoidance of the AMDIAR area may be more likely for residents from communities whose use areas are on the periphery of the AMDIAR area.

Socio-Cultural Impacts

Impacts to resource abundance, resource availability, and user access would likely affect the costs and time associated with conducting subsistence activities and could have larger socio-cultural impacts on residents in the AMDIAR area. Decreased abundance or availability of resources may result in residents spending more time and effort in the pursuit of those resources, with greater risks to hunter safety. Some residents may reduce the time spent harvesting subsistence resources if the resources are unavailable in traditional harvesting areas and residents do not have the money to expend on traveling farther. These impacts could be further compounded by increased unauthorized access by non-local harvesters with greater means to access resources and harvesting practices which are in direct conflict with traditional Athabascan and Iñupiaq values. Impacts related to resource availability, such as decreased community subsistence harvests, would likely have greater impacts to vulnerable low income, unconnected, and low-harvest households (Kofinaset al. 2016). Decreased harvests among the study communities could also have more wide-ranging effects due to the potential impacts on sharing networks within the region in addition to networks which extend to other regions (Kofinas et al. 2016). Sharing is a key value across the study region which is central to subsistence and which strengthens social and kinship ties across communities and regions.

Changes in traditional land use areas over time could also have effects on cultural identity, as a community's identity is inextricably tied to the lands of their ancestors. The proposed road corridor bisects an area that is a traditional boundary between the Iñupiat and Athabascans, including an area of shared use; impacts to resource availability and changes in subsistence use patterns could disrupt these traditional boundaries and associated cultural identity of the residents of the area (Watson 2018). In the case of the Iñupiat of the Koyukuk River valley, their identity continues to be strongly associated with traditional use areas north of the Kobuk River and into the Brooks Range, despite recent shifts in contemporary subsistence patterns resulting from changes in resource availability, land management, and access. Further changes to the availability of caribou and other resources and a shifting away from the traditional use areas of their ancestors could erode resident's sense of identity. Finally, if the road reduces the availability of key subsistence resources such as caribou, moose, or sheefish, communities may experience negative social effects (e.g., increased drug and alcohol use, increased depression) resulting from poor harvests of those resources in a given year, increased food insecurity, and perceived degradation of culturally or spiritually important places and resources.

Economic opportunity associated with increased revenue/dividends, job opportunities, and income, can have positive effects on rural communities and on subsistence use patterns by encouraging residents to remain in their home communities and invest their income into to subsistence technologies and pursuits. Increased income and job opportunities can also have negative impacts on subsistence use patterns by changing the socioeconomic status of certain community members, reducing the time available to engage in subsistence activities, facilitating a shift toward store-bought goods, and altering social roles within a community. Local jobs directly associated with road construction and operation will be limited in number, temporary, and requiring skills and qualifications which most local residents do not have (see EIS Section 3.4.5, Socioeconomics and Communities).

Job opportunities would be greatly reduced after construction, with the road employing between 9 and 15 local residents, depending on the alternative. The relatively lucrative mining jobs are more likely to go to

NANA shareholders and to residents of the closest communities (Kobuk, Ambler, Shungnak), because 2 of the largest mines are on NANA land or subject to NANA agreements. Such jobs, which allow both for relatively high income and for chunks of time off that may be used for subsistence activities, are less likely to go to Doyon shareholders whose subsistence areas would be equally affected. Those communities in the Doyon region with fewer job benefits coupled with distance from the new road would be further affected because they would not benefit from reduced costs of supplies and fuel; only communities close to the road, such as Bettles/Evansville (Alternatives A and B) and Hughes (Alternative C) have potential to see benefits from reduced costs of fuel, goods, and groceries, including fuel, fishing and hunting tools, snowmobiles and boats that help in the subsistence harvest. Other subsistence communities in the Doyon region would experience the impacts of the road crossing their subsistence use areas but would be too far from the road to benefit from the reduced costs of subsistence activities.

All alternatives would cross ANCSA Native corporation land (see EIS Appendix F, Table 5), some of it Doyon Limited land and some NANA land (regional corporations) and some of it land associated with smaller Native corporations. It is likely the corporations would sell gravel from their lands for road construction and maintenance, and may collectively receive tens of millions of dollars (Cardno 2015). Shareholders likely would receive dividends from the regional corporations bolstered by those payments. NANA shareholders would be expected to benefit substantially more because of payments from the mines in addition to payments for gravel. These funds may help individuals adapt to subsistence impacts by providing funds toward subsistence equipment and supplies, but the funds would not go solely to shareholders in communities experiencing project impacts to subsistence; the funds would go all shareholders.

Those communities close to the road that end up connecting by spur road or trail, or just by snowmobile or boat, could experience a change in the balance between the subsistence economy and cash economy. For instance, a study on the economic benefits and subsistence impacts of public-use roads found that communities' locations along public roads were associated with an approximately one-third decrease in subsistence harvests, with little to no benefit in terms of increased personal incomes (Magdanz et al. 2016). The impacts of a private use road have not been well investigated.

Over time, decreased abundance and availability of resources, in combination with decreased access to or avoidance of traditional harvesting areas, may reduce overall participation rates in subsistence or harvest amounts. When subsistence users' opportunities to engage in subsistence activities are limited, then their opportunities to transmit knowledge about those activities, which are learned through participation, are also limited. If residents stop using portions of the project area for subsistence purposes, either due to avoidance of development activities or reduced availability of subsistence resources, the opportunity to transmit traditional knowledge to younger generations about those traditional use areas would be diminished. While communities would likely maintain a cultural connection to these areas and acknowledge these areas as part of their traditional land use area, the loss of direct use of the land could lead to reduced knowledge among the younger generation of place names, stories, and traditional ecological knowledge associated with those areas. There would also be fewer opportunities for residents to participate in the distribution and consumption of subsistence resources, ultimately affecting the social cohesion of the community. Any changes to residents' ability to participate in subsistence activities, to harvest subsistence resources in traditional places at the appropriate times, and to consume subsistence foods could have long-term or permanent effects on the spiritual, cultural, and physical well-being of the study communities by diminishing social ties that are strengthened through harvesting, processing, and distributing subsistence resources, and by weakening overall community well-being.

6.4.2 Alternative A: AIDEA Proposed Route (GAAR North) to the Dalton Highway

Alternative A crosses use areas for 12 subsistence study communities, including Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Coldfoot, Evansville, Hughes, Kobuk, Selawik, Shungnak, and Wiseman. Thus, these communities would likely experience direct impacts of the AMDIAR on their subsistence uses in terms of direct loss of subsistence use areas, impacts on user access, and direct impacts to resource availability (e.g., localized disruptions to resource behavior or distribution resulting from project activities and infrastructure). Impacts to resource abundance or larger impacts to resource availability resulting from changes to migration routes or habitat use could extend to other subsistence study communities or, in the case of caribou, to the 42 WAHWG study communities.

Communities with the highest number of resource uses crossed (five or more resources) include Bettles, Evansville, Shungnak, Ambler, Coldfoot, Kobuk, and Wiseman. Alternative A bisects community uses for Bettles, Evansville, Kobuk, and Shungnak, (i.e., community residents would need to cross or detour around the road in order to access a large portion of their subsistence use area), and therefore in terms of access these communities would be most heavily impacted by Alternative A. Bettles, Evansville, and Kobuk would be located closest to the road corridor and would therefore be more likely to experience benefits of the road related to lowered costs of subsistence supplies/equipment and other goods in the event that these communities can develop a way to create an access route from their community to the nearby corridor (Kobuk is the only community that will have direct access). Potential negative impacts of increased access to communities are often associated with the increased potential or ease of bringing drugs, alcohol, and other prohibited substances into communities and the negative sociocultural impacts that could ensue. The attending Alaska Native entities during scoping expressed concerns that increased access to subsistence use areas and increased access to and from communities may negatively impact the cultural wellbeing of many in the area. The Native Village of Allakaket discussed the potential effects of outside access to their community, noting that while road access to the community will likely not be of much benefit to residents, it may create opportunities for bootleggers and drug dealers to access the community:

> The road is too far north from our village to make it practical to bring in groceries and goods to reduce the cost of living, but it is not so far as to prevent those who want to make a great deal of money from drugs and alcohol from driving down the road and then by snowmachine or four-wheeler to Allakaket. Regardless of whether mining or trucking companies prohibit substance abuse, there will be individuals willing to bring it into Allakaket. We have seen no plans on the part of the state or federal government to provide a greater police presence to stop this. We in Allakaket do not even have a public safety officer to address this. (Allakaket Tribal Council 2018)
>
> [The Project] should take into account the potential for reduced subsistence diets and increases in access to alcohol and drugs. (Allakaket Tribal Council 2018)

Key subsistence harvesting areas that Alternative A would cross through include the Ambler River, Kobuk River, Mauneluk River, Beaver Creek, Reed River, Alatna River, Upper Koyukuk River, Iniakuk River and Lake area, John River, Wild River, and South and North Fork Koyukuk river. Each of these locations are traditional harvesting areas for multiple communities, particularly among the Kobuk River Region and Koyukuk River Region communities and for multiple resources (see Sections 5.1 and 5.3).

Resources for which availability could be directly affected under Alternative A include caribou (nine communities), moose (nine communities), small land mammals (eight communities), migratory birds (six communities), Dall sheep (six communities), and vegetation (six communities) (Table 42). Of these resources, moose, caribou, and vegetation are resources of high importance to majority of the potentially affected study communities (see Table 42). For a smaller number of communities, harvests of salmon, non-salmon fish, bear, and eggs could be directly affected.

Alternative A crosses through key migratory range for the WAH and could therefore affect the availability of WAH caribou to the south (in the fall) and north (in the spring/summer) of the road. The road runs perpendicular to the primary direction of movement during migration, thus introducing an impact source that could lead to caribou being diverted and delayed during migration. Caribou cross the Alternative A corridor during both the fall and winter (Section 3.3, Mammals). Alternative A is to the north of a majority of the study communities whose caribou hunting activities peak in the fall. Deflections of caribou to the north of these communities during the fall months could have substantial impacts on resource availability to subsistence harvesters. The likelihood of such deflections would vary annually based on environmental and development-related (e.g., traffic and noise levels) factors. The importance of maintaining the north-south migration is evident in traditional hunting methods which place hunting camps to the south of rivers and allow the first of the caribou herd to pass by before hunting them (WAHWG 2017). Direct impacts to caribou availability along the road corridor resulting from smaller-scale disruptions may occur for the communities of Bettles, Evansville, Shungnak, Ambler, Kobuk, Alatna, Allakaket, Anaktuvuk Pass, and Selawik. For Anaktuvuk Pass, the road corridor is on the periphery of their caribou hunting areas. Larger-scale disruptions may extend to other users of the WAH. Alternative A does not occur within the range of the RMH. Traffic increases on the Dalton Highway may affect the HHH and may affect subsistence activities near the Dalton Highway.

Under Alternative A, fish availability could be directly affected for four study communities: Bettles, Evansville, Shungnak (for salmon), and Ambler. Non-salmon fish are a resource of high importance to these communities. In particular, sheefish spawning grounds which are particularly sensitive to changes in environmental conditions, occur along the Alatna and Kobuk rivers, which are crossed by the Alternative A corridor. Any impacts from construction or operation of the road corridor which change water quality downstream could affect sheefish spawning grounds and could impact communities downstream from the corridor on the Koyukuk and Ambler River drainages, including Alatna, Allakaket, Hughes, Huslia, Ambler, Kobuk, Shungnak, Kiana, and Noorvik. These communities could experience indirect impacts if larger changes to fish health or availability occur. Alternative A has a greater potential to directly affect sheefish spawning grounds compared to Alternative C. In addition to sheefish spawning grounds, Alternative A also crosses streams in the Upper Koyukuk drainage which support spawning for Chinook, chum salmon, and whitefish, including the Alatna River, Henshaw Creek, North Fork Koyukuk River, Wild River, and John River. Impacts to these spawning grounds could also have larger effects to communities who harvest salmon downstream from the road corridor.

6.4.3 Alternative B: AIDEA Alternative Route (GAAR South) to the Dalton Highway

Alternative B is similar to Alternative A in terms of the communities which could be directly affected and the nature of the potential impacts. Alternative B crosses use areas for 12 subsistence study communities: Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Coldfoot, Evansville, Hughes, Kobuk, Selawik, Shungnak, and Wiseman (Table 43). Thus, these communities would likely experience direct impacts of the AMDIAR on their subsistence uses in terms of direct loss of subsistence use areas, impacts on user access, and direct impacts to resource availability (e.g., localized disruptions to resource behavior or distribution resulting from project activities and infrastructure). The primary difference between Alternatives A and B in terms of direct community impacts is that the route would not overlap with migratory bird hunting areas for Ambler but would overlap with vegetation harvest areas for that community. Alternative B would cross through similar key subsistence harvesting areas as Alternative A, with the addition of the Hogatza River area and Norutak Lake which are used by multiple Kobuk and

Koyukuk River Region communities (see Sections 5.1 and 5.3). Alternative B would cross within about seven miles of sheefish spawning habitat on the Reed River and would therefore introduce higher potential for degradation and contamination of that habitat from spills (Section 3.3, Fish and Amphibians). For caribou, the effects would the same as under Alternative A (Section 3.3, Mammals). Impacts to resource abundance or larger impacts to resource availability resulting from changes to migration routes or habitat use could extend to other subsistence study communities or, in the case of caribou, to the 42 WAHWG study communities.

6.4.4 Alternative C: Diagonal Route to the Dalton Highway

Alternative C crosses use areas for 12 subsistence study communities (Table 46), including Alatna, Allakaket, Ambler, Anaktuvuk Pass, Hughes, Huslia, Kiana, Kobuk, Selawik, Shungnak, Stevens Village, and Tanana. These communities would likely experience direct impacts of the AMDIAR on their subsistence uses in terms of direct loss of subsistence use areas, impacts on user access, and direct impacts to resource availability (e.g., localized disruptions to resource behavior or distribution resulting from project activities and infrastructure). Impacts to resource abundance or larger impacts to resource availability resulting from changes to migration routes or habitat use could extend to other subsistence study communities or, in the case of caribou, to the 42 WAHWG study communities. However, larger migratory changes are less likely under Alternative C than Alternatives A and B (see discussion below).

Communities with the highest number of resource uses crossed (five or more resources) include Allakaket, Hughes, Kobuk, Shungnak, Ambler, Stevens Village, and Alatna. Alternative C bisects community uses for Hughes, Kobuk, and Shungnak (i.e., community residents would need to cross or detour around the road in order to access a large portion of their subsistence use area), and therefore in terms of access these communities would be most heavily impacted by Alternative C. These three communities would also be most likely to experience benefits of the road related to lowered costs of subsistence supplies/equipment and other goods in the event that these communities can develop a way to create an access route from their community to the nearby corridor. The community of Kobuk would be located directly along the Alternative C route.

Key subsistence harvesting areas that Alternative C would cross through include the Lower Kobuk River, Pah River Flats, Hogatza River, Hughes Creek, Indian River, Melotzina River, Ray Mountains, and Ray River. Each of these locations are traditional harvesting areas for multiple communities, particularly among the Koyukuk, Tanana, and Yukon River Region communities (see Sections 5.3, 5.4, and 5.5).

Resources for which availability could be directly affected under Alternative C include small land mammals (11 communities), caribou (10 communities), non-salmon fish (eight communities), moose (eight communities), bear (seven communities), vegetation (six communities), migratory birds (six communities), and salmon (five communities) (Table 44). For a smaller portion of communities, harvests of Dall sheep and upland game birds could be affected. For a majority of the study communities, caribou, moose, non-salmon fish, salmon, and vegetation are resources of high importance (Table 44). Alternative C would have greater noise impacts compared to Alternatives A and B as it will affect more previously undisturbed land than Alternatives A and B, and noise would spread wider under Alternative C due to terrain differences. Thus, impacts on resource availability and user avoidance related to noise may occur over a greater area under Alternative C (Section 3.2.6)

Alternative C does not cross through the primary migratory range for the WAH and does not intersect the primary north-south migratory movement of the herd. Therefore, the alternative would be less likely to affect migration routes and behavior for WAH caribou and less likely to have direct and indirect effects on resource availability to the caribou study communities. However, Alternative C does occur within the wintering grounds for the WAH and affects an overall greater amount of WAH habitat, and therefore direct impacts to caribou availability along the road corridor may occur for the communities of Allakaket, Hughes, Kobuk, Shungnak, Ambler, Alatna, Huslia, Anaktuvuk Pass, Selawik, and Tanana, all of whom have caribou hunting areas overlapped by the alternative. For Anaktuvuk Pass, the road corridor is on the periphery of their caribou hunting areas. Alternative C bisects the overall and summer ranges of the RMH; due to the small size of population and herd range, impacts to this herd could be more amplified; however, the RMH is difficult to access and hunted by the subsistence study communities only occasionally and therefore direct impacts to local hunters would be possible but unlikely. No impacts to the HHH would occur as a result of Alternative C.

Compared to Alternatives A and B, Alternative C crosses areas of higher value moose habitat and therefore could have greater impacts to moose availability in nearby communities. Impacts would be relatively localized along the road system and therefore would affect communities with moose hunting areas closest to the road corridor (e.g., Hughes, Kobuk, and Shungnak).

Compared to Alternatives A and B, under Alternative C, fish availability could be directly affected for a greater number of communities (eight communities versus four). Alternative C crosses Kobuk River directly downstream from sheefish spawning habitat. Thus, any changes to waterways which obstruct access to spawning grounds or affect water quality could have larger indirect impacts to communities who harvest sheefish upstream and downstream from the road corridor, including Alatna, Allakaket, Bettles, Evansville, Hughes, Kobuk, Shungnak, Ambler, Huslia, and Kiana. However, Alternative C would be less likely to have direct impacts on sheefish spawning grounds. In addition, while Alternative C would cross more fish streams than alternatives A and B, it would construct more bridges and fewer minor culverts which are more likely to obstruct fish passage. In addition to sheefish spawning grounds, Alternative C also crosses streams which support spawning for Chinook and chum salmon. Impacts to salmon spawning grounds could also have larger effects to communities who harvest salmon downstream from the road corridor along the Yukon and Koyukuk rivers.

6.5. Community Impact Indicator Summaries

This section presents a summary of impact indicators by community and alternative. Communities with the greatest number of resources of high importance and use areas bisected by the project (compared to having partial, peripheral, isolated, or no use areas crossed by the project) would likely experience the greatest intensity of effects related to the project. The following definitions are used in defining the level of project intersection with community use areas:

- Bisect – proposed project crosses through the center or large portions of a community's use areas
- Partial – proposed project intersects a portion of use areas near the community
- Periphery – proposed project intersects use areas located on the outer edge of the community's use areas
- Isolated – proposed project intersects community use areas in one specific, contained location
- None – proposed project does not intersect with the community's use areas

In summary, for Alternatives A and B, Shungnak, Evansville, Bettles, and Kobuk would experience the greatest intensity of impacts due to the greater number of resources of high importance that are overlapped with the Project and that their subsistence use areas are bisected by the Project (Table 47, Table 48). Ambler, Allakaket, and Alatna could also experience a higher intensity of impacts due to greater numbers of resources of higher importance and larger portions of use areas potentially affected. Alternative C would be similar except Bettles and Evansville would be unlikely to experience effects and Hughes would be added to the list of communities that would experience greater impacts from the Project

(Table 49). These tables do not account for the potential for larger indirect effects that could occur, particularly for resource availability impacts, which are more uncertain and for which the study team did not identify any systematic, quantifiable impact indicators.

Table 47. Alternative A impact indicator summary – resource importance and use areas

Community	Number of high resources crossed	Number of moderate resources crossed	Number of low resources crossed	Number of resource of indeterminate importance crossed	Level of project intersection with use areas
Shungnak	4	2	2	0	Bisect
Evansville	4	2	2	0	Bisect
Bettles	3	3	2	0	Bisect
Kobuk	2	2	2	0	Bisect
Ambler	3	3	1	0	Partial
Allakaket	2	0	2	0	Partial
Alatna	1	1	2	0	Partial
Wiseman	3	2	0	1	Periphery
Selawik	1	0	0	0	Periphery
Hughes	0	0	0	1	Periphery
Coldfoot	1	0	2	3	Isolated
Anaktuvuk Pass	1	0	1	0	Isolated
Beaver	0	0	0	0	None
Buckland	0	0	0	0	None
Galena	0	0	0	0	None
Huslia	0	0	0	0	None
Kiana	0	0	0	0	None
Kotzebue	0	0	0	0	None
Livengood	0	0	0	0	None
Manley Hot Springs	0	0	0	0	None
Minto	0	0	0	0	None
Nenana	0	0	0	0	None
Noatak	0	0	0	0	None
Noorvik	0	0	0	0	None
Rampart	0	0	0	0	None
Stevens Village	0	0	0	0	None
Tanana	0	0	0	0	None

Table 48. Alternative B impact indicator summary – resource importance and use areas

Community	Number of high resources crossed	Number of moderate resources crossed	Number of low resources crossed	Number of resource of indeterminate importance crossed	Level of project intersection with use areas
Evansville	4	2	2	0	Bisect
Shungnak	4	2	2	0	Bisect
Bettles	3	3	2	0	Bisect
Kobuk	2	2	2	0	Bisect
Ambler	4	2	1	0	Partial
Alatna	1	2	2	0	Partial
Allakaket	2	0	2	0	Partial
Wiseman	3	2	0	1	Periphery
Selawik	1	0	0	0	Periphery
Hughes	0	0	0	1	Periphery
Coldfoot	1	0	2	1	Isolated
Anaktuvuk Pass	1	0	1	0	Isolated
Beaver	0	0	0	0	None
Buckland	0	0	0	0	None
Galena	0	0	0	0	None
Huslia	0	0	0	0	None
Kiana	0	0	0	0	None
Kotzebue	0	0	0	0	None
Livengood	0	0	0	0	None
Manley Hot Springs	0	0	0	0	None
Minto	0	0	0	0	None
Nenana	0	0	0	0	None
Noatak	0	0	0	0	None
Noorvik	0	0	0	0	None
Rampart	0	0	0	0	None
Stevens Village	0	0	0	0	None
Tanana	0	0	0	0	None

Table 49. Alternative C impact indicator summary – resource importance and use areas

Community	Number of high resources crossed	Number of moderate resources crossed	Number of low resources crossed	Number of resource of indeterminate importance crossed	Level of project intersection with use areas
Shungnak	**5**	**2**	**1**	0	Bisect
Kobuk	**4**	**3**	**2**	0	Bisect
Hughes	**4**	**3**	**1**	1	Bisect
Allakaket	**4**	**3**	**2**	0	Partial
Ambler	**4**	**3**	**1**	0	Partial
Alatna	**1**	**3**	**1**	**0**	Partial
Stevens Village	**3**	**2**	**2**	**0**	Periphery
Tanana	**2**	**0**	**1**	**0**	Periphery
Huslia	**1**	**2**	**0**	**0**	Periphery
Selawik	**1**	**0**	**1**	**0**	Periphery
Anaktuvuk Pass	**1**	**0**	**1**	**0**	Isolated
Kiana	**1**	**0**	**0**	**0**	Isolated
Beaver	**0**	**0**	**0**	**0**	None
Bettles	**0**	**0**	**0**	**0**	None
Buckland	**0**	**0**	**0**	**0**	None
Coldfoot	**0**	**0**	**0**	**0**	None
Evansville	**0**	**0**	**0**	**0**	None
Galena	**0**	**0**	**0**	**0**	None
Kotzebue	**0**	**0**	**0**	**0**	None
Livengood	**0**	**0**	**0**	**0**	None
Manley Hot Springs	**0**	**0**	**0**	**0**	None
Minto	**0**	**0**	**0**	**0**	None
Nenana	**0**	**0**	**0**	**0**	None
Noatak	**0**	**0**	**0**	**0**	None
Noorvik	**0**	**0**	**0**	**0**	None
Rampart	**0**	**0**	**0**	**0**	None
Wiseman	**0**	**0**	**0**	**0**	None

6.6. Other Indirect and Cumulative Impacts/Indirect and Cumulative Impacts of Growth

This section discusses other indirect and cumulative impacts of the AMDIAR and associated growth in the region, including mining development and other road access. Various economic, social, and environmental changes throughout history have affected subsistence use patterns of the study communities and required subsistence users to be highly adaptive. Major historic events that have affected subsistence in the region include pre-contact trade and contact between Iñupiat and Athabascans; initial European contact that introduced western trade goods; the fur trade in the early nineteenth century that introduced a market economy and the use of firearms; the late nineteenth and early twentieth century gold rush that resulted in territorial shifts, establishment of new communities, intermarriage, and a subsequent starvation period compounded by a caribou decline; introduction of new technologies such as outboard motors; and missionaries and school requirements that resulted in the centralization of communities and abandonment of semi-nomadic subsistence patterns (Watson 2018).

More recent actions which have affected subsistence uses and resources within the study region include mining development (including the Red Dog Mine), infrastructure projects, scientific research, recreation and tourism, sport hunting and fishing, hunting and harvesting regulations, establishment of wildlife refuges and national parks, and environmental changes resulting from climate change. Construction of the TAPS and Dalton Highway have affected subsistence access and resource availability for communities in the eastern portion of the project area, with many residents believing that the highway and pipeline have resulted in changes to caribou migration across the region. The Red Dog Mine, including the DMTS and port site, has introduced contamination concerns for local residents, particularly Kivalina residents who are situated downstream from the mine, and have affected resource distribution and migration for resources such as caribou and marine mammals possibly resulting in decreased harvests of these resources over time (EPA 2009). Increased sport hunting and fishing in the region and associated air traffic have resulted in increased competition for local subsistence users in addition to disturbance and displacement of subsistence resources such as caribou. The establishment of Gates of the Arctic National Park and Preserve (GAAR) in the 1980s also affected access to and use of traditional harvesting areas for residents of nearby communities within the northeastern portion of the project area (Watson 2018). Current subsistence use patterns, as described in Section 5, are the result of the adaptation of communities to all of the above forces of change. Any future actions, regardless of how minor they seem at the time, will also contribute to changes in subsistence patterns.

Impacts of climate change include changes in the predictability of weather conditions such as the timing of freeze-up and breakup, snowfall levels, storm and wind conditions, and ice conditions (e.g., ice thickness on rivers and lakes), all of which affect individuals' abilities to travel to subsistence use areas when resources are present in those areas. In addition, subsistence users may experience greater risks to safety when travel conditions are not ideal. Changes in resource abundance or distribution resulting from climate change can also affect the availability of those resources to subsistence users or may cause subsistence users to travel farther and spend more time and effort on subsistence activities (Brinkman 2016).

Construction and operation of the AMDIAR would likely result in changes to resource abundance, resource availability, and user access for many of the subsistence study communities. The project would introduce a large industrial road corridor into an area that was previously undeveloped and which was used primarily for subsistence and recreational purposes. Under any alternative, 12 communities have direct uses of the project corridor(s), and a majority of these communities are rural, low-income, non-road-connected communities who rely on subsistence to support their mixed economy. The AMDIAR would introduce impacts to resource abundance and resource availability for key resources such as sheefish, whitefish, salmon, and caribou, while also reducing (rather than facilitating) access to traditional harvesting areas. The road itself may increase access to and reduce costs of commercial goods for certain communities; however, few local jobs directly associated with the road (e.g., maintenance and operation) will be available after construction. Impacts to resource availability and user access will be most pronounced for communities who do not experience increased income associated with the road (i.e., road or mining jobs) and/or do not experience benefits of the road related to lowered costs of subsistence supplies/equipment, food, or other goods. These communities would have less opportunity to purchase or invest in fuel and equipment to adjust to changes in access and resource availability.

Reasonably foreseeable actions within the region that could contribute to subsistence impacts include development of the Ambler Mining District (Arctic, Bornite, Sun, and Smucker projects); use of the AMDIAR for commercial access; use of the AMDIAR for commercial use by local communities and Native Allotment owners. Secondary access roads connecting the AMDIAR to other mining areas and claims, Air Force lands, and local communities are also a potential. See Appendix H for details.

The AMDIAR will facilitate additional mining and other development throughout the study region, which will contribute to impacts on subsistence resource abundance, resource availability, and user access for subsistence users across the region. Mining development will result in the physical removal of traditional subsistence hunting and harvesting areas for the study communities in addition to decreased access to these areas through security/access restrictions and through user avoidance of development areas. The overall area available for subsistence use will likely shrink over time due to the increasing presence of infrastructure and human activity within traditional use areas.

Construction of additional access roads to mines, communities, and other locations will contribute to fragmentation of habitat for resources such as caribou and moose, which would remove usable habitat for these resources and in the case of caribou could cause substantial changes in range distribution. While the construction of roads would result in a net loss of current habitat areas, clearing and maintenance of ROWs may also create new movement corridors and feeding areas, particularly for moose. Impacts to migrating caribou increase with density of roads and infrastructure (see Section 3.3, Mammals). Mining activities would cause further disturbance to wildlife through the presence of mine pits and noise and disturbance from heavy machinery, blasting, and human activity. Mine development and additional road construction would also contribute to further contamination and alteration of waterways which may cause substantial degradation to spawning grounds and other habitat for non-salmon fish (sheefish and other whitefish) and salmon that are key subsistence species across the region. Mining and further road development could have population-levels effects on certain fish species, particularly if mine activities result in contamination or degradation of Kobuk River sheefish spawning grounds and Alatna River whitefish spawning grounds. One of the four potential mine projects is located on a stream that is a direct tributary of the Kobuk River's only sheefish spawning grounds, the other three enter downstream of that spawning ground. Contamination of these tributaries could have population level impacts on sheefish, a key subsistence resource in the study region.

The potential for increased access into the project area resulting from local and non-local use of the project road and ROW (regardless of legality) may increase competition in the region for certain resources and decrease harvesting success for local hunters. Secondary access roads developed by communities would likely be used, at least by local residents, for subsistence harvesting activities and could create harvesting corridors and increase competition within those areas. Even if the road is reclaimed, the remaining cleared area within ROW would likely become accessible for local and non-local hunters traveling by snowmachine and off-road vehicles. If the road, ROW, or reclaimed ROW increases access into the region, state and federal regulators may respond by introducing stricter hunting and harvesting regulations as well, which would affect availability of resources to local communities. Increased competition and decreased resource availability may result in residents having to travel farther and spend more time, money, and effort to harvest resources such as moose and caribou.

The potential for increased access into the region was a key concern voiced by residents during both scoping and traditional knowledge studies associated with the AMDIAR (Watson 2014, BLM 2018b). Many residents do not believe that the road will remain private and point to previous roads which they believed to have restricted access which were eventually opened to the public (e.g., the Dalton Highway). The WAHWG cited the Dalton Highway as an example of how restricted access roads can easily be opened to the public due to political and public pressure:

> The WACH declined for much of the last two decades. Reduced population levels during that time led to harvest restrictions. Although the most recent caribou count indicates a population that is stabilizing or possibly starting to increase, concerns remain that increased access due to roads could greatly compound user conflict and limited availability of caribou. We recognize that the proposed road is currently specified as being commercial-only. However, history (e.g., with the Dalton Highway) suggests that once roads are established they eventually become used by the public. We are greatly concerned that the Ambler Road will not remain closed to public use given this history and the multiple jurisdictions (State, Federal and Native) that the proposed road would cross. (Western Arctic Caribou Herd Working Group 2018)

In addition, it is unclear whether the road would allow access to small mining claims; while large mines would likely have policies regarding hunting and fishing by workers, smaller mining outfits or individuals may allow these activities. According to Guettabi et al. (2016), increased access resulting from the road and/or ROW would likely reduce harvest success for local hunters, particularly for moose. Specifically, the study analyzed harvest rates by the number of hunters in game management units (GMUs) and found that the quantity of moose harvested was inversely related to the number of moose hunters within a GMU. The study estimated that for every one percent increase in the number of moose hunters in the project area, communities along the project corridor would harvest approximately 1.09 times less moose than if there were no additional access to the region. However, this conclusion is based on an assumption that the road will eventually be opened to public access, which BLM does not believe is reasonably foreseeable. Increased access of the area resulting solely from illegal trespass of restricted roads and/or ROWS would likely not have the same level of impacts on harvesting success. According to the WAHWG (2017), communities within the region have already experienced increased competition in traditional hunting areas, with greater numbers of hunters concentrated within smaller areas. Sport hunting is a key issue within the region for subsistence harvesters, and illegal access to the area via a road or ROW would contribute to these impacts.

If the AMDIAR results in reduced availability of subsistence resources such as moose, caribou, sheep, small land mammals, fish, waterfowl, or vegetation, or if it decreases access to traditional use areas, then residents from the study communities may have to spend greater amounts of time, effort, and money in order to locate and procure these resources. Residents may also have to travel farther to less familiar areas to find resources, with greater risks to health and safety. While some hunters respond to changes in resource availability by taking more trips and increasing costs in order to harvest what they need, others may choose to take fewer trips because of lack of funds or reduced success.

Communities in the study region currently have high levels of unemployment and low income with high costs of living; despite these factors, many of the study communities have remained stable and resilient through a mixed economy which revolves around subsistence hunting and harvesting (Guettabi et al. 2016). Construction of the AMDIAR and associated mining development would result in increased employment opportunities and income for residents of some of the subsistence study communities. Residents may invest the income from construction, operation, and mining jobs into supplies and equipment (e.g., snowmachines, outboards, fuel, ammunition) to support subsistence activities. In addition, the ability to use the road to transport commercial goods, including subsistence supplies and equipment, may also reduce certain costs associated with subsistence. However, at this time, there is no guarantee that this benefit is certain for any community. In addition, benefits associated with increased employment and income would be most likely to occur for NANA shareholders and communities due to agreements between mining companies on NANA lands regarding local hire policies. Thus, interior communities such as Alatna, Allakaket, Bettles, and Evansville may experience subsistence impacts (e.g., reduced resource availability and access to traditional harvesting areas) without the counter benefits of increased income and employment associated with mine development.

Those individuals who obtain long-term employment associated with the AMDIAR or associated mining developments may experience reduced time to engage in subsistence activities, although they may continue to invest monetarily in and support subsistence activities for others in the community. Those with mining jobs may move away from their communities, as some have done in association with the Red Dog Mine, to larger urban centers. The benefits of increased employment and income will likely only occur for certain households and certain communities and could cause social tensions associated with increased inequality. As noted in BurnSilver and Magdanz (2019), household responses to social, economic, and environmental change are not homogenous, and benefits of economic growth are generally not distributed equally. Certain households are more vulnerable to changes in community economic status and disruptions in subsistence harvesting, social ties, and sharing. Household sensitivity and adaptive capacity are good indicators of how households will respond to sudden change. Factors determining household sensitivity include low-harvest, low-income households, or households that are “unbalanced” or “spread thin” (e.g., medium-harvest, low income; or low harvest, high income). Certain communities have greater adaptive capacity, overall, than others, but all communities show significant variation among individual households. Thus, increased economic benefits to a region will not be distributed equally to all households and the most vulnerable households will likely experience the greatest consequences of subsistence disruptions through weakened social networks and the inability to adapt to changes in resource availability.

In rural Alaska, certain households or individuals play a particularly important role in harvesting and distributing subsistence foods to households and individuals who are unable to hunt or harvest for themselves. Research from the ADF&G has found that as a general rule, 30 percent of households, referred to as “super-harvester households,” generally harvest 70 percent of the total community harvest (Wolfe 2004). Harvests may be even more concentrated for specific resources such as caribou (SRB&A Forthcoming; Kofinas et al. 2016). An increase in employment associated with the road and mine developments may result in some households or individuals shifting away from their roles as super-harvesters as they have less time to engage in subsistence activities as they once did. Subsistence roles within a community regularly change and evolve due to household circumstances (e.g., age and number of household members, employment levels, income, health), and communities generally adapt to these changes, with new harvesters filling or returning to previous subsistence roles as their circumstances allow and as the need presents itself. In addition, the roles of super-harvester households and high-earning households are not mutually exclusive; in fact, Kofinas et al. (2016) found that many super-harvester households are high income households, and the vast majority of high harvesting households have at least one employed household member. Other research has shown an inverse relationship between income and harvesting levels, with high income associated with lower harvests (Guettabi et al. 2016). On a community scale, Magdanz et al. (2016) found a 2.5 percent decrease in in household mean harvests for each 10 percent increase in household income. In a single study community controlling for household size, the harvest-income association disappeared. Thus, recent research suggests that at a community and household level, increased income is not associated with increased harvest.

It is likely that responses to increased income will vary by households; some households will invest their increased income into subsistence pursuits (including providing gas and supplies to active harvesters from other households), while others may gradually participate less in the subsistence economy. A sudden increase in employment levels in a community may cause at least a temporary disruption in social ties and roles within the subsistence study communities, which could cause a decline in the distribution of subsistence foods for a period of time.

A number of studies have documented the resilience of subsistence communities in the face of sudden or dramatic changes, noting that communities and households often respond to scarcity of one resource (caribou) by increasing their harvests of another, or by increasing income sources when subsistence foods are less available (Martin 2015). Resilience allows communities and households to adjust to changes while maintaining access to key cultural resources and activities. However, the ability of households to be resilient in the face of change does not negate the existence of impacts, nor does it imply that households can simply adapt to all forces of change. In addition, as discussed above, communities and households are not homogenous in their capacity to adapt to sudden change (BurnSilver and Magdanz 2019) Larger disruptions to subsistence ties, particularly in combination with decreased availability of key subsistence resources, could affect social, cultural, and economic well-being, particularly to the more vulnerable low income, unconnected, and low-harvest households who rely on strong sharing networks for their food security (Kofinas et al. 2016). Over time, if communities in the region become road-connected, the availability of goods, increased income and employment opportunities, and decreased harvesting opportunities could result in an overall decrease in subsistence harvests among the study communities.

Ultimately, the cumulative impacts to subsistence resulting from the AMDIAR, other reasonably foreseeable developments, and climate change could result in reduced harvesting opportunities for local residents and alterations in subsistence harvesting patterns. A recent analysis comparing road-connected communities to non-road-connected communities showed that road-connected communities have substantially lower subsistence harvests than non-road-connected communities (Guettabi et al. 2016). Other research (e.g., Magdanz et al. 2016) has shown an estimated decline of one-third of subsistence harvests for communities along a publicly accessible road, with the potential for a relatively modest increase in income; thus, the loss to subsistence would likely not be offset by an increase in income, nor would increase income address the social or cultural losses to communities. These studies analyzed socio-economic impacts of a road into the study region but was based on the assumption that the road would eventually become public, which BLM has determined is not reasonably foreseeable. The road-connected communities in its analysis were located on publicly-accessible roads in more densely populated areas. The currently proposed road is a private, industrial-access road but would also incrementally introduce elements of a commercially accessible road including increased access to and decreased costs of goods such as food and equipment. Thus, while the AMDIAR may not reduce subsistence harvests to levels seen along other road-connected communities in the state, the combination of reduced resource availability, decreased user access, increased income (for some communities), and increased access to commercial goods (for some communities), will likely alter subsistence harvesting patterns across the region and affect overall subsistence harvests for certain communities. Decreased harvests among the study communities could have wide-ranging effects due to the potential impacts on sharing networks within the region in addition to networks which extend to other regions (Kofinas et al. 2016). Sharing is a key value across the study region which is central to subsistence. Decreased harvests could disrupt existing sharing networks to other communities and regions if residents are unable to share as widely or frequently as they are accustomed.

Cumulative impacts of Alternative A and B related to resource abundance and availability would likely be greater than those under Alternative C, as they would be more likely to affect resource availability of migrating caribou to the subsistence study communities, particularly during the fall months, and are most likely to have population-level effects on sheefish and whitefish, all key subsistence species among the study communities. However, impacts related to user access and direct impacts on resource availability along the road corridors would be similar across all alternatives and would affect a similar number of study communities.

When subsistence users' opportunities to engage in subsistence activities are limited, then their opportunities to transmit knowledge about those activities, which are learned through participation, are also limited. If residents stop using portions of the project area for subsistence purposes, either due to avoidance of development activities or reduced availability of subsistence resources, the opportunity to transmit traditional knowledge to younger generations about those traditional use areas would be diminished. While communities would likely maintain a cultural connection to these areas and acknowledge these areas as part of their traditional land use area, the loss of direct use of the land could lead to reduced knowledge among the younger generation of place names, stories, and traditional ecological knowledge associated with those areas. There would also be fewer opportunities for residents to participate in the distribution and consumption of subsistence resources, ultimately affecting the social cohesion of the community. Any changes to residents' ability to participate in subsistence activities, to harvest subsistence resources in traditional places at the appropriate times, and to consume subsistence foods could have long-term or permanent effects on the spiritual, cultural, and physical well-being of the study communities by diminishing social ties that are strengthened through harvesting, processing, and distributing subsistence resources, and by weakening overall community well-being.

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Appendix M:

ANILCA Section 810 Final Evaluation

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A. ANILCA Section 810 Final Evaluation

This analysis of subsistence impacts is prepared for the Ambler Road Final Environmental Impact Statement (FEIS) that analyzes the environmental consequences of a proposed road to the Ambler Mining District (District). The U.S. Bureau of Land Management (BLM) has prepared this analysis, on behalf of the Department of Interior, to fulfill the departmental requirements pursuant to Section 810 of Alaska National Interest Lands Conservation Act (ANILCA), as part of the FEIS to address a right-of-way (ROW) application filed by the Alaska Industrial Development and Export Authority (AIDEA). AIDEA proposes to construct, operate, and remove a 211-mile, all-season, industrial access road from the existing Dalton Highway at milepost (MP) 161 westerly to the District, located within the Northwest Arctic Borough (NAB) in the southern foothills of the Brooks Range of north-central Alaska. Under AIDEA's proposal, approximately 25 miles of the 211 miles of road would cross BLM-managed lands and approximately 26 miles would cross NPS-managed lands. According to AIDEA, the road would provide access for mineral exploration, mine development, and mining operations in the District as well as commercial commerce to communities if spur access roads are developed in the future. The proposed road would not be open to public access. There is currently no road or other surface access to the District from the existing transportation network. The District has long been recognized as containing a variety of mineral deposits, which have been explored or evaluated for more than a century (AIDEA 2016; Grybeck 1977). There are more than 1,300 active mining claims in the District vicinity (ADNR 2018). A 2015 economic analysis identified 4 major mineral deposits, with Ambler Metals' (formerly Trilogy Metals Inc.) Arctic and Bornite deposits the most active (Cardno 2015), which would benefit from an industrial access road to develop the deposits and improve economics.

The FEIS provides detailed analysis of the following three road alternatives and a no-action alternative:

- No Action Alternative: The No Action Alternative evaluates what would occur if the BLM does not grant a road ROW to AIDEA. The No Action Alternatives provides a baseline for comparison to the other alternatives and it is a potential outcome of the FEIS.
- Alternative A: Alternative A is AIDEA's proposed alternative. It starts at MP 161 of the Dalton Highway and is 211 miles long with 3,498 acres of DOI-managed lands. The distance from Fairbanks to the road terminus would be 456 miles.
- Alternative B: Alternative B is an alternate route proposed by AIDEA across NPS lands in GAAR. It is a variation on Alternative A, with the same beginning point (MP161) and termini. It is 228 miles long with 3,083 acres of Department of Interior (DOI)-managed lands. The distance from Fairbanks to the road terminus would be 473 miles.
- Alternative C: Alternative C grew out of scoping comments. The route begins at MP 59.5 of the Dalton Highway and is 332 miles long with 19,090 acres of DOI-managed land. The distance from Fairbanks to the road terminus would be 476 miles.

A.1 Subsistence Evaluation Factors

Section 810(a) of (ANILCA), 16 United States Code (USC) 3120(a), 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." As such, an evaluation of potential impacts on subsistence under ANILCA Section 810(a) must be completed for the Ambler Road Draft Environmental Impact Statement (FEIS). ANILCA requires that this evaluation include findings on three specific issues, as follows:

- The effect of use, occupancy, or disposition of public lands on subsistence uses and needs

- The availability of other lands for the purposes sought to be achieved
- Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes

Per Bureau of Land Management (BLM) Instruction Memorandum No. AK-2011-008 (BLM 2011), three factors are considered when determining if a significant restriction of subsistence uses and needs may result from the proposed action, alternatives, or in the cumulative case, as follows:

- Reduction in the abundance of harvestable resources used for subsistence purposes
- Reduction in the availability of resources used for subsistence caused by alteration of their distribution, migration patterns, or location
- Legal or physical limitations on access of subsistence users to harvestable resources

Each alternative must be analyzed according to these criteria. ANILCA Section 810 also requires that cumulative impacts be analyzed (BLM 2011). This approach helps the reader separate subsistence restrictions that could be caused by activities proposed under the four alternatives, including the no action alternative, from those that could be caused by past, present, or future activities that have occurred or could occur in the surrounding area.

An alternative would be considered to significantly restrict subsistence uses if, after consideration of protection measures, such as lease stipulations or required operating procedures, it can be expected to substantially reduce the opportunity to use subsistence resources (BLM 2011). Substantial reductions are generally caused by large reductions in resource abundance, a major redistribution of resources, extensive interference with access, or major increases in the use of those resources by non-subsistence users.

If the analysis determines that the proposed action, alternatives, or the cumulative case may significantly restrict subsistence uses, the head of the Federal agency having jurisdiction over the federal public lands in question is required to notify the State of Alaska and appropriate regional and local subsistence committees. It also must conduct ANILCA Section 810 hearings in potentially affected communities.

It is possible that the finding may be revised to "will not significantly restrict subsistence uses" based on changes to alternatives, new information, or new mitigation measures resulting from the hearings. If the significant restriction remains, the head of the Federal agency having jurisdiction may prohibit the action or finalize the evaluation by making the following determinations:

- A significant restriction of subsistence uses would be necessary, consistent with sound management principles for the use of public lands
- The proposed activity would involve the minimal amount of public land necessary to accomplish the purpose of the use, occupancy, or other disposition
- Reasonable steps would be taken to minimize adverse effects on subsistence uses and resources resulting from such actions (Section 810(a)(3))

The head of the Federal agency having jurisdiction can then authorize use of the public lands.

B. ANILCA Section 810(A) Evaluations and Findings for All Alternatives and the Cumulative Case

Chapter 2 of the FEIS includes a detailed description of the sequencing of construction, operation and maintenance and decommissioning of the road. Road construction includes procurement and use of gravel resources, timing of construction, construction equipment and uses, personnel camps and support logistics, including air traffic support for personnel and material. Construction of the road would be in three separate phases, projected to span 10 years. Operations and maintenance include mine operations, material and ore transport, transport of fuel and chemicals, maintenance of material sites and facilities and communications. Decommissioning includes the proposed decommissioning of the project and reclamation. The evaluation and findings following this introductory section include short summaries of the alternatives descriptions otherwise described in detail in the FEIS.

Chapter 3 of the Ambler Road FEIS describes the current environmental status of the project area and potential effects of the alternatives to subsistence and subsistence resources. Appendix H of the Ambler Road FEIS: Indirect and Cumulative Impacts Associated with the Ambler Road of the FEIS addresses the indirect and cumulative impacts of the road and Appendix L of the Ambler Road FEIS: Subsistence Technical Report assesses information regarding subsistence use in the project area. This analysis uses the above information from the FEIS to evaluate potential impacts to subsistence pursuant to Section 810(a) of ANILCA and as directed in BLM instruction memorandum (BLM IM AK-2011-008).

The evaluation of potential impacts to subsistence resources was conducted by identifying impact indicators and analyzing potential impacts of the proposed road and its alternatives on subsistence uses. These impacts were compared to the three subsistence impact categories according to Section 810 of ANILCA: resource abundance, resource availability and user access. Two impact indicators were identified that could be quantitatively measured for the subsistence communities: resource importance and subsistence use areas. Resource importance is measured in three categories: high, moderate and low. Resource importance is established by analyzing historical harvests from the potentially affected communities. Subsistence use areas were quantified from years of subsistence use data collected primarily by ADF&G. A detailed discussion of this methodology is available in Appendix L of the Ambler Road FEIS: Subsistence Technical Report Section 5.

These impact indicators are based on NEPA guidance, which requires consideration of both context and intensity when assessing significant impacts (40 CFR 1508.27). By understanding the relative importance of each subsistence resource and the location of where these subsistence resources are used, as well as the context and intensity of impacts to subsistence resources and activities, vulnerable impacts from the proposed project can be better analyzed.

Subsistence uses and resources are discussed in detail in the Ambler Road FEIS Section 3.4.7. Tables 42-45 in Appendix L of the Ambler Road FEIS: Subsistence Technical Report Section 6.4 illustrates the resource importance to each community whose subsistence use area would potentially be affected by the proposed road. Tables 47- 49 of the technical report quantifies the categories of resource importance by community. Each alternative of the proposed road is evaluated for the availability, abundance and access to subsistence resources of importance to communities: caribou, moose, fish (salmon and non-salmon), vegetation and other resources (large land mammals, marine mammals, migratory birds, etc.).

B.1 Evaluation and Findings for No Action Alternative

Under the No Action Alternative, the BLM would not grant a ROW. The No Action Alternative provides a baseline against which impacts under other alternatives can be evaluated.

B.1.1 Evaluation of the Effect of Use, Occupancy or Disposition on Subsistence Use and Need

Under the No Action Alternative, there would be no reduction in the abundance of harvestable resources (caribou, moose, salmon, non-salmon fish, vegetation and other) used for subsistence purposes. There would be no adverse impacts on wildlife habitats, direct impacts on subsistence resources, or increased harvest and increased competition from non-subsistence users. There would be no reduction in the availability of subsistence resources caused by an alteration in their distribution, migration, or location. There would be no limitation on the access of subsistence users to harvestable resources, including physical and legal barriers.

B.1.2 Evaluation of the Availability of Other Lands

Under the No Action Alternative, construction and operation of the road would not occur on federally managed public lands. Therefore, there would be no need to evaluate other lands for the access road.

B.1.3 Evaluation of Other Alternatives That Would Reduce or Eliminate the Use, Occupancy or Disposition of Public Lands Needed for Subsistence Purposes

Under the No Action Alternative, construction and operation of the road would not occur. Therefore, there would be no need to evaluate other ways to accommodate the proposed action.

B.1.4 Findings

The No Action Alternative would not result in a significant restriction of subsistence uses. A positive determination pursuant to ANILCA Section 810 is not required.

B.2 Evaluation and Findings for Alternative A (AIDEA Proposed Route (GAAR North) to the Dalton Highway)

Alternative A is a 211-mile alignment, accessing the District from the east, with its eastern terminus at MP 161 of the Dalton Highway. It is a total length of 456 miles to Fairbanks. It runs almost directly west to the District across primarily state-managed, BLM-managed, and NPS-managed lands. The ROW would traverse the south side of the Brooks Range, following a series of stream and river valleys oriented roughly east-west, separating the Schwatka Mountains from a series of smaller mountain ranges and foothills, including the Ninemile Hills, Jack White Range, Alatna Hills, Helpmejack Hills, Akoliakruich Hills, Angayucham Mountains, and Cosmos Hills. This route crosses GAAR farther north than Alternative B. See Ambler Road FEIS, Appendix A, Map 2-3.

B.2.1 Evaluation of the Effect of Use, Occupancy or Disposition on Subsistence Use and Need

B.2.1.1 Caribou

Abundance

Caribou, of the large land mammals, is the most depended upon natural resource available to potentially affected communities (FEIS Section 3.3.4 Mammals). In this region of Alaska caribou is the primary resource harvested, making up 32 percent of the total poundage of consumable resources (Appendix L, Section 5.1.2).

In 18 of the 27 communities involved in this study, caribou are of high or moderate importance (Appendix L, Table 42). Of these communities, nine would see a direct impact by the proposed action: Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Evansville, Kobuk, Selawik and Shungnak. Bettles, Evansville, Kobuk and Shungnak all have subsistence use areas that would be bisected by the proposed road. Evansville, Kobuk and Shungnak are considered in the high value resource category for caribou. These communities would be impacted most by the ROW. Alatna, Allakaket and Ambler subsistence use areas would be partially bisected by the proposed action. Allakaket and Ambler are both ranked in the high category for caribou use, with Alatna ranked moderate. Anaktuvuk Pass and Selawik are located on the periphery of the project. Both communities are in the high dependence category for caribou use. All other communities in the subsistence study, whether they are ranked as having a high, moderate or low dependence on caribou, have subsistence use areas outside of the project area and likely wouldn't see an impact on their subsistence use.

The project area passes through the winter, migratory and peripheral range of the WAH and the peripheral range of the Hodzana Hills Herd (HHH). Construction and operation activities as described in the proposed road FEIS Section 3.4.7 could affect abundance by:

- causing direct mortalities
- loss and fragmentation of habitat
- behavioral changes

Direct mortalities could occur if traffic is at expected use of 168 trips per day, with the chance for a caribou-vehicle strike. While this may occur, the significance of an individual collision on the herd population would be minor. Caribou may also see the road as a physical barrier that may alter their behavior or shift their migratory patterns. This may lead to a change in body condition due to expenditure of energy (Sullender 2017). Increased energy expenditures may result in reduced foraging rates and, ultimately, decreased mating success/pregnancy rates. Caribou migration may be altered to the point where calving success and winter survival are affected. These would both have major impacts on the herd population. While the proposed project will occur in approximately .0005% of the WAH overall range, effects from fragmenting an unbroken habitat with a linear structure may impact caribou behavior. These changes could lead to a higher mortality rate in caribou affecting the overall population.

Availability

Bettles, Evansville, Kobuk and Shungnak subsistence use areas would all be bisected by the proposed road alignment. Caribou is a high value resource to Shungnak, Evansville and Kobuk and a moderate resource to Bettles. These communities would experience the greatest impact from the road being built. The project would intersect a portion of the subsistence use areas of Allakaket, Alatna and Ambler. Allakaket and Ambler are ranked as high value for caribou, with Alatna ranked as moderate. Wiseman and Selawik subsistence use areas are both on the periphery of the proposed project and are ranked as high value for caribou. Hughes is also on the periphery of the area but is ranked as moderate value on caribou. Impacts to these communities could be realized as subsistence users having to travel farther and longer to harvest caribou than they previously did. It could also cause less overall hunter success, meaning subsistence users would have to turn to non-traditional food sources.

The primary construction and operation activities which may affect caribou availability to local communities include:

- air and ground traffic
- construction noise (e.g., blasting, machinery)
- presence of linear infrastructure (e.g., road)
- human activity

Air traffic has been a commonly reported and observed impact on caribou on the North Slope and in Northwest Alaska (SRB&A 2009, 2018, Georgette and Loon 1988, Sullender 2017). Air traffic is observed to cause behavioral changes, skittish behavior, and delayed or diverted crossing behavior, which in turn has impacts on caribou hunting success. These types of behaviors are most observed in response to helicopter traffic, although fixed-wing aircraft have also been observed to elicit similar responses. In addition to changes in behavior, increased exposure to aircraft disturbance may also affect body condition through increased energy expenditures (Sullender 2017). Furthermore, increased energy expenditures may result in reduced foraging rates and, ultimately, decreased mating success/pregnancy rates. This would have significant impacts on the herd population.

Roads, road traffic and construction are also believed to cause behavioral and migratory changes in caribou which can affect hunting success. Deflections or delays of caribou movement from roads and associated ground traffic and human activity has been documented in the traditional knowledge of harvesters (SRB&A 2009, 2014, 2018) and during behavioral studies on caribou, particularly for maternal caribou (ABR and SRB&A 2014 and Johnson et al 2019). In recent years, reports of ground traffic–related impacts on the North Slope caribou hunting, particularly in the vicinity of Nuiqsut, have increased with the construction of gravel roads in the area (SRB&A 2016, 2017, 2018). Impacts of roads have also been observed by Noatak and Kivalina caribou hunters regarding the Red Dog Delong Mountain Transportation System (DMTS) (SRB&A 2014). Residents have observed that some caribou may stop once they reach the DMTS, sometimes traveling alongside the road before crossing, and other times bypassing the road altogether. Such behavior has also been documented through radio collar observation. A study conducted by (Wilson et.al. 2016), found that the DMTS influenced the movements of approximately 30 percent of radio-collared WAH caribou, and the average delay in crossing was 33 days. Caribou from the Teshekpuk Herd (TH) were not similarly affected, which could be due to greater exposure of the TH to industrial development in the eastern portion of its range. In general, observed caribou behavior in response to the DMTS is variable: in some cases, caribou cross seemingly without delay, while in other cases herds scatter and migration is delayed for multiple days (Wilson et al. 2016, ABR and SRB&A 2014). Responses to roads also seem to vary from year to year based on the context in which roads are encountered.

Access

Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Evansville, Kobuk, Selawik and Shungnak would all see their subsistence hunting areas intersected by the proposed ROW (Appendix L: Tables 42 and 47). Bettles, Evansville, Kobuk and Shungnak would have their hunting areas bisected by the project. Allakaket, Alatna and Ambler would have their subsistence hunting area partially intersected, while Selawik would be on the periphery of the project. The communities that would have their use areas wholly or partially bisected would see the largest impact on their subsistence activities.

Impacts to harvester access would occur within the vicinity of the road corridor, where harvesters could be faced with physical obstructions to access or by removal of usable area (e.g. avoidance of work areas).

- physical barriers: road, construction laydown materials, pilings and heavy equipment
- diversion: avoidance of material sites and other areas which are unsafe for travel
- crossing ramps: placement of ramps and ease of use by subsistence users, hunters may not be permitted to cross construction-phase roads until crossing areas are established

The degree of impacts from construction and operation would depend on whether the timing of construction activities conflicts with subsistence use areas and activities for a community. Because construction would occur year-round, it is likely that there would be direct conflicts with construction activities for certain subsistence use areas. Subsistence activities occur year-round, peaking in the fall (August and September) and again in the mid-winter and early spring (February through April) for most study communities with available data (Appendix L: Section 5). The project corridors cross areas used for both riverine and overland travel, and construction activities would occur year-round; thus, residents may experience significant impacts during all subsistence seasons and activities which are overlapped by the proposed ROW.

The proposed ROW would not permit access to residents for subsistence purposes but would allow residents to cross the road at established crossing areas. The efficacy of crossing ramps to reduce access impacts for local hunters would depend on the location, design, and frequency of the ramps along the ROW. Subsistence users do not always use or follow established trails when pursuing resources overland; instead traveling in various directions based on environmental factors (e.g., weather, snow and ice conditions) and traditional knowledge of resource distribution and behavior. Therefore, the presence of crossing ramps would not eliminate significant impacts to user access. Subsistence users may have to travel additional distances when pursuing resources in order to locate approved crossing areas, or they may take safety risks by crossing in areas not approved for crossing. In addition, despite the presence of crossing ramps, some individuals may still have difficulty using crossing ramps, especially when hauling sleds. Subsistence users in the community of Nuiqsut have reported difficulty under certain conditions when using crossing ramps on industrial roads near their community (SRB&A 2018).

B.2.1.2 Moose

Abundance

The proposed road corridor crosses subsistence moose hunting areas for nine communities. Moose is considered a resource of high importance for five of the communities (Alatna, Allakaket, Bettles, Evansville and Wiseman), and of moderate importance for three communities (Ambler, Kobuk, and Shungnak) (Appendix L, Table 42).

Construction and operation activities as described in the proposed road FEIS Section 3.4.7 could affect abundance by:

- causing direct mortalities
- loss and fragmentation of habitat
- behavioral changes

Direct mortalities could occur during construction and operation both from vehicle-moose collisions. An estimated 168 trips on the road daily would substantially increase the probability of a collision. This probability would be the same all year long. Construction would affect moose through removal or disturbance of habitat. Since moose have smaller ranges than caribou and do not migrate, impacts would be more localized to the immediate vicinity of the road.

Availability

Impacts to moose availability would generally be on a smaller geographic scale than for caribou, as moose have smaller ranges and residents do not rely on seasonal migratory movements when hunting them. Thus, impacts to moose hunting from construction and operation of the road would occur primarily in the vicinity of the road where moose could exhibit avoidance or other behavioral changes. Because a majority of moose hunting in the region occurs along rivers during the fall months, impacts would be most likely to occur in areas where the road corridor crosses key moose hunting rivers such as the Koyukuk and Kobuk rivers, and smaller drainages such as the Alatna, John, and Wild rivers. Residents may experience decreased success in these areas due to moose remaining in deeper brush (Appendix L: Section 6.4.1). Because intersections with the road are a very small portion of the rivers, this would not have a significant effect on overall hunter success.

Aside from the temporary disturbance during construction and of traffic during operation, moose availability would not be significantly impacted by the proposed ROW. Moose may actually use the road as a travel corridor, especially in winter. Moose may still be available to harvest by subsistence users at current levels.

Access

While road access for local subsistence users would not be permitted, it is possible that residents from local communities would use the cleared area of the ROW alongside the road as a travel corridor; particularly if game such as moose concentrate in these corridors. Use of the ROW may facilitate access to hunting areas farther from the community as well as between communities. AIDEA indicates that ROW travel would be prohibited, and security would patrol the roads to prevent violations. Enforcement measures would reduce but not eliminate use of the ROW. Restrictions on use of the ROW, particularly by residents when certain areas of the road would be crossable, may be difficult to enforce.

B.2.1.3 Fish

Abundance

The proposed ROW would cross subsistence fishing areas for four communities: Shungnak, Ambler, Bettles and Evansville. Fish is considered a resource of high importance for these communities (Appendix L, Table 42). Key fish species for these communities include chum salmon, sheefish, humpback and broad whitefish and, to a lesser extent, cisco, northern pike, grayling, burbot, and trout. In addition to the above communities who have documented use of the rivers crossed by the proposed project corridor, communities downstream that rely on sheefish (Buckland, Kobuk, Kiana, Noorvik, Selawik, Noatak and Kotzebue) could experience consequences to harvest if larger impacts to fish movement, reproductive success or health occur (FEIS Section 3.3.2, 3-43 and 3-52).

Impacts to fish under Alternative A could include:

- spawning habitat loss
- increased turbidity from construction sedimentation
- contamination from accidental spills
- introduction of invasive species

The proposed ROW would construct bridges across known Koyukuk River Chinook and chum salmon spawning habitat and install culverts in more than 1,000 perennial streams assumed to support anadromous and/or resident fish. Bridges and culverts would eliminate and alter fish habitat (FEIS Section 3.3.2, Fish and Amphibians). Culverts would eliminate portions of natural stream channels by routing flow underneath the roadway embankment. The project proponent proposes to use stream simulation design principles that more replicate natural stream conditions, which will minimize but not eliminate impacts to waterways. Replacing natural habitat with culverts and confining flow through culverts and bridges would reduce habitat complexity, increase sedimentation and scour potential, and degrade habitat quality both upstream and downstream throughout the life of the road.

The Kobuk and Alatna rivers are key spawning grounds for sheefish and are also important fishing areas. The upper Kobuk River supports the largest spawning concentration of sheefish in Alaska. The Kobuk is well known for its world-class sheefish trophy fishing. The Alatna River is the most important spawning area for sheefish and other whitefish species in the upper Koyukuk River drainage (FEIS Section 3.3.2). The ROW would cross both drainages under Alternative A. If construction removed suitable spawning habitat directly, the loss would equate to a significant decrease to spawning success.

Sedimentation, especially when increased over naturally occurring levels, adversely affects habitat quality and function. Increased fine sediments can smother incubating eggs, decrease fry emergence, reduce the amount of suitable habitat for juvenile fish, and decrease benthic community production (Limpinsel et al. 2017). Elevated turbidity from suspended solids diminishes habitat quality, and may decrease primary production, elevate water temperatures, and affect feeding behavior; large plumes can damage gills and impair organ function (Limpinsel et al. 2017). If sedimentation increased in any of the spawning areas, there would be a significant impact to spawning success.

Spills have the potential to substantially degrade habitat quality and affect the long-term health of individual fish and fish populations. Habitat located in the vicinity of road crossing sites, which includes spawning, rearing, feeding, wintering and migratory habitat, would be most susceptible to contamination from potential spills. Such a spill, particularly if near a stream, would substantially alter water chemistry, cause fish mortality, substantially degrade habitat quality and function, and cause population-level effects.

The introduction of invasive species could also impact fish habitat and/or productivity. Unlike other ROW impacts that are expected to be more short-term, the introduction of invasive species could become a long-term impact if their spread is uncontrolled. This would cause a significant effect because of the long-term nature of the impact.

Availability

Construction activities which may affect fish availability to subsistence communities include:

- installation of bridges, culverts and related pile installation
- stream diversion and excavation
- gravel mining
- loss of harvest area

Fish could be diverted, displaced, or obstructed due to culvert placement, excavation, or stream diversion. While impacts to fish resulting from construction activities are expected to be localized, subsistence users often harvest fish in specific locations along rivers; thus, localized changes in fish distribution could have impacts on resource availability for individual harvesters.

Removing gravel from a stream channel changes the structure of its natural habitat for aquatic species, sediment transport dynamics and flow processes; degrades quality and habitat function upstream and downstream of mined areas; and alters fish and invertebrate communities (Brown et al. 1998). Removing streambed gravel from relic channels in the floodplain would degrade habitat quality by reducing habitat complexity and altering dynamics, which may affect survival rates of incubating eggs (Kondolf et al. 2002). Adverse impacts to fish may be fairly localized during the activity, although the full magnitude of effects is difficult to quantify given the lack of specific gravel extraction methods and plans. Studies have shown that attempts to mitigate or restore streams impacted by gravel mining may be ineffective because impacts often extend kilometers upstream and downstream of mined sites (Brown et al. 1998). Gravel mining near sheefish and other whitefish spawning areas would have especially negative consequences to fish populations, since these fish have specific spawning requirements and large numbers of fish spawn in relatively small, distinct areas.

While impacts to fish resulting from construction activities are expected to be localized, subsistence users often harvest fish in specific locations along rivers; thus, localized changes in fish distribution could have impacts on resource availability for individual harvesters. In addition to the communities who have documented use of the rivers crossed by the project corridors, communities upstream and downstream from the project corridors could experience impacts on fish availability if larger impacts to fish movement or health occur. An impact of this scale would be quite significant.

Access

There may be periods of time during construction where access along certain river drainages is obstructed due to bridge construction activities. It is anticipated that bridges would be designed with adequate clearance. However, it is possible that bridges may also obstruct boat travel along certain smaller waterways; the likelihood of this impact depends on individual bridge height and design.

B.2.1.4 Vegetation

Abundance

Vegetation is a high value resource to all communities except Livengood and Nenana in the project area Bettles, Evansville, Kobuk and Shungnak subsistence use areas would be bisected by the ROW. The Wiseman subsistence use area is located on the periphery of the project area.

Construction and operation activities which may affect the abundance of vegetation, including berries, wild plants, and wood include:

- clearing of the ROW
- fugitive dust
- contamination from accidental spills

ROW construction would result in the removal of vegetation harvesting areas for residents. Communities along the proposed road corridors may also experience reduced availability of vegetation in traditional harvesting areas during and after construction of the road. This may lead to an overall decline in the abundance of harvestable vegetation.

In addition, a larger area surrounding the road would likely be removed from use for some individuals due to concerns about contamination. Impacts to vegetation harvest areas resulting from roads has been documented in relation to the Red Dog DMTS (SRB&A 2009b). Residents from Kivalina have reported observing dust on vegetation and changes in the taste or appearance of berries. In addition, some individuals have reported that they no longer use traditional vegetation harvesting areas along the DMTS due to concerns about contamination.

Spills have the potential to substantially degrade vegetation. Vegetation located in the vicinity of road would be most susceptible to contamination from potential spills. Introduction of toxicants from petroleum products associated with vehicle use and road run-off can impact vegetation (FEIS Section 3.3.1). Accidental spills along the ROW may significantly restrict harvestable vegetation in the direct vicinity of the road.

Availability

Construction and operation activities which may affect the availability of vegetation would include:

- clearing of the ROW
- fugitive dust
- contamination from accidental spills

Availability of vegetation in the direct route of the road may be directly impacted due to construction activity. Construction activity may lead to concerns by residents about contamination of subsistence resources, particularly plants and berries. This concern would be especially elevated in areas where naturally occurring asbestos is exposed during construction or contained in the gravel fills used for the project. Spills or other contamination could also affect the local distribution of vegetation or may result in resources being considered unavailable to local harvesters due to concerns of contamination.

Permanent loss of native vegetation would occur from construction of the main road, landing strips, material and rip-rap sources, and construction access roads, due to vegetation clearing and the placement of gravel fill. Loss of vegetation through an undisturbed landscape would result in several effects to the surrounding environment, including alteration of adjacent vegetation community composition and loss or alteration of fish and wildlife habitat. Removal of native vegetation in this area, particularly in boreal forest, could take decades to recover (FEIS Section 3.3.1).

Access

Impacts to harvester access would occur along the ROW, where harvesters could be faced with physical obstructions to access or by removal of usable area.

- physical barriers: road, construction laydown materials, pilings and heavy equipment
- diversion: avoidance of material sites and other areas which are unsafe for travel
- crossing ramps: placement of ramps and ease of use by subsistence users, individuals may not be permitted to cross construction-phase roads until crossing areas are established

The degree of impacts from construction and operation would depend on whether the timing of construction activities conflicts with harvest. Because construction would occur year-round, it is likely that there would be direct conflicts with vegetation harvest. Subsistence harvest activities occur year-round, peaking in the summer for most communities (Appendix L: Section 5). The project corridor crosses areas used for both riverine and overland travel; thus, residents may experience significant impacts during all activities which are overlapped by the proposed ROW. While access would be hindered more for some communities than others, the proposed ROW may significantly restrict current levels of access for all involved communities.

B.2.1.5 Other

Abundance

Other subsistence resources such as Dall sheep, bear, muskoxen, small land mammals, marine mammals, migratory birds, upland game birds and eggs are considered of moderate or low importance or have fewer communities depending on them for subsistence (FEIS Section 3.4.7). Impacts from construction and operation could occur but may not significantly impact the abundance of these resources available for subsistence use.

Availability

Availability of all other subsistence resources would vary from season to season and resource to resource. Construction can impact hunting for land mammals (large and small), birds (waterfowl and upland), and gathering eggs. Construction activities that may affect resource availability for subsistence users include:

- construction activity
- physical obstructions from infrastructure vehicle and air traffic
- accidental fuel or other contaminant spills

In the short term, construction activity may displace or divert resources such as large land mammals, small land mammals, and waterfowl, due to associated activity. Construction may also destroy vegetation and surrounding habitat for resources. Clearing of trees and brush for the ROW and stripping of topsoil and organic material may alter or degrade resource habitat, particularly for herbivores that depend on surface vegetation. Habitat alteration can affect resource distribution, thereby reducing the availability of those resources to subsistence users in traditional hunting or harvesting areas. Equipment, material storage sites and related infrastructure associated with construction, may act as a physical barrier to wildlife. This general disturbance of wildlife could result in subsistence resources being unavailable at the time and place that subsistence users are accustomed to finding them.

During construction and operation, the availability of subsistence resources would be affected through air and ground traffic, resulting in changes in behavior, changes in local distribution of resources, and/or avoidance of the ROW.

Accidental spills may degrade habitat along the ROW. This may alter the behavior of wildlife dependent upon the habitat, causing avoidance of the ROW. This would not significantly affect resources in this category. Wildlife in this group do not migrate as the caribou do, and therefore would not experience a large-scale affect. Effects from the road would be more localized to the general vicinity of the ROW.

Access

Impacts to harvester access would occur within the vicinity of the road corridor, where harvesters could be faced with physical obstructions to access or by causing harvesters to avoid construction work areas. Construction infrastructure such as the road, construction laydown materials, and heavy equipment could present physical barriers to subsistence users. In addition, individuals traveling overland may have to divert around material sites and other areas which are unsafe for travel. The road will include crossing ramps for local residents to use when traveling overland, although there has been some concern of their ease of use; therefore the road may pose an obstruction to overland travel during the construction phase; in addition, hunters may not be permitted to cross construction-phase roads until crossing areas are established, thus obstructing travel altogether for a period of time.

B.2.2 Evaluation of the Availability of Other Lands

Alternative A and B are both similar in the amount of federal land used by the ROW (3,498 and 3,083 acres respectively). The only variation in public land between the alternatives would occur within GAAR. The remainder of the two routes would be located on State and Native Corporation land. Alternative C proposes to use BLM managed land for most of the route (19,090 acres), with Native Corporation land and State of Alaska land managing less. Other DOT&PF previously identified alternative corridors considered include the Original Brooks East, Kanuti Flats, Elliot Highway, Parks Highway Railroad, DMTS Port, Cape Blossom, Selawik Flats and Cape Darby. These routes did not meet screening criteria and were not considered further (see FEIS Appendix G for further discussion).

Of the feasible alternatives carried forward for evaluation, the proposed route was designed and engineered to optimize many environmental and economic considerations. Alternative A is the most economically feasible route and while it crosses more waterbodies requiring culverts or bridges, it has a smaller overall footprint than the other proposed routes. The National Park Service, in their Ambler Mining District Industrial Access Project Environmental and Economic Analysis (EEA), found Alternative B to have less of an impact to caribou habitat than Alternative A within the boundary of Gates of the Arctic Park and Preserve (GAAR). While Alternative A would have more suitable lichen habitat removed for construction and there would be an increased chance of a caribou vehicle strike within GAAR boundaries, Alternative A would have a lesser impact to resources over the entire Ambler Road Project footprint. While Alternative C crosses the subsistence use area of 12 communities, A and B both cross only subsistence use areas of 11 communities[1]. Alternatives A and B both have the largest project area in the WAH habitat (4,161 and 4,775 acres respectively), while Alternative C has an area of 4,120 total acres. Alternative C, unlike Alternatives A and B, would also intersect the range of the RMH, a small, non-migratory herd centered on the Ray Mountains.

[1] Note: For alternatives A and B the only resource used by Hughes that could be affected would be Dall sheep. The importance of Dall sheep to the community of Hughes is not known. Only high and moderate valued resources were analyzed in detail for in this Section 810 Analysis.

The purpose of constructing and operating the proposed road would be to access the District. As such, there is no other feasible terminus for the road. Therefore, the only options are the starting point and the route the road would follow.

B.2.3 Evaluation of Other Alternatives That Would Reduce or Eliminate the Use, Occupancy or Disposition of Public Lands Needed for Subsistence Purposes

AIDEA and DOT&PF considered numerous transportation modes and route alternatives for accessing the District. Their screening process eliminated many of those options as either not physically or economically feasible. Consideration was given to the environment as air travel only was an option; a rail system was another. Using existing infrastructure, such as the DMTS, for part of the route was considered. These options did not meet the criteria established for this project. Only physically and economically feasible alternatives were carried through for analysis in the FEIS.

B.2.4 Findings

Alternative A would not result in a significant restriction to subsistence uses for Beaver, Galena, Hughes, Huslia, Livengood, Manley Hot Springs, Minto, Nenana, Rampart, Stevens Village and Tanana.

Alternative A may result in a significant restriction to subsistence uses for Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak and Wiseman due to a decrease in abundance and availability of caribou, fish and vegetation.

All communities may not experience impacts equally to all resources. But the proposed road project may significantly impact at least one resource for all above communities.

The proposed road may deflect or delay the migration of caribou of the WAH by an average of 33 days (Appendix L Section 6.4.1). Fragmentation of habitat from construction of the project (although small in relation to overall caribou habitat) may change behavior that may result in an increased expenditure of energy, because the habitat is currently unaltered (FEIS Section 3.3.4). This may lead to a decrease in overwinter survival and lower reproductive success. A reduction of population of the herd may also lead to caribou not being available when and where subsistence users are accustomed to harvesting them. The proposed road may also limit or divert subsistence users in their harvest of caribou.

Construction of the proposed road requires many bridges, culverts and bank modifications to be completed. This can affect the population of fish indirectly by loss of habitat and lower spawning success. Lower abundance may lead to a lower availability of both salmon and non-salmon fish in historical subsistence use areas.

Construction of the proposed road would remove suitable vegetation harvest areas and hinder access to more. While this area is very small in comparison to the overall harvest areas, vegetation harvesting is a high value resource to nearly all communities in the study area. Considering the importance of vegetation, altered availability of vegetation may result in a significant reduction in subsistence uses.

B.3 Evaluation and Findings for Alternative B (AIDEA Alternative Route (GAAR South) to the Dalton Highway)

Alternative B is similar to Alternative A, but it differs in the route through GAAR. It is 228 miles long with a total distance to Fairbanks of 473 miles. This routes crosses GAAR further south than Alternative A.

B.3.1 Evaluation of the Effect of Use, Occupancy or Disposition on Subsistence Use and Need

B.3.1.1 Caribou

Because Alternative B is very similar to Alternative A, there would be no quantifiable differences between the analyses for caribou. See Section B.2.1.1 of this evaluation.

B.3.1.2 Moose

Because Alternative B is very similar to Alternative A, there would be no quantifiable differences between the analyses for moose. See Section B.2.1.2 of this evaluation.

B.3.1.3 Fish

Most of the analysis of Alternative A would apply similarly to Alternative B. See Section B.2.1.3 of this evaluation. Noticeable differences will be discussed below.

The route chosen through GAAR for Alternative B would place a river crossing on the Reed River approximately 7 miles from sheefish spawning habitat on the mainstem of the Kobuk River and closer to sheefish spawning habitat than any other alternative. This may increase the likelihood of impact to the resource. Moving a crossing closer to sheefish spawning habitat, especially with the concentrated spawning area located there would increasing sediment from construction and erosion and potential degradation and contamination of the habitat from accidental spills. This may impact reproductive success of sheefish in the Kobuk River. As stated in B.2.1.3 of this evaluation, this particular stretch of the Kobuk River has the highest concentration of sheefish spawning habitat in Alaska. Any effect on spawning success here may affect a large portion of the sheefish population.

B.3.1.4 Vegetation

Alternative B differs from Alternative A in that the ROW would overlap Ambler’s vegetation harvest area. This may lead to a direct impact by removal of harvestable vegetation or contamination (real or perceived) to harvestable vegetation by fugitive dust and accidental spills (see Section B.2.1.4). This may significantly restrict harvest by the community of Ambler. The direct loss of harvestable vegetation by construction of the road would last for the life of the project. Even after reclamation of the road, vegetation can take decades to recover.

B.3.1.5 Other

Because Alternative B is very similar to Alternative A, there will be no quantifiable differences between the analyses for other resources. See Section B.2.1.5 of this evaluation.

B.3.2 Evaluation of the Availability of Other Lands

See Section B.2.2 of this evaluation.

B.3.3 Evaluation of Other Alternatives That Would Reduce or Eliminate the Use, Occupancy or Disposition of Public Lands Needed for Subsistence Purposes

See Section B.2.3 of this evaluation.

B.3.4 Findings

Alternative B would not result in a significant restriction to subsistence uses for Beaver, Galena, Hughes, Huslia, Livengood, Manley Hot Springs, Minto, Nenana, Rampart, Stevens Village and Tanana.

Alternative B may result in a significant restriction to subsistence uses for Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, *Selawik, Shungnak and Wiseman due to a decrease in abundance and availability of caribou, fish and vegetation.*

See Section B.2.4 of this evaluation for discussion.

B.4 Evaluation and Findings for Alternative C (Diagonal Route to the Dalton Highway)

The BLM developed this alternative based on scoping comments. The 332-mile route is longer than the other alternatives but has a similar driving length (476 miles) to Fairbanks. This alternative would have a logical terminus connecting into the road and rail network to provide year-round access to existing port facilities.

B.4.1 Evaluation of the Effect of Use, Occupancy or Disposition on Subsistence Use and Need

B.4.1.1 Caribou

Abundance

Impacts of the road to caribou would generally be the same between Alternative C and Alternative A/B[2]. The route change would affect different communities which will be discussed here. Any variation in impact on resource between the two alternatives will be discussed here as well. Similar impacts of the road are discussed in Section B.2.1.1 of this evaluation.

Ten communities would experience a direct impact on caribou from Alternative C; Alatna, Allakaket, Ambler, Anaktuvuk Pass, Hughes, Huslia, Kobuk, Selawik, Shungnak and Tanana. Six of these communities consider caribou of high importance, Allakaket, Ambler, Anaktuvuk Pass, Kobuk, Selawik and Shungnak (Appendix L: Table 44). Tanana is in the low resource category, with the remaining communities in the moderate category. Hughes, Kobuk and Shungnak would have their subsistence hunting areas bisected by the proposed road. Alatna, Allakaket and Ambler subsistence hunting areas would be partially intersected by the proposed ROW. The proposed ROW would be located on the periphery of Selawik and Tanana's subsistence hunting areas. Anaktuvuk Pass would see an impact in an isolated portion of their subsistence use area. All other communities in the subsistence study, whether they are ranked as having a high, moderate or low dependence on caribou, have subsistence use areas outside of the project area and likely wouldn't see an impact on their subsistence use.

Alternative C places the ROW through the middle of the entire RMH range; it bypasses the HHH range and passes through the peripheral and winter range of the WAH. This alternative intercepts only a small portion of the migratory area of the WAH. The RMH may experience a direct impact from this alternative. Because the RMH is a smaller herd (812 as of last census), access to it is limited and it has a relatively short season, subsistence harvest is low (FEIS Section 3.3.4). Alternative C crosses more WAH habitat than the other alternatives. But, may have a lesser impact on their fall and spring migrations because it only intercepts a small portion of their migratory range.

Availability

Impacts of the road to caribou would be the same between Alternative C and Alternatives A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.1 of this evaluation.

[2] Note, while Alternative C would affect more habitat than Alternatives A and B, the impacts to subsistence users would be localized to subsistence use areas. Any alteration of resource availability, abundance, or access would be felt the same by subsistence users, it's just different communities that would experience the impact.

Access

Impacts of the road to caribou would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.1 of this evaluation.

B.4.1.2 Moose

Abundance

Impacts of the road to moose would be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed here. For impacts of the road see Section B.2.1.2 of this evaluation.

The proposed ROW crosses subsistence moose hunting areas for eight communities, Alatna, Allakaket, Ambler, Hughes, Kobuk, Shungnak, Stevens Village and Tanana. Moose is considered a resource of high importance for five of the communities (Alatna, Allakaket, Hughes, Stevens Village and Tanana), and of moderate importance for the rest (Appendix L, Table 44).

Availability

Impacts of the road to moose would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.2 of this evaluation.

Access

Impacts of the road to moose would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.2 of this evaluation.

B.4.1.3 Fish

Abundance

Impacts of the road to fish would generally be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed here. Any variation in impact on resource between the two alternatives will be discussed here as well. Similar impacts of the road are discussed in Section B.2.1.1 of this evaluation.

The proposed ROW crosses subsistence fishing areas for nine communities: Alatna, Allakaket, Ambler, Hughes, Huslia, Kiana, Kobuk, Shungnak and Stevens Village. This alternative affects more community fishing resources than the other two alternatives. For all these communities except Alatna and Stevens Village, fish are categorized as a resource a high importance (Appendix L, Table 44). Hughes, Kobuk and Shungnak would see their subsistence fishing areas bisected by the proposed ROW. Alatna, Allakaket and Ambler use areas would be partially intersected by the ROW. The ROW would fall on the periphery of the Hughes and Huslia fishing use areas. These communities would have direct impacts to their subsistence use areas from the proposed project. Other communities not directly impacted by the road could also see an effect in terms of spawning habitat loss, increased turbidity and loss of harvest area.

Alternative C crosses the Kobuk River directly downstream from Kobuk River sheefish spawning habitat. Thus, any changes to waterways which obstruct access to spawning grounds could have larger indirect impacts to communities who harvest sheefish upstream and downstream from the road corridor. However, Alternative C would be less likely to have direct impacts on sheefish spawning grounds due to sediment and turbidity. But Alternative C would require a crossing on the Koyukuk River near Hughes in the middle of known sheefish spawning habitat. In addition, while Alternative C would cross more fish streams than alternatives A and B, it would construct more bridges and fewer minor culverts which are more likely to obstruct fish passage. In addition to sheefish spawning grounds, Alternative C also crosses streams which support spawning for Chinook and chum salmon. Impacts to salmon spawning grounds could also have larger effects to communities who harvest salmon downstream from the road corridor along the Yukon and Koyukuk rivers.

Availability

Impacts of the road to fish would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.3 of this evaluation.

Access

Impacts of the road to fish would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.3 of this evaluation.

B.4.1.4 Vegetation

Abundance

Impacts of the road to vegetation would be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed here. For impacts of the road see Section B.2.1.4 of this evaluation.

Vegetation is a resource of high importance to almost each community in the project area. Allakaket, Ambler, Hughes, Kobuk, Shungnak and Stevens Village are in the high value category for vegetation. Shungnak and Kobuk subsistence use areas would be bisected by the proposed ROW. Allakaket and Ambler would see their subsistence use areas partly intersected, and Stevens Village's use area is on the periphery of the project.

Availability

Impacts of the road to vegetation would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.4 of this evaluation.

Access

Impacts of the road to vegetation would be the same between Alternative C and Alternative A/B. The route change would affect different communities which are discussed in the previous section. For impacts of the road see Section B.2.1.4 of this evaluation.

B.4.1.5 Other

Abundance

Impacts of the road to other resources would be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed here. For impacts of the road see Section B.2.1.5 of this evaluation.

Other resources are of low or moderate importance to almost each community in the project area. Alatna, Allakaket, Ambler, Anaktuvuk Pass, Hughes, Huslia, Kobuk, Selawik, Shungnak, Stevens Village and Tanana all use at least one other resource that may be impacted by the proposed ROW.

Availability

Impacts of the road to other resources would be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed in the previous section. For impacts of the road see Section B.2.1.5 of this evaluation.

Access

Impacts of the road to other resources would be the same between Alternative C and Alternative A/B. The route change would affect different communities which will be discussed in the previous section. For impacts of the road see Section B.2.1.5 of this evaluation.

B.4.2 Evaluation of the Availability of Other Lands

See Section B.2.2 of this evaluation.

B.4.3 Evaluation of Other Alternatives That Would Reduce or Eliminate the Use, Occupancy or Disposition of Public Lands Needed for Subsistence Purposes

See Section B.2.3 of this evaluation.

B.4.4 Findings

Alternative C would not result in a significant restriction to subsistence uses for Beaver, Bettles, Buckland, Coldfoot, Evansville, Galena, Kotzebue, Livengood, Manley Hot Springs, Minto, Nenana, Noatak, Noorvik, Rampart and Wiseman.

Alternative C may result in a significant restriction to subsistence uses for Alatna, Allakaket, Ambler, Anaktuvuk Pass, Hughes, Huslia, Kiana, Kobuk, Selawik, Shungnak, Stevens Village and Tanana due to decrease of abundance and availability of caribou, fish and vegetation.

All communities may not experience impacts equally to all resources. But the proposed road project may significantly impact at least one resource for all above communities.

Alternative C may not affect the migration of WAH caribou as much as the other two alternatives. But there is still a portion of the road that extends into the WAH migratory area and this alternative crosses more total range of the WAH, so an impact may occur (Appendix A: Map 3-22). Approximately 20 percent of the WAH cross this area in the winter. This may significantly divert the herd on their winter range making availability to subsistence users a concern.

Construction of the proposed road requires many water crossings to be installed. This is concerning because of the proximity to sheefish spawning habitat. If any detrimental impact stems from these installations a majority of the sheefish population in Northwest Alaska may be significantly impacted.

Construction of the proposed road would remove suitable vegetation harvest areas and hinder access to more. While this area is very small in comparison to the overall harvest areas, vegetation harvesting is a high value resource to nearly all communities in the study area. Considering the importance of vegetation, altered availability of vegetation may result in a significant reduction in subsistence uses.

B.5 Evaluation and Findings for the Cumulative Case

The goal of the cumulative case analysis presented in Appendix H is to evaluate the incremental impact of the actions considered in the EIS, in conjunction with all past, present, and reasonably foreseeable future activities in or near the Ambler Road. Past and present actions which have affected subsistence uses and resources within the study region include mineral development, infrastructure projects, scientific research, recreation and tourism, sport hunting and fishing, hunting and harvesting regulations, establishment of wildlife refuges, national parks and preserves, and environmental changes resulting from climate change.

Actions included in the cumulative case analysis are listed in Appendix H Section 2. Past and present actions that have affected subsistence and resources are:

- oil exploration and extraction, including Trans-Alaska Pipeline System (TAPS) and the Dalton Highway
- Red Dog Mine, including the DMTS and port site
- sport hunting and fishing
- passage of ANILCA
- impacts of climate change
- Reasonably foreseeable future actions are:
- development of mineral prospects within the District
- use of the proposed road for commercial access
- use of the proposed road for commercial use by local communities and Native Allotment owners

B.5.1 Evaluation of the Effect of Use, Occupancy or Disposition on Subsistence Use and Need

B.5.1.1 Oil Exploration and Extraction

Oil and gas exploration, development, and production is ongoing and planned within the onshore North Slope, State and Federal waters in the Beaufort Sea, and in the Western Canadian Arctic. These activities include exploration work, infrastructure development, construction, and maintenance, gravel mining, and production associated with existing wells. These activities are expected to continue under all alternatives.

Construction of the TAPS and Dalton Highway have affected subsistence access and resource availability for communities in the eastern portion of the project area, with many residents believing that the highway and pipeline have resulted in changes to caribou migration across the region. Impacts to vegetation within this area include construction of the Dalton Highway and other roads and airports in rural Alaska communities, which has resulted in loss within the footprints, alteration beyond the footprints, and the spread and establishment of non-native invasive species (NNIS) near developments.

B.5.1.2 Red Dog Mine

The Red Dog Mine, including the DMTS and port site, has introduced contamination concerns for local residents, particularly Kivalina residents who are situated downstream from the mine, and have affected resource distribution and migration for resources such as caribou and marine mammals possibly resulting in decreased harvests of these resources over time (EPA 2009). Residents have observed that some caribou would stop once they reach the DMTS, sometimes traveling alongside the road before crossing, and other times bypassing the road altogether. Such behavior has also been documented through radio collar observation.

B.5.1.3 Sport Hunting and Fishing

Increased sport hunting and fishing in the region and associated air traffic have resulted in increased competition for local subsistence users in addition to disturbance and displacement of subsistence resources such as caribou.

B.5.1.4 ANILCA

The establishment of Gates of the Arctic National Park and Preserve (GAAR) in the 1980s also affected access to and use of traditional harvesting areas for residents of nearby communities within the northeastern portion of the project area by limiting use of ATV’s in national parkland (Watson 2018).

B.5.1.5 Climate Change

Climate change is an ongoing factor considered in cumulative effects analyses of the Ambler Road. Climate change could affect the habitat, behavior, distribution, and populations of fish and wildlife within the program area. Impacts of climate change include changes in the predictability of weather conditions such as the timing of freeze-up and breakup, snowfall levels, storm and wind conditions, and ice conditions (e.g., ice thickness on rivers and lakes), all of which affect individuals' abilities to travel to subsistence use areas when resources are present in those areas. In addition, subsistence users may experience greater risks to safety when travel conditions are not ideal. Changes in resource abundance or distribution resulting from climate change can also affect the availability of those resources to subsistence users or may cause subsistence users to travel farther and spend more time and effort on subsistence activities (Brinkman 2016).

B.5.1.6 Reasonably Foreseeable Future Actions

Reasonably foreseeable actions within the region that could contribute to subsistence impacts include development of the Ambler Mining District (Arctic, Bornite, Sun, and Smucker projects); use of the AMDIAR for commercial access; use of the AMDIAR for commercial use by local communities and Native Allotment owners

The development of mines within the District and secondary access roads would result in habitat loss, alteration, and fragmentation of WAH caribou migratory and winter range. The mines, mining roads, and secondary access roads would increase habitat fragmentation exponentially. The fragmentation of habitat would further remove usable habitat for caribou during migration and winter, which could force substantial range shifts, increased competition for resources, or increased predation (NCASI 2008). Alternative's A and B, both place the ROW in more migratory habitat than Alternative C, which may spatially alter WAH migration away from subsistence use areas of Alatna, Allakaket, Ambler, Bettles, Evansville, Hughes, Kobuk, Shungnak, Selawik and Wiseman. But, Alternative C places the ROW more in the winter range of the WAH. This may alter the WAH use of winter range and impact Alatna, Allakaket, Ambler, Hughes, Huslia, Kobuk, Selawik, Tanana and Shungnak. In addition, it is unclear whether the road would allow access to small mining claims; while large mines would likely have policies regarding hunting and fishing by workers, smaller mining outfits or individuals may allow these activities. According to the Western Arctic Herd Working Group (WAHWG 2017), communities within the region have already experienced increased competition in traditional hunting areas, with greater numbers of hunters concentrated within smaller areas. Sport hunting is a key issue within the region for subsistence harvesters, and public access to the area via a road or ROW would contribute to these impacts.

Reasonably foreseeable future actions that would impact fish include the advanced mining development and indirect road access. Direct and indirect chemical stressors such as mining-related pollution, acid mine drainage, and the release of toxic materials have the potential to significantly impact aquatic life health and the survival of fish populations (Limpinsel et al. 2017). Toxic metals that bioaccumulate in fish tissue can lead to fish mortality, increased susceptibility to disease, reduced growth rates, and pose health risks to human consumers (Hughes et al. 2016). Given the proximity of the 4 most advanced mine projects to the Kobuk River sheefish spawning grounds and the large numbers of sheefish that spawn in this habitat, sheefish may be especially vulnerable to population-level effects (Appendix H Section 3.4.2), from large scale spills or leaching of acid rock into waterways (Appendix L pg. 166).

Mining and its associated activities have the potential to cause the greatest impacts to vegetation. Open pit and underground mining would result in loss of vegetation within the project area and alteration of vegetation beyond project areas from disturbance of surface and groundwater flow, lowering of the water table from dewatering activities, and fugitive dust from heavy metals and accessory roads. As has been shown at Red Dog Mine, fugitive dust from heavy metals can travel thousands of feet to several kilometers in distance, particularly if strict mitigation measures are not employed or practiced. This can result in increased or complete loss of lichen and moss (Neitlich et al. 2017). Heavy metal dust can persist in the soil for many decades (Neitlich et al. 2017), resulting in adverse impacts to the surrounding vegetation and habitat. Although the exact number of acres of vegetation that would be lost or altered is unknown, the potential magnitude of loss and alteration is expected to be at least in the thousands of acres, not including accessory roads. In addition, hundreds of thousands of acres of mining claims exist in the advanced mining scenario, which could result in more loss and alteration than initially predicted if more claims are developed.

B.5.2 Evaluation of the Availability of Other Lands

See Section B.2.2 of this evaluation.

B.5.3 Evaluation of Other Alternatives That Would Reduce or Eliminate the Use, Occupancy or Disposition of Public Lands Needed for Subsistence Purposes

See Section B.2.3 of this evaluation.

B.5.4 Findings

The cumulative case, when taken in conjunction with Alternatives A, B, and C, would not result in a significant restriction to subsistence uses for the communities of Beaver, Galena, Livengood, Manley Hot Springs, Minto, Nenana, Rampart and Stevens Village.

The cumulative case, when taken in conjunction with Alternatives A, B, and C, may result in a significant restriction to subsistence uses for the communities of Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Hughes, Huslia, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak, Stevens Village, Tanana, and Wiseman, due to a potential decrease in abundance and availability of caribou, fish and vegetation.

All communities may not experience impacts equally to all resources. But the proposed road project may impact at least one resource for all above communities.

Cumulative impacts of Alternatives A and B related to resource abundance and availability would likely be greater than those under Alternative C, as they would be more likely to affect resource availability of migrating caribou to the subsistence study communities, particularly during the fall months, and are most likely to have population-level effects on sheefish and whitefish, all key subsistence species among the study communities. However, impacts related to user access and direct impacts on resource availability along the road corridors would be similar across all alternatives and would affect a similar number of study communities.

The proposed road in conjunction with discussed cumulative effects may divert or delay the migration of caribou of the WAH by an average of 33 days (Appendix L Section 6.4.1). This may lead to a decrease in overwinter survival and lower reproductive success. A reduction of population of the herd may also lead to caribou not being available when and where subsistence users are accustomed to harvesting them. The proposed road and cumulative impacts may also limit or divert subsistence users in their harvest of caribou.

Construction of the proposed road and addition of numerous open pit mining operations requires much infrastructure to be completed. This can affect the population of fish indirectly by loss of habitat and lower spawning success. Lower abundance may lead to a lower availability of both salmon and non-salmon fish in historical subsistence use areas.

Construction of the proposed road in conjunction with discussed cumulative effects would remove suitable vegetation harvest areas and hinder access to more. While this area is very small in comparison to the overall harvest areas, vegetation harvesting is a high value resource to nearly all communities in the study area. Considering the importance of vegetation, altered availability of vegetation may result in a significant reduction in subsistence uses.

C. Notice and Hearings

ANILCA Section 810(a) provides that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Section 810(a) (1) and (2). The BLM provided notice in the Federal Register that it made positive findings pursuant to ANILCA Section 810 that the Alternatives A, B, and C and cumulative case presented in the Ambler Road FEIS, met the “may significantly restrict” threshold. As a result, public hearings were held in the potentially affected communities of Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak and Wiseman, along with hearings in Anchorage, Fairbanks and Washington DC. Notice of these hearings were provided in the Federal Register and by way of the local media. Meeting dates and times were also posted on BLM’s website at eplanning.blm.gov.

D. Subsistence Determinations under ANILCA Section 810(a)(3)

ANILCA Section 810(a) provides that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Section 810(a)(1) and (2), and makes the three determinations required by ANILCA Section 810(a)(3). The three determinations that must be made are: 1) that such a significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of the public lands; 2) that the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other such disposition; and 3) that reasonable steps will be taken to minimize adverse impacts to subsistence uses and resources resulting from such actions [16 U.S.C. 3120(a)(3)(A), (B), and (C)].

The BLM has found in this final subsistence evaluation that Alternatives A, B, C and the cumulative case considered in this FEIS may significantly restrict subsistence uses. Therefore, the BLM undertook the notice and hearing procedures required by ANILCA Section 810 (a)(1) and (2) in conjunction with release of the Ambler Road DEIS in order to solicit public comment from the potentially affected communities and subsistence users of Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak and Wiseman.

There are two separate public lands ROW permit decisions to be made in response to AIDEA’s application: issuance of a ROW across BLM-managed lands and issuance of a ROW across NPS-managed lands. The Final EIS was prepared to inform the BLM decision, while an Environmental and Economic Analysis (EEA) is being prepared to inform the decision with respect to NPS-managed lands. The EEA is not yet complete. Because this 810 Analysis is applicable to both decisions, the three determinations required by ANILCA Section 810(a)(3) will be made after completion of the EEA and will be documented either as an appendix to the applicable records of decision or issued concurrent with them.

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Name and Title **Date**

Appendix N:

Potential Mitigation

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Table of Contents

Attachment

Acronyms

AAC	Alaska Administrative Code
ACEC	Area of Critical Environmental Concern
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AGL	above ground level
AIDEA	Alaska Industrial Development and Export Authority
ARD	acid rock drainage
BLM	Bureau of Land Management
BMP	best management practice
CFR	Code of Federal Regulations
DOI	U.S. Department of the Interior
EIS	Environmental Impact Statement
GAAR	Gates of the Arctic National Park and Preserve
ISPMP	Invasive Species Prevention and Management Plan
MBTA	Migratory Bird Treaty Act
NAD83	North American Datum of 1983
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNIS	Non-native Invasive Species
NOA	naturally occurring asbestos
NPS	National Park Service
NTP	Notice to Proceed
PA	Programmatic Agreement
POD	Plan of Development
POL	Petroleum, Oils and Lubricants
ROD	Record of Decision
ROW	right-of-way

SF299	Standard Form 299
SPCCP	Spill Prevention Control and Countermeasure Plan
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USC	U.S. Code

1 Introduction and General Provisions

This document is intended to identify and discuss potential measures to mitigate adverse impacts from the Ambler Road Project. Overall, this broad list of potential mitigation is provided to inform the various decision makers of available options for mitigating impacts from the Amber Road Project. The Bureau of Land Management's (BLM's) authority to require and enforce mitigation generally is limited to mitigating impacts to BLM-managed lands and resources on those lands. However, for purposes of the National Environmental Policy Act (NEPA), mitigation measures are also identified and discussed for the range of activities the Alaska Industrial Development and Export Authority (AIDEA) has proposed, regardless of whether the activity occurs on or off BLM-managed land. Overall, this broad list of potential mitigation is provided to inform the various decision makers of available options for mitigating impacts from the Amber Road Project. This appendix is generally organized in the same order as the Environmental Impact Statement (EIS), with Section 1 providing general background and overall measures, Section 2 providing general measures related to design and construction features of any alternative, and Section 3 providing measures applicable to specific resource categories addressed in the EIS.

The following potential mitigation measures were identified through consideration of law, regulation, and plan policy; identified through proposals from AIDEA, other agencies, and/or members of the public; or identified as the BLM has worked through the analysis in the EIS. Each agency may select measures such as these for inclusion in decisions related to their own jurisdictions. If the BLM selects one of the action alternatives in its Record of Decision (ROD), the ROD will identify the mitigation measures that the BLM will require. While this document present conceptual mitigation measures, the right-of-way (ROW) grant would provide further detail regarding specifics of the mitigation measures listed in this document.

Measures to mitigate adverse impacts that have already been committed to by AIDEA through its project application are considered design features and as such, are presented in Chapter 2, Alternatives (Section 2.4.4), and analyzed as part of the proposed project and alternatives in Chapter 3, Affected Environment and Environmental Consequences, of the EIS. To the extent these design features could be modified for clarity or increased effectiveness, the modification is included in this appendix as a mitigation measure.

In this document, the effectiveness of each potential mitigation measure is noted, and each resource section or subsection below, the expected effectiveness of the mitigation measures if collectively applied is discussed. For this analysis, it is assumed that the measure would by implemented by AIDEA and enforced by the BLM. The discussion includes consideration of whether and how the effectiveness of mitigation on BLM-managed land would be affected if the same mitigation is not applied off BLM-managed land. The landowner discussion is necessary, because the BLM manages only part of the land along each alternative and its authority is limited to mitigating impacts to BLM-managed lands and resources. The BLM would have authority over approximately 3,000 to 3,500 acres of the project on federal lands for Alternatives A and B (out of approximately 15,000 acres for the total project footprint), and authority over approximately 19,000 acres of the project on federal lands along Alternative C (out of approximately 23,000 acres total), as shown in Appendix F, Social Systems Tables and Supplemental Information, Table 5.

Guidelines used for consideration of effectiveness are as follows:

- Highly effective: The impact(s) targeted by the mitigation measure would not occur or would be wholly mitigated in normal construction or operations.
- Mostly effective: The impact(s) targeted by the mitigation measure likely would occur at a low level or in minor areas but overall would be avoided in normal construction or operations.

- Partially effective: The impact(s) targeted by the mitigation measure would occur despite the measures but would be reduced in effect or spatial extent.
- Minimally effective: The impact(s) targeted by the mitigation measure would occur despite the measures, which may have a mitigating effect but not enough to be measurable or otherwise meaningful.

The analysis of effectiveness in some cases are tempered by consideration of atypical events that could occur outside of normal construction or operating conditions and that may cause impacts. An example of an atypical event is an accident, such as a truck rollover that causes a spill.

1.1 General Measures

1. **Potential BLM Mitigation Measure:** AIDEA would conduct all activities associated with the initiation, construction, operation, and termination of the grant within the authorized limits of the ROW area.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at restricting all impact to the relatively narrow corridor defined by the ROW grant. Wildlife (including mammals, fish and birds), subsistence, fugitive dust, and water quality impacts would extend beyond the bounds of the ROW grant.

2. **Potential BLM Mitigation Measure:** Any activities on the Ambler Road ROW beyond those analyzed in the EIS and specified in the ROW grant must have prior written approval of the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective at preventing AIDEA from taking actions that are not approved under the ROW grant without formal approval from the Authorized Officer.

3. **Potential BLM Mitigation Measure:** AIDEA would ensure that the facilities to be constructed, used, and operated would limit or prevent damage to scenic, esthetic, cultural, and environmental values (including damage to fish and wildlife habitat), damage to federal property, and hazards to public health and safety.

   Effectiveness: This mitigation measure, on its own, would be partially effective at limiting or preventing damage to the identified resources. AIDEA would need to plan for and implement specific measures to meet this requirement. This EIS identifies impacts to the resources addressed in this measure that are unavoidable.

4. **Potential BLM Mitigation Measure:** AIDEA must notify the Authorized Officer in writing 30 days prior to the beginning of any temporary closure and 90 days prior to initiation of permanent closure and reclamation activities.

   Effectiveness: This mitigation measure, on its own, would be highly effective at informing the BLM of temporary and permanent closure of the road. This would allow the BLM to prepared for closure activities and put staff in place for oversight and review of closure activities and documents.

5. **Potential BLM Mitigation Measure:** Except as specified in the grant, AIDEA would not disturb or destroy pipelines, fuel gas lines, roads, trails, work pads, survey monuments or ROW markers, cathodic protection devices, monitoring rods, drainage/erosion control structures, or any other facilities or properties existing on public lands. Any disturbance of these facilities or properties by

AIDEA in the conduct or operations under this ROW would be reported to the Authorized Officer and would be restored to the satisfaction of the Authorized Officer.

Effectiveness: This mitigation measure, on its own, would be highly effective at preventing disruption to the listed facilities and their functions on BLM-managed land. The measure recognizes the potential for accidental disturbance to facilities, but clearly leaves responsibility for restoration with AIDEA.

6. **Potential BLM Mitigation Measure:** Except for authorized road/traffic signs, no signs or advertising devices would be placed on the ROW or on adjacent public lands, except those posted by or at the direction of the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective at preventing impacts to visual resources from intrusive and unnecessary features that detract from the natural setting.

7. **Potential BLM Mitigation Measure:** AIDEA would not block or obstruct the ingress or egress along any permanent existing roads or trails, including perennial winter trails and subsistence trails identified by communities, unless explicitly approved by the Authorized Officer. See also Section 3.4.2, Transportation and Access.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at maintaining existing access in the project area. The limitations on crossings imposed for safety would not be avoided.

8. **Potential BLM Mitigation Measure:** To ensure monument preservation and aid in the management of federal lands, the points where the road enters, on which the road is located, and where it leaves federal interest lands would be documented. This would be accomplished by locating and measuring to the nearest monuments on either side of the as-built centerline of the road. When on federal lands, if the road centerline falls within 1,320 feet of an existing monument, its position would also be measured and its relationship shown relative to the centerline. These steps would ensure both objectives and would assist in the federal land manager's ability to identify where the road is on federal lands.

   Effectiveness: This mitigation measure, on its own, would be highly effective at documenting the road location with respect to federal land and assist the BLM in meeting its land management obligations.

9. **Potential BLM Mitigation Measure:** AIDEA would conduct an environmental briefing with all employees, contractors, and subcontractors so they are familiar with the stipulations. AIDEA would maintain records of participant names and dates for these briefings and would make such records available to BLM on demand. AIDEA would ensure that a copy of the stipulations would be readily available in either hard copy or electronic format to all employees, contractors/subcontractors, and agency staff at all crew quarters and offices associated with road operations (e.g., gatehouses, offices at maintenance camps).

   Effectiveness: This mitigation measure, on its own, would be mostly effective at meeting the requirements of environmental mitigation measures set forth in BLM's ROD that can be influenced by the actions of employees, contractors, and subcontractors. It is possible that, through human error, some stipulations at some times in some locations do not get implemented and lead to adverse impacts that could have been avoided. Instructing workers on the compliance requirements in the stipulations would significantly improve the level of compliance.

10. **Potential BLM Mitigation Measure:** AIDEA would develop and submit a monitoring plan for approval by the Authorized Officer. It would be designed to demonstrate compliance with the approved plan of operations and other federal and state environmental laws and regulations, provide early detection of potential problems, and supply information that would assist in directing corrective actions should they become necessary. Examples of monitoring programs that may be relevant include water quality, air quality (dust control), slope stability, revegetation progress (during reclamation), noise levels, and wildlife mortality. Specific programs required to be included would be itemized in the Grant. Monitoring plans may incorporate existing state and federal monitoring requirements to avoid duplication. However, the submitted monitoring plan needs to include copies of and clearly reference these other plans. Appropriate corrective measures will be undertaken should impacts be identified during monitoring.

    Effectiveness: This mitigation measure, on its own, would be mostly effective at recording AIDEA's compliance with the mitigation objectives and, if necessary, identifying corrective action to address unanticipated impacts and or ineffective mitigation.

11. **Potential BLM Mitigation Measure:** AIDEA would ensure that copies of all relevant monitoring plan records are available for BLM review at any project camp, office, or permanent facility at all times.

    Effectiveness: This mitigation measure, on its own, would provide the BLM with up-to-date information on monitoring activities. In addition, the measure would build awareness of the importance of compliance at all operational levels of the project.

12. **Potential BLM Mitigation Measure:** AIDEA would provide to the BLM copies of any permits required by any other Federal or State agencies with jurisdiction (including, but not limited to, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the Alaska Department of Fish and Game, the Alaska Department of Natural Resources, the Alaska Department of Environmental Conservation, and the Alaska Department of Transportation and Public Facilities) prior to receiving a Notice to Proceed (NTP) with surface disturbing activities on BLM-managed lands. The terms and conditions of all other agency permits would be incorporated into the terms and conditions of AIDEA's BLM-issued Grant of Right of Way. When other agencies require submission of activity plans or monitoring reports, AIDEA would provide identical and concurrent copies to BLM.

    Effectiveness: This mitigation measure, on its own, would be highly effective at providing the BLM with information pertaining to all of AIDEA's environmental commitments for the project and potentially provide efficiencies in compliance monitoring.

13. **Potential BLM Mitigation Measure:** In accordance with regulation at 43 Code of Federal Regulations (CFR) 2805.11(c), AIDEA may only use the ROW for the specific use the grant authorizes. AIDEA would ensure that the road, camps, and any other authorized facilities are used only in support of authorized activities. Other uses, including use by hunters, fishers, tourists, researchers, or employee's friends or family members, is not authorized. This does not preclude providing appropriate emergency assistance to anyone in distress, providing assistance and support to law enforcement or search and rescue personnel, or providing support to agency staff and contractors engaged in administration of the Grant of Right of Way.

    Effectiveness: This mitigation measure, on its own, would be highly effective in constraining use of the road to its intended purpose, allowing for exceptions in the event of emergencies. This measure would avoid impacts from unauthorized use and subsequent environmental degradation.

Summary of Effectiveness: Together, all measures in this section would be highly effective in meeting the objectives of securing the road for its intended use, minimizing the effects of the road on environmental resources, and establishing an ongoing program of compliance.

1.2 Reporting Requirements

1. **Potential BLM Mitigation Measure:** AIDEA would submit documentation of consultation with affected subsistence communities to the BLM within 90 days of approving 90 percent road design at each phase of construction and annually by the end of the calendar year for 2 years following completion of construction of each phase, and at minimum every 5 years thereafter for the life of the project. Reporting would include a list of issues raised during consultation and results of road use monitoring.

   Effectiveness: This mitigation measure, on its own, would be highly effective in recording AIDEA's involvement with affected communities during design, construction, and operation. The BLM would be able to monitor issues and respond appropriately.

2. **Potential BLM Mitigation Measure:** AIDEA would monitor road use and keep records of numbers of vehicles by vehicle class and trip purpose. AIDEA would include in its monitoring and record keeping any unauthorized use of the road.

   Effectiveness: This mitigation measure, on its own, would be highly effective at allowing tracking of road use with respect to volume, frequency, vehicle types, and trip purpose to compare actual road traffic with AIDEA's application. The BLM would be able to determine whether AIDEA is operating the road as intended.

3. **Potential BLM Mitigation Measure:** AIDEA would provide the BLM with as-built drawings of the road within 90 days of completion of each construction phase. Data would be in the form of an ESRI shape file(s) referencing the North American Datum of 1983 (NAD83).

   Effectiveness: This mitigation measure, on its own, would be highly effective in documenting the road location and construction details for BLM records and would be used to compare the constructed project to the project as proposed in the application. The as-built drawings could also be used to monitor compliance with construction specifications and mitigation commitments.

4. **Potential BLM Mitigation Measure:** AIDEA would provide annual reports of incidents and accidents, including location, date, nature of incident or accident, whether any administrative or enforcement action was initiated, actions taken by AIDEA in response, and status of response completion. At a minimum, the types of incidents and accidents must include fuel, oil, or hazardous material spills; overturned vehicles or equipment; incidents that resulted in exceeding state water quality standards; incidents that altered stream banks, resulting in the stream leaving its normal channel (i.e., stream blowouts); wildlife injuries or fatalities; and fish kills. During construction, AIDEA would provide monthly reports of camp locations and dates utilized, fuel storage locations and dates utilized, routes used for off-highway fuel hauls and dates utilized, storage locations for any hazardous materials with dates utilized, and types of materials.

   Effectiveness: This mitigation measure, on its own, would be highly effective in documenting accidents and out-of-compliance actions, their consequences, the remediation actions taken, and the residual effects. This information would allow the BLM to monitor and identify ongoing problems and take corrective action with AIDEA, if needed.

Summary of Effectiveness: Together, all measures in this section would be highly effective in documenting AIDEA's design, construction, and operations practices for compliance with environmental commitments included in the ROD.

1.3 General Responsibilities and Plan of Development

1. **Potential BLM Mitigation Measure:** AIDEA would refine, based on the NEPA analysis, the Plan of Development (POD) provided with the Standard Form 299 (SF299) ROW grant application, and the POD would be reviewed and approved by the BLM and made part of the ROW grant to AIDEA. In accordance with regulations at 43 CFR 2805.12(a)(8)(vi), AIDEA would construct, operate, and maintain the Ambler Road and Related Facilities within the ROW in a manner consistent with the grant, including the approved POD.

   Effectiveness: This mitigation measure, on its own, would be highly effective in providing consistency in documenting AIDEA's plan for the road, with the same current information included in the Plan of Development (POD) and Standard Form 299 (SF299). This would eliminate conflict and confusion that could result if the project's guiding documents relied on information obtained during 2 different phases of project development.

2. **Potential BLM Mitigation Measure:** ADIEA's proposed design features, industry best management practices (BMPs), and the BLM adopted mitigation measures listed in the BLM ROD for the Ambler Road Final EIS would be incorporated by reference into the AIDEA's POD and compliance program. Selected design features, BMPs, and mitigation measures would be refined and clarified in the subsequent ROW grant stipulations.

   Effectiveness: This mitigation measure, on its own, would be highly effective in identifying AIDEA's responsibilities for meeting the environmental commitments developed during the application, NEPA review, and permitting processes.

Summary of Effectiveness: Together, the measures in this section would be highly effective in creating a record of AIDEA's design, construction, and operations commitments for reducing environmental impact.

1.4 General Completion of Use (Restoration/Reclamation)

See also Section 3.3.1, Vegetation and Wetlands.

1. **Potential BLM Mitigation Measure:** Upon completion of use of all, or a very substantial part, of the ROW, AIDEA would promptly remove all improvements and equipment, except as otherwise approved by the Authorized Officer, and would restore the ROW to a condition that is approved in writing by the Authorized Officer. Road closure would include barriers near either end and at other locations as needed to minimize continued use of the alignment as a transportation corridor by off-road vehicles including snowmobiles.

   Effectiveness: This mitigation measure, on its own, would be partially effective in restoring the ROW; however, complete restoration would not be possible given the irreversible and irretrievable commitment of resources. In addition, the environmental impacts that could result from removal of road materials could be greater than the effect of leaving some materials in place. The plan for what is being removed and how it will be removed will be important in ensuring the effectiveness of this stipulation.

2. **Potential BLM Mitigation Measure:** When the project improvements (infrastructure, roadbeds, and pads) are no longer needed, the end-of-project reclamation would include removing the fill placed in wetlands, and restoring the original contours of the landscape to return the land to its original condition for fish and wildlife.

   Effectiveness: This mitigation measure, on its own, would be partially effective in restoring former wetlands and fish and wildlife habitat. The 50-year life of the project could cause changes to wetlands that may make complete restoration impossible. Recovering the landscape to preconstruction conditions would require removal of massive quantities of road building materials. The removal and disposal of some materials may have more environmental impact than leaving them in place. The lack of resiliency of the arctic environment can make restoration difficult. It can take a considerable length of time for recovery.

3. **Potential BLM Mitigation Measure:** The location and method of disposal of used fill and other waste material removed from the road and associated facilities during closure and reclamation would be subject to pre-approval by the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective in ensuring that potentially contaminated waste material is disposed of in accordance with relevant law, regulation, policy, and land use plan requirements.

4. **Potential BLM Mitigation Measure:** AIDEA would submit an initial closure and reclamation plan for approval prior to receiving a NTP for construction on BLM-managed land. AIDEA would submit an updated closure and reclamation plan with each submission of as-built designs, at each five year interval for the life of the project, and upon notification of intent to begin closure and reclamation activities.

   Effectiveness: This mitigation measure, on its own, would be highly effective in identifying AIDEA's plans and responsibilities for reclamation. In this process, AIDEA would regularly revisit the plan and methods of closure and update the plan as technologies and conditions of the facilities change.

5. **Potential BLM Mitigation Measure:** Each closure and reclamation plan update would be required to include documentation that AIDEA has notified any local communities authorized to receive goods or services via AIDEA facilities of the plan and anticipated timelines.

   Effectiveness: This mitigation measure, on its own, would be highly effective in informing affected communities of AIDEA's plan and schedule for removal of facilities and restoration of the corridor.

6. **Potential BLM Mitigation Measure:** AIDEA would submit a final summary report to the Authorized Officer within 30 days of completion or cessation of operations. This report would include:

   a. Written statement of program completion with completion date.
   b. Summary compilation of incident and accident reports required under mitigation measure #4 in section 1.2.
   c. A comprehensive map showing camp locations and dates utilized, fuel storage locations and dates utilized, routes used for off-highway fuel hauls and dates utilized, storage locations for any hazardous materials with dates utilized, and types of materials.

   Effectiveness: This mitigation measure, on its own, would be highly effective in providing a record for the BLM to identify locations of known and potential contaminants on BLM-managed land. The

BLM could use this information to confirm complete removal of contaminated materials during the restoration process.

Summary of Effectiveness: Together, all measures in this section would be highly effective in documenting AIDEA's restoration and reclamation plan, keeping the plan current with the conditions of the facilities to be removed, and keeping the affected communities informed of the reclamation plan. The effectiveness of the restoration and reclamation of the ROW corridor itself would depend on the value of the restoration work versus the environmental effects of the restoration and reclamation activities. It may be only partially effective to remove all materials from the corridor.

2 Alternatives

This section presents general requirements related to construction of any alternative. Specific design and construction measures are also listed in Section 3, Affected Environment and Environmental Consequences, for protection of individual resources.

1. **Potential BLM Mitigation Measure:** Before BLM would issue a NTP for a construction segment or project, AIDEA would, in a manner acceptable to the Authorized Officer, locate and clearly mark on the ground the exterior boundaries of the ROW and the location of all related facilities proposed to be constructed as part of that specific construction segment or project.

   Effectiveness: This mitigation measure, on its own, would be highly effective in providing the BLM the information needed to confirm the limits of the ROW and footprint of construction, communicating to contractors building the construction segment or project, and allowing the BLM or other agencies to perform compliance inspections to make sure work is occurring in authorized locations.

2. **Potential BLM Mitigation Measure:** AIDEA would provide a financial guarantee, making funds accessible to BLM to cover the cost of construction, operation, maintenance, and termination/reclamation in the event they are unable to do so. The financial guarantee mechanism must meet the requirements of BLM regulation and policy.

   Effectiveness: This mitigation measure, on its own, would be highly effective in securing funding for the reclamation effort and assuring the BLM that the reclamation process will move forward at the conclusion of operations, whether or not AIDEA is still a financially solvent entity within the State of Alaska.

3. **Potential BLM Mitigation Measure:** AIDEA would submit a plan for use of explosives on federal land, including but not limited to blasting techniques, to the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective in providing the BLM information pertaining to the use of explosives on BLM-managed lands. The use, locations, schedule, and techniques for blasting would assist the BLM in controlling public access in blasting areas and support environmental and public safety.

4. **Potential BLM Mitigation Measure:** All construction and operations activities would be conducted with due regard for good resource management and in such a manner as not to block any stream or drainage system; change the character or course of a stream; cause the pollution of any stream, lake, wetland, or land area; or cause pollution of the air.

Effectiveness: This mitigation measure, on its own, would be mostly effective in having AIDEA adopt sound practices for providing environmental protections while supporting resource extraction. Environmental impacts cannot be wholly avoided. Requiring "due regard" for the proper management of resources and the avoidance of impacts to water, land, and air would support a culture of avoiding environmental impacts among project participants and reduce overall impacts of the project.

Summary of Effectiveness: Together, all measures in this section would be highly effective in identifying the project limits and AIDEA's commitments to resource protection, restoration, and reclamation. It would be mostly effective in reducing environmental impacts, but would not result in complete avoidance of impacts.

3 Affected Environment and Environmental Consequences

3.1 Introduction

This section reflects the Affected Environment and Environmental Consequences chapter of the EIS and presents mitigation measures and design features in the same order the topics are addressed in the EIS. Note that there is substantial crossover between some sections, such as water, wetlands, and soils/erosion control. Cross references are provided where possible.

3.2 Physical Environment

3.2.1 Geology and Soils

1. **Potential BLM Mitigation Measure:** Each installation of artificial erosion control media would remain in place and be inspected and maintained weekly during the growing season until sufficient vegetation is established to achieve natural erosion control.

   Effectiveness: This mitigation measure is designed to stabilize soils and slopes, reducing sedimentation into wetlands and waterbodies, and reducing erosion. On its own, the measure would be mostly effective at reducing impacts under normal construction conditions associated with erosion and sediment control. Higher than expected precipitation events may result in sedimentation and erosion than exceeds the artificial erosion control media capacity. Extremely wet and dry conditions (or wildfire conditions occurring during construction seasons) may result in insufficient establishment of natural erosion control within the growing season. The Stormwater Pollution Prevention Plan (SWPPP) prepared for the project (see Chapter 2, Section 2.4.4 of the EIS) would identify methods, procedures, and remediation measures to reduce these occurrences and repair or replace damaged or insufficient control media. Other agencies and landowners would likely include this mitigation in their permits and authorizations for the project.

2. **Potential BLM Mitigation Measure:** The monitoring plan included as a potential mitigation measure in Section 1.1 would include a permafrost monitoring plan to detect and respond to issues resulting from permafrost disturbance at any location in the construction or operating right of way, including spur roads, landing strips, and building pads.

   Effectiveness: This mitigation measure is intended to address impacts to the infrastructure and impacts to the surrounding area associated with permafrost degradation. This could include surface cracking, embankment settlements, blocked or perched culverts, or drainage changes. On its own, this mitigation measure would be partially effective at eliminating infrastructure impacts associated with the thawing of permafrost sections under and along the road and road facilities. This mitigation measure, on its own, would only be minimally effective at reducing the project's contribution to area permafrost degradation, as identification of issues would be after-the-fact.

3. **Potential BLM Mitigation Measure:** AIDEA would immediately construct the road to full depth embankment (Phase 2), without the prior construction actions to create a pioneer road, to reduce permafrost degradation and associated road quality deterioration.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the permafrost degradation impacts associated with the construction and operation of the pioneer road, for which removal of vegetation and reduced depth of embankment for approximately 2 years would likely accelerate or amplify the warming of the soil regime. The mitigation measure would be minimally effective at eliminating the permafrost degradation anticipated with or without road construction due to climate change during the project lifespan.

4. **Potential BLM Mitigation Measure:** If foam is used to insulate the permafrost from thermal degradation, it would be composed of closed-cell extruded polystyrene or other closed cell foams (e.g., blueboard) rather than non-extruded expanded polystyrene foam.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with permafrost thawing under the road bed. Alaska road applications have found that closed cell foams are more effective than other foams for thermal insulation.

5. **Potential BLM Mitigation Measure:** Geotechnical investigations would include acid-base accounting for samples collected from material sites, along the road alignment, and at locations of ancillary facilities to identify areas of potential acid rock drainage. Testing also would be done for non-acidic metals leaching. Cuts would be minimized in areas with high potential for acid rock drainage and non-acidic metals leaching. AIDEA would provide a protocol for determining when alternative locations would be needed to avoid such areas and, if avoidance is not possible, how cut material and drainage would be handled.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with acid rock drainage (ARD). Decision making associated with the geochemical testing data may result in the development of ARD or metal leaching despite reasonable measures to predict and avoid. In addition, changes to the drainages or presence of neutralizing minerals can change, resulting in ARD and leaching development over time. Management and mitigation of ARD and metal leaching once initiated is difficult and very expensive, resulting in unbudgeted reclamation costs.

6. **Potential BLM Mitigation Measure:** AIDEA would develop and implement a plan to educate workers, regional health care workers, and residents of all communities in the area potentially affected by the Ambler Road, on the health effects of exposure to Naturally Occurring Asbestos (NOA). The plan would include opportunities for routine risk-based health screening for non-cancerous and cancerous asbestos related diseases of workers, nearby communities, and regular subsistence users.

   Effectiveness: This mitigation measure is designed to educate, build awareness, and diagnose health problems early. As such, it would be highly effective at those aims. However, it would be minimally effective at reducing impacts associated with NOA. In combination with measures proposed to require AIDEA to provide testing, training, and safety gear for workers, it would be beneficial and educational for workers, drivers, and local communities. The health related impacts are not changed by routine screenings; however, the opportunities to receive local medical care and screenings within the area communities, enabling early medical diagnoses and interventions, are likely a reassurance to area residents. Asbestosis and lung diseases can take decades to develop, but within the project lifespan.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be partially effective at reducing impacts associated with geologic and soil hazards, and are likely to be implemented along the full length of the proposed road corridor (including non-BLM-managed lands). Additional mitigation measures addressing NOA are identified in Section 3.2.7, Air Quality.

3.2.2 Sand and Gravel Resources

The majority of the proposed mitigation in this section applies to operation of mineral material sites (i.e., gravel pits). However, some apply to placement and management of mineral materials for road and ancillary facility construction and operation.

1. **Potential BLM Mitigation Measure:** Gravel and other construction materials would not be taken from streambeds, riverbeds, active floodplains, lakeshores, or outlet of lakes unless the taking is approved by the Authorized Officer as per further site-specific analysis.

   Effectiveness: This mitigation measure is designed to minimize impacts on waterbodies, including but not limited to bank erosion, channel migration, changes to surface or subsurface flows, changes to flow velocity, and other local hydraulic effects. It addresses impacts to water bodies, water quality, and aquatic habitat. This mitigation measure, where applied, would be highly effective at eliminating impacts that would be caused by such actions, and maintaining distance between the project actions and the waterbodies would reduce impacts to water quality and habitat. It is assumed that obtaining the approval by the Authorized Officer to engage in these actions would require additional design review and sufficient mitigation measures to avoid or reduce impacts.

   This mitigation measure would only apply to non-navigable waterways. Many of the rivers crossed within the proposed alternatives have been determined navigable and are State-owned submerged lands. It would be the decision of the State of Alaska whether gravel extraction permits for the beds of State-owned riverbed would be issued. The State has issued gravel extraction permits within active floodplains and riverbeds in the past to expedite rural construction projects, so it cannot be assumed that the State would adopt this mitigation measure on non-navigable or navigable waterways.

   Because the BLM manages only portions of the lands proposed within each alternative, if this mitigation measure is not adopted by all land owners, managers, or resource permitting agencies, it is anticipated that there would be impacts to downstream watersheds.

2. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would provide a detailed mineral materials (e.g., gravel) mining and reclamation plan to BLM for approval at least 90 days prior to beginning any mining operations. The mining and reclamation plan would address all applicable items in the attached Mineral Materials Mining and Reclamation Plan Proposal form (Attachment A). It would also address what would be done with asbestos-containing materials during reclamation.

   Effectiveness: This mitigation measure is designed to provide sufficient time and professional resources to review and identify that land management objectives and mitigation measures are properly applied to all construction activities related to mineral mining on public lands. On its own, it would be highly effective at eliminating and reducing impacts associated with incomplete or incorrect application of land management policies.

3. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would notify BLM at the beginning and end of active mining operations.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at eliminating impacts associated with or land use conflicts on BLM-managed lands. It would be partially effective at eliminating impacts resulting from lack of agency coordination; timely public notifications; and incomplete implementation of approved monitoring, regulatory permit compliance, or reclamation plans associated with the material sites.

4. **Potential BLM Mitigation Measure:** Excavated materials would not be stockpiled in rivers, streams, 100-year floodplains, or wetlands unless approved by the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with placement of fill or materials within a floodplain; disruption of natural floodplain hydrology, floodplain, and wetland connectivity; and changes in fish habitat for temporary storage of gravel and other materials.

5. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that the site is developed sequentially in cells. A disturbed cell would be reclaimed prior to opening a new area. Exceptions to allow for thawing of permafrost may be granted at the discretion of the Authorized Officer

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with erosion and sedimentation of soils.

6. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that a 100-foot undisturbed buffer is maintained along any lakes or creeks that flow through upland material mining pits. Any approved access roads that bisect the buffer area would be rehabilitated at the close of mining by revegetating the crossing with plant species and densities similar to those in the undisturbed buffer for at least 100 feet from the bank-full elevation. Access roads in buffers originally void of vegetation would be scarified to a minimum depth of 8 inches during final reclamation.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating water quality impacts that would be caused by erosion and sedimentation of disturbed soils under high flow events. This mitigation measure also is highly effective at reducing impacts caused by accidental leaks or spills from vehicles and mining equipment.

7. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that buffer zones are not disturbed, except by designated crossings. Operation of equipment, placement of overburden or mined material, or storage/placement of any equipment and supplies would not be allowed in any buffer zones identified in the mining and reclamation plan, specified in the Decision Record for this authorization, or required in these stipulations.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with water quality.

8. **BLM Standard Stipulation for Mineral Material Mining:** Unless separately authorized, AIDEA would ensure that no material site is used for storage of materials and supplies not related to production of mineral from that site. Unless separately authorized, AIDEA would ensure that mineral materials sites are not used for secondary or value-added production processes not related to production of mineral materials.

Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with the stockpiling of non-native soils that could alter the pH of the area.

9. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that no minerals originating outside the permit area are imported to the permit area, except as may be authorized in approved project plans.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with the stockpiling of non-native materials.

10. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that overburden, topsoil, and vegetation are stockpiled separately in a manner that prevents loss through erosion, preserves them for use in reclamation, and does not impede access to usable mineral materials.

    Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts on water quality and improving potential for successful reclamation activities. It may require larger acreages to be used for material stockpiling.

11. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that work pit sides are sloped to prevent erosion and provide for the safety of humans and animals. Slopes along pit sides and inactive faces would be no greater than 3:1 (horizontal:vertical).

    Effectiveness: This mitigation measure, on its own, would be mostly effective at eliminating impacts associated with slope failure on the safety of humans and animals.

12. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that site stabilization measures and measures to control erosion, sedimentation, and stormwater are maintained in proper working order throughout the term of the authorization, including during periods of temporary closure or inactivity.

    Effectiveness: This mitigation measure, on its own, would be highly effective at reducing water quality impacts associated with improperly placed or maintained controls. The implementation of a SWPPP is standard construction practice and permitting requirement in Alaska. It is included in AIDEA's design features (Chapter 2, Section 2.4.4 of the EIS)

13. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that BMPs for dust abatement (e.g., graveling, watering) are utilized when deemed necessary by AIDEA, their contractor, or subcontractor, or when directed by a BLM representative.

    Effectiveness: This mitigation measure, on its own, would be highly effective at reducing air and water quality impacts associated with dust control. AIDEA has committed in their design features outlined in Chapter 2, Section 2.4.4 of the EIS to develop and implement a Dust Control Plan.

14. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would meet with BLM staff at the end of the life cycle of the material site mine, prior to final reclamation, to define final configuration of the mine.

    Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with reclamation activities and potential future impacts to floodplains, vegetation, habitat, and water quality that could result by the final form and condition of the mine site.

15. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that reclamation is conducted in accordance with the approved reclamation plan. Deviations or modifications to the approved reclamation plan must be approved in writing by the Authorized Officer prior to execution.

    Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating impacts associated with water resources and habitat from not implementing the approved plans.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be highly effective at reducing air, water, wetland, floodplain, and habitat impacts associated with decisions and actions to mine sand and gravel resources on BLM-managed lands in the project area. If applied similarly along the project area, these standard stipulations would extend throughout the project area. Most of these measures are considered standard stipulations for BLM Mining Procedures, and standard construction practices employed within the State of Alaska and have proven effective.

3.2.3 Hazardous Waste

1. **Potential BLM Mitigation Measure:** AIDEA or its designee would prepare and implement a comprehensive waste management plan. This plan would be drafted in consultation with federal, state, and borough agencies as appropriate, and would be submitted to the Authorized Officer for approval. Management decisions affecting waste generation would be addressed in the following order of priority: (1) prevention and reduction, (2) recycling, (3) treatment, and (4) disposal. The plan would include:

    a. Precautions taken to avoid attracting wildlife to food and garbage, including use of bear-resistant containers for all waste materials and classes.
    b. Protocols for the incineration, backhaul, or composting of all putrescible waste in a manner approved by the Authorized Officer; burial of waste is not permitted. All solid waste, including incinerator ash, would be disposed of in an approved waste-disposal facility in accordance with U.S. Environmental Protection Agency and Alaska Department of Environmental Conservation (ADEC) regulations and procedures.
    c. Procedures for the disposal of wastewater and domestic wastewater. The BLM prohibits wastewater discharges or disposal of domestic wastewater into bodies of fresh, estuarine, and marine water, including wetlands, unless authorized by an Alaska Pollutant Discharge Elimination System permit.

    Effectiveness: This mitigation measure, on its own, if implemented as planned, would be mostly effective at preventing avoidable spills and also effective as a means for ensuring employees and contractors who are trained in the plan are able to efficiently and effectively clean up or contain any spills that may occur.

2. **Potential BLM Mitigation Measure:** Construction camps and permanent facilities for maintenance and operations would meet ADEC standards for handling and disposal of solid waste, human waste, gray water, and kitchen sanitation. AIDEA would provide waste disposal, gray water, and sanitation plans with sufficient detail to determine that they comply with ADEC guidelines.

    Effectiveness: This mitigation measure, on its own, if implemented as described by the approved plans, would be highly effective at reducing impacts associated with solid waste, human waste and gray water.

3. **Potential BLM Mitigation Measure:** AIDEA would remove all waste generated by road activities, and dispose of waste according to applicable local, state, and federal laws. Prompt removal of discarded or unneeded material, equipment, and debris is required.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating air and water quality impacts associated with the abandonment, improper storage, or disposal of construction wastes

4. **Potential BLM Mitigation Measure:** Temporary construction camps, permanent maintenance and operations stations, and all facilities would be maintained in a sanitary manner. Solid waste would be collected in bear-proof containers until hauled away for proper disposal.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to wildlife and human safety associated with the improper handling of wastes.

5. **Potential BLM Mitigation Measure:** AIDEA would transport, store, transfer, and dispose of hazardous waste, hazardous materials, and hazardous material containers in a way that meets legal requirements and prevents release to the environment.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at preventing avoidable impacts on soil, air, and water quality from improper or illegal procedures in hazardous waste and handling.

6. **Potential BLM Mitigation Measure:** Hazardous material containment liner material would be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing soil and water quality impacts associated with leaks and spills of stored chemicals.

7. **BLM Standard Stipulation for Mineral Material Mining:** AIDEA would ensure that all solid waste and garbage, including incinerated ash, is removed from public lands and disposed of in an ADEC-approved waste disposal facility. No solid waste is to remain on site for more than 90 days.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with construction and camp garbage and waste.

8. **Potential BLM Mitigation Measure:** AIDEA would ensure that portable toilets are used for human waste disposal, and are regularly maintained anywhere construction or maintenance activity is concentrated, such as at material sites. The disposal of human waste is not authorized on public land.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating impacts associated with water and soil contamination associated with the improper storage, handling, and disposal of human and biological wastes on public lands. It is AIDEA's intent to construct long-term maintenance facilities that would likely include septic systems.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be highly effective in ensuring sites remain reasonably clean and tidy, wildlife is not habituated to human food and garbage, and lands and waters are not polluted by normal operations. See also the following measures regarding unforeseen events such as spills. Effectiveness on BLM-managed land would be compromised if these measures were not in place across the full length of the road. However, laws and stipulations of land owners and permitting agencies, such as ADEC, are likely to result in similar stipulations throughout, although it is possible the State of Alaska or Native corporations could allow landfilling on their lands. The BLM would have much greater authority over regulation and handling of solid and hazardous wastes under Alternative C, because so much more of the route would be located on BLM-managed lands.

3.2.3.1 Spill Prevention and Response

1. **Potential BLM Mitigation Measure:** For construction phases, including material site operation, and for operations and maintenance of the road, AIDEA will prepare a Spill Prevention Control and Countermeasure Plan (SPCCP). The plan would be submitted to the Authorized Officer prior to the storage or transport of petroleum products greater than 1,320 gallons. AIDEA would follow the approved plan and update it as necessary throughout the term of Road Activities. One or more other plans would be prepared, submitted for approval, and followed to address special spill prevention and countermeasures associated with other hazardous material known to be transported on the Ambler Road, such as mining chemicals, liquefied natural gas, and mining ore.

   Effectiveness: This mitigation measure, on its own, would be highly effective at preventing impacts on soils, air, and water quality from avoidable spills and accidents. If successfully implemented, it would also ensure employees and contractors are appropriately educated in the plan, trained in the procedures, and sufficiently equipped to identify, clean up or contain any spills, and comply with notification procedures, which would reduce impacts when spills or accidents occur.

2. **Potential BLM Mitigation Measure:** All spills would be contained and cleaned up as soon as the release has been identified. Appropriate spill response equipment and supplies must be on hand when hazardous materials are used. Field crews must have access to these materials, and they must be available at each refueling point. All employees would be trained in general spill-response protocol and reporting requirements. Personnel with a higher level of spill-response training specific the hazardous materials known to be transported on the Ambler Road would always be present at each maintenance station and, if there is an associated airstrip, have oversight responsibility for the airstrip. The release of Petroleum, Oils, and Lubricants (POLs) or hazardous substances other than POLs to any water body is to be reported to ADEC as soon as the person has knowledge of the release. All other releases would be reported in accordance with ADEC spill reporting guidelines (in Fairbanks 907-457-2121, or 1-800-478-9300 outside normal business hours).

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with spills.

3. **Potential BLM Mitigation Measure:** Notice of any reportable spill (as required by 40 CFR 300.125 and 18 Alaska Administrative Code [AAC] 75.300) would be given to the Authorized Officer as soon as possible, but no later than 24 hours after occurrence.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with spills that need additional response expertise and oversight to ensure timely cleanup and prevent additional exposures.

4. **Potential BLM Mitigation Measure:** ADEC-approved oil spill cleanup materials (absorbents) would be carried by trucks transporting fuel or hazardous fluids on the road and would be available at all fueling points. AIDEA would ensure that communities identified at risk in the SPCCP were trained in emergency preparedness and, where prompt access to the road would be practical, provided spill cleanup materials. The absorbents would be appropriate to the hazardous substances that are used throughout the project.

Effectiveness: This mitigation measure, on its own, would be highly effective at reducing soil and water quality impacts associated with oil spills, and would be effective at educating local community leaders in emergency preparation and spill response.

5. **Potential BLM Mitigation Measure:** AIDEA agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S. Code [USC] 9601, et. seq. or the Resource Conservation and Recovery Act, 42 USC 6901, et. seq.) on the authorization (unless the release or threatened release is wholly unrelated to the authorization permittee/AIDEA/permittee's activity on the authorization). This agreement applies without regard to whether a release is caused by AIDEA, its agent, or an unrelated third party.

   Effectiveness: This mitigation measure establishes upfront in clear terms the legal and financial responsibility of AIDEA for all cleanup actions. This should be highly effective at motivating AIDEA to develop detailed plans and procedures, complying with local, state and federal laws, and ensure they and any contractors are training to successfully implement all spill response plans and procedures.

6. **Potential BLM Mitigation Measure:** During construction and operation, "duck ponds" would be placed beneath all parked vehicles at all times. Fuel spill kits would be kept on site wherever equipment is working. An overpack drum would be kept on site wherever drums are used to store or transfer petroleum or other hazardous materials.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with oil leaks and spills.

7. **Potential BLM Mitigation Measure:** AIDEA would ensure that all spill containment devices, including "duck ponds," liners, and vehicle drip pans, are maintained in good working condition at all times. Spill containment devices that are punctured, torn, or worn beyond serviceability would be replaced within 24 hours of discovery of the unserviceable condition.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating impacts associated with spills and leaks.

8. **Potential BLM Mitigation Measure:** Equipment that has been identified as having fluid leaks would have a drip basin under the leak area to ensure no release to the surrounding environment occurs.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with leaking fluids onto soils and vegetation.

9. **Potential BLM Mitigation Measure:** Prior to allowing any cyanide to be transported on the Right of Way, AIDEA would be a signatory in good standing to the International Cyanide Management Code. AIDEA would also require that any third party permitted to haul cyanide on the Right of Way be a signatory in good standing to the International Cyanide Management Code.

   Effectiveness: This mitigation measure, on its own, would be highly effective at preventing avoidable spills.

Summary of Effectiveness: The spill measures listed above, if implemented collectively, are expected to be mostly effective in preventing spills and checking spills that do occur with minimal environmental damage under most circumstances. For spills of large volumes of toxic material that escape into flowing waters before adequate response can be mobilized (e.g., tanker truck rollover), the measures are likely to be ineffective. The measures described above likely would be required by land managers/owners such as the National Park Service (NPS), State, and Native corporations and by permitting agencies such as the U.S. Army Corps of Engineers (USACE) and Alaska Department of Fish and Game (ADF&G). Therefore, effectiveness is anticipated to be relatively uniform across the entirety of the Proposed Action and Alternatives. Failure to implement these measures off BLM-managed land could result in adverse impacts to BLM-managed land if a spill occurs upstream from or in relatively close proximity to BLM-managed land. These measures would be enhanced by the Fuel Handling and Storage measures (see Section 3.2.3.2).

3.2.3.2 Fuel Handling and Storage

1. **Potential BLM Mitigation Measure:** Transportation and storage of hazardous materials would be handled in a manner to minimize the potential impacts to the environment and human health.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with fuel spills.

2. **Potential BLM Mitigation Measure:** AIDEA would ensure that all hazardous materials containers, including POL containers, are stored within secondary containment.

   a. Double-walled tanks would meet secondary containment requirements.
   b. When containment other than double-walled tanks is used, the containment area would be lined with an impermeable liner composed of material compatible with the substance(s) to be contained. The liner would be free of cracks or gaps and sufficiently impervious to contain leaks or spills.
   c. If the containment is completely under cover of a roof, then the containment volume must be large enough to contain the capacity of the largest container stored within.
   d. If the containment is not completely under cover of a roof, then the containment volume must be large enough to contain the capacity of the largest container stored, plus water from a 5-year, 24-hour storm event. The amount of precipitation from a 5-year, 24-hour storm event for a given location can be found at hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_ak.html.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating and or reducing impacts associated with leaks or breaks of tanks and containers.

3. **Potential BLM Mitigation Measure:** Transfer of POLS to equipment would be completed in a secure manner to minimize the possibility of contamination of the surrounding environment. At a minimum, secondary containment would be placed under the transfer location to catch overflow and assist the operator in containing a spill, if one occurs.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating impacts associated with leaking and spills during fuel transfers.

4. **Potential BLM Mitigation Measure:** Any equipment needing repairs that have the potential to release fluids would be repaired at a designated maintenance station if the equipment can be moved. If such repairs must be conducted in the field, the repairs would be completed over an impermeable liner to ensure fluid migration to the environment does not occur.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating or reducing impacts associated with equipment repairs.

5. **BLM Land Use Plan requirement:** No fuel storage or refueling of equipment would be allowed within the 100-year floodplain of a river or lake, unless approved by the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with leaks or spills from vehicles or containers within floodplains.

6. **BLM Land Use Plan requirement:** Fuel barrels and tanks, propane tanks, and all other hazardous substance storage containers must be labeled with the following information: Contractor or Road Operator name, contents of the container (name of the product put in the container, if not in the original container from the manufacturer), and date the product was purchased/put in the container (e.g., Smith [University of Alaska-Fairbanks], Gasoline, September 2008). Fuel handling would be in compliance with all state and federal regulations.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with spills and leaks from fuel and chemical storage containers. This mitigation measure would communicate important data that would inform handling specifications and response protocols to facilitate safe and efficient cleanup responses.

Summary of Effectiveness: The fuel measures listed above, if implemented collectively, are expected to be mostly effective in preventing spills and checking spills that do occur with minimal environmental damage under most circumstances. For spills of large volumes of toxic material that escape into unfrozen soils or flowing waters before adequate response can be mobilized (e.g., tanker truck rollover), the measures are likely to be ineffective. The measures likely would be required by the NPS, State, and Native corporations and by permitting agencies such as USACE and ADF&G. Therefore, effectiveness is anticipated to be relatively uniform across the entirety of the Proposed Action and Alternatives. Failure to implement these measures off BLM-managed land could result in adverse impacts to BLM-managed land if a spill occurs upstream from waters that flow through BLM-managed land. These measures would be enhanced by the Spill Prevention and Response measures (see Section 3.2.3.1).

3.2.4 Paleontological Resources

1. **Potential BLM Mitigation Measure:** AIDEA would develop a plan addressing inadvertent discovery of paleontological resources as part of its Plan of Development, to be submitted for approval.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at eliminating impacts associated with paleontological resources since the mitigation measure only addresses what happens after the resource is inadvertently discovered. Assuming the POD stipulates that if paleontological resources are found, AIDEA will contact the BLM and suspend all operations in the immediate area and that operations will not continue until the BLM issues a written authorization to proceed, it would be mostly effective at reducing impacts.

3.2.5 Water Resources

See also related stipulations under Sections 3.2.1, Geology and Soils (permafrost); 3.2.2, Hazardous Waste; 3.3.1, Vegetation and Wetlands; and 3.3.2, Fish and Amphibians.

3.2.5.1 Water – General

1. **Potential BLM Mitigation Measure:** 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. See also Section 3.3.2, Fish and Amphibians, regarding fish passage culverts.

Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with the roadway embankment blocking natural hydrology, changing flow paths, increasing pooling, changing erosion and sedimentation, or reducing connectivity of wetlands and floodplains. This is a typical practice for the design of roads in Alaska.

2. **Potential BLM Mitigation Measure:** Stream crossings would preserve floodplain connectivity to the greatest extent possible. Their design would include setting the invert for overflow culverts at the same grade level as the floodplain, and distributing the overflow culverts to match the flood-flow patterns in the floodplain. Culverts installed for sheet-flow connectivity would be marked so they can be easily inspected to ensure their intended functions.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with the roadway embankment on connectivity of wetlands and floodplains. These techniques would reduce flow quantity changes at individual culverts and changes to the distribution of flow within a floodplain or wetland area crossed by the roadway embankment. Typical practice for the design of roads in Alaska is to mark all culverts to assist in inspection.

3. **Potential BLM Mitigation Measure:** Mobile ground equipment would not be operated in or on lakes, streams, or rivers on BLM-managed land except when ice thickness is adequate to support the equipment without altering the stream bed or displacing water outside the stream channel, unless specifically approved by the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with disturbance to river and lake beds and wetland areas. This is a typical winter construction and safety practice.

4. **Potential BLM Mitigation Measure:** Following completion of use of ice bridges or ice roads, and before breakup occurs, AIDEA would breach ice bridges or ice roads at primary flow locations.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the blockage of primary flow channels during spring breakup and associated flooding of upstream reaches. This is typical practice for larger streams/rivers on Alaska's North Slope prior to breakup. Impacts to non-primary flow channels would not be mitigated by this measure, however.

5. **Potential BLM Mitigation Measure:** AIDEA would ensure that the temperature of natural surface water or groundwater would not be changed, beyond those changes happening under background conditions, by the Ambler Road or by any Ambler Road activities to affect the natural surface water or groundwater, unless approved by the Authorized Officer. Potential mitigation measures include limiting changes to energy pathways to those waters, such as avoiding changes in surface albedo, vegetative cover, reflected solar energy, or areas of pooling.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with water temperature changes such as increased permafrost thaw, vegetation health, aufeis growth, or loss of fish habitat. This measure may be difficult or costly to achieve, monitor, and maintain as climate changes continue.

6. **Potential BLM Mitigation Measure:** To comply with Executive Order 11988, and Department Manual 520, disturbance in floodplains would be avoided where practicable. When avoidance is not

practicable, floodplain disturbance would be minimized and floodplain function restored to the extent practicable.

a. New road construction within 100-year floodplains would be avoided unless no practicable alternative exists. Where the authorized route intersects a stream, it is assumed that road construction in the floodplain is unavoidable. Where new road construction is otherwise undertaken in the 100-year floodplain (e.g., parallel to a stream, in proximity to a lake, or for access to ancillary facilities), AIDEA would provide written documentation to the BLM of the alternative locations considered and rationale for why the alternatives are not practicable.
b. Roads through floodplains would cross riparian areas perpendicular to the main channel to the extent practicable.
c. Throughout the ROW, structural and vegetative treatments in riparian areas would contribute to the maintenance or restoration of proper functioning condition.
d. When riparian vegetation is cleared, riparian vegetation diversity and density would be re-established to the extent practicable.

Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with construction of the roadway embankment within a floodplain and disruption of natural floodplain hydrology, floodplain and wetland connectivity, and changes in fish habitat.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be highly effective at reducing impacts associated with water resources. Most of these measures are common design and construction practices in Alaska and would be applicable and highly likely to be implemented on all sections of all alternatives. Measures 4 and 5, if only required for BLM-managed lands, would result in higher performing sections on BLM-managed lands but less robust sections if not imposed for other lands. Based on the difficulty and potential high cost of Measure 5, it is unlikely to be implemented on lands outside of BLM management. Measure 6 would result in more of Alternative C being better designed and constructed, but with much of the current alignment including floodplains, may be very costly to redesign or construct.

3.2.5.2 Water Quality

1. **Potential BLM Mitigation Measure:** The applicant would employ BMPs for stormwater, sediment, and erosion control per the Alaska Storm Water Guide (dec.alaska.gov/water/wnpspc/stormwater/Guidance.html), with particular attention to considerations for linear projects.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with sedimentation and erosion. These are typical and required stormwater pollution prevention practices in Alaska construction projects.

2. **Potential BLM Mitigation Measure:** Snow ramps or snow bridges and ice thickening used during construction at watercourse crossings would be substantially free of soil and/or debris. The ramps and/or bridges would be breached upon completion of the winter construction season before spring snowmelt begins.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with sediment and debris entering the water course during construction activities and avoiding flooding by channel blockage during breakup.

3. **Potential BLM Mitigation Measure:** Caissons, coffer dams, or other methods would be used for in-water drilling or pile driving to keep work areas separate from surface waters, to protect water

quality. If any drilling muds were used for geotechnical drilling, bridge pile drilling, or other drilling, muds would be kept separate from any surface water. Muds would be disposed of as solid waste in an approved lined pit or in an established landfill and would not be disposed of on the ground surface or in water. See also Hazardous Waste (Section 3.2.3).

Effectiveness: This mitigation measure, on its own, would be highly effective at reducing water quality impacts associated with construction in river channels and floodplains that could introduce foreign materials to watercourses. It is recommended that this measure be required for all lands for all alternatives, especially for major bridge construction entailing bridge piers within the river channel.

4. **Potential BLM Mitigation Measure:** A 100-foot undisturbed vegetation buffer would be maintained along any ponds, lakes, creeks, rivers or higher-value wetland (patterned fens, emergent wetlands, and moss-lichen wetlands). The buffer width would start from the edge of the riparian area associated with waterbodies or from the edge of higher value wetland.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing water quality impacts associated with construction and roadway operations that could introduce foreign materials to ponds, lakes, creeks, rivers, or high-value wetlands. This measure would also provide a buffer to any hydrologic changes experienced at the roadway or cross drainage culverts prior to entering natural drainage channels. It is recommended that this measure be required for all lands for all alternatives.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be highly effective at reducing impacts associated with construction and operation on water quality. If these measures are only required for BLM-managed lands, Alternative C would benefit the most as it has the most waterway crossings (and BLM managed lands) where water quality can be impacted. Many of these measures are standard construction BMPs and likely to be required by other land owners and managers. It is recommended that these measures be required for all lands for all alternatives.

3.2.6 Acoustical Environment (Noise)

1. **Potential BLM Mitigation Measure:** As part of the plan of development, AIDEA would provide a Noise Management Plan, subject to land manager approval, outlining noise reduction methods and features to be used during construction and operation of the right of way.

   Effectiveness: The Noise Management Plan would likely include measures to reduce noise from construction vehicles and haul trucks, such as good mufflers, directional backup alarm, and limiting use of air brakes; however, the noise from blasting, excavating, grading, vehicle movement, and other construction and maintenance activities would be unavoidable. If mitigation measures in the plan were to be implemented, they would be partially effective at reducing impacts associated with construction and operational noises. The cost of noise barriers would be prohibitive and would not likely be included in the plan.

3.2.7 Air Quality and Climate

1. **Potential BLM Mitigation Measure:** Prior to receiving an NTP for surface disturbing activities, AIDEA would submit a Dust Control Plan, subject to approval by the Authorized Officer and review by ADEC, that would apply to all road construction and maintenance activities and to construction and operation of all project facilities, including airstrips, construction camps, and material sites. At a minimum, the plan would include: a literature review of the effectiveness and environmental effects of different palliative options; documentation of consultation with the ADEC, ADF&G, USFWS,

NPS, and EPA regarding palliative selection; rationale for selection of palliatives that includes consideration for minimizing effects on fish, wildlife, vegetation, and water quality; and a dust control prescription (BMPs, palliatives, policies, practices, and methodologies, and general schedules) by activity, season, road segment, and construction phase. In developing the Dust Control Plan, the BLM expects AIDEA to achieve 75 percent dust control. Details on palliatives, frequency, and application method would be included in this plan.

Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to air quality from dust generated or mobilized during construction, operations, and maintenance activities. While AIDEA has committed to employing standard BMPs related to dust suppression to minimize emissions, a requirement to submit a Dust Control Plan subject to approval by the Authorized Officer may further reduce impacts of fugitive dust on air quality, water quality, fish and aquatic life, fish habitat, and vegetation. If the BLM were to require AIDEA to submit a Dust Control Plan only within BLM-managed portions of the routes, this measure would be ineffective at reducing potential impacts for the majority of Alternatives A and B, since much of the land traversed by those routes are not managed by the BLM. Under Alternative C, this measure would be much more effective at reducing potential impacts given the large proportion of BLM-managed lands on that route.

2. **Potential BLM Mitigation Measure:** The Air Quality component of the monitoring plan required in Section 1.1 would include, at a minimum: methods for determining compliance with applicable State and Federal laws and regulations; methods for monitoring dust impacts at sensitive receptors in all potentially affected communities during construction, road maintenance activities, and during road use; and correlating those measurements with dust production by right of way activities; methods for monitoring dust production during all activities that involve disturbance of NOA materials; methods for determining the effectiveness of dust control policies, practices, and methodologies implemented; and actions to be taken in response to adverse monitoring results.

   Effectiveness: This mitigation measure would be mostly effective at reducing impacts to air quality from emissions and dust generated or mobilized during construction, operations, and maintenance activities. While AIDEA has committed to employing standard BMPs related to dust suppression to minimize emissions, the requirement to conduct air monitoring, document implementation of plans and practices, and identify corrective actions as necessary, would enforce the proposed mitigation and address unanticipated impacts or ineffective mitigation. If the BLM were to require AIDEA to submit a monitoring plan only within BLM-managed portions of the routes, or if corrective actions would only be enforced on BLM-managed portions of the routes, this measure would be ineffective at reducing potential impacts for the majority of Alternatives A and B, since much of the land traversed by those routes are not managed by the BLM. Under Alternative C, this measure would be more effective at reducing potential impacts given the large proportion of BLM-managed lands on that route.

3. **Potential BLM Mitigation Measure:** Dust suppressants with ingredients potentially harmful to aquatic organisms would not be used within 328 feet of any fish-bearing stream and higher-value wetlands (e.g., emergent wetlands, moss-lichen wetlands, patterned fens and shallow ponds).

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing the potential for dust control palliatives to impact fish and aquatic life within 328 feet of fish-bearing streams and higher value wetlands. If the BLM were to require AIDEA to avoid using dust control suppressants with ingredients potentially harmful to aquatic organisms within this distance of fish streams and high value wetlands only on BLM-managed lands, this measure would be ineffective at reducing potential impacts to fish along the majority of Alternatives A and B, since much of the land traversed by those routes are not managed by the BLM. This measure would be much more effective at reducing potential impacts to fish under Alternative C, given the large proportion of BLM-managed lands on that route, than Alternatives or B. Further, this measure would be more effective if it were also to prohibit the use of dust control suppressants with potentially harmful ingredients to all fish-bearing waters, including lakes, ponds, and off-channel habitats.

4. **Potential BLM Mitigation Measure:** AIDEA would ensure that all construction camps would be located in areas that avoid potential exposure to asbestos, or have been constructed to avoid human exposure to asbestos. AIDEA would ensure that all personnel who work on construction or operation of the road or associated facilities are fully informed of hazardous areas and methods to prevent their exposure to asbestos.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at eliminating exposures to asbestos in the temporary construction camps. This mitigation measure also provides training to all personnel working within the project area of the NOA hazard, which would be partially effective at eliminating exposures. This mitigation measure, as expressed, would cover some of the design features that AIDEA has committed to regarding the avoidance of materials containing NOA, as well as conditions of use. This measure would be equally effective at addressing NOA exposure along any of the action alternatives.

5. **Potential BLM Mitigation Measure:** Naturally Occurring Asbestos:

   Prior to receiving a NTP with surface disturbing activities, AIDEA would submit for approval by the Authorized Officer a comprehensive plan for dealing with and minimizing human exposure to NOA. At a minimum, the plan would address specific details of implementing the relevant design features in their proposal, qualifications of staff providing oversight for NOA-related activities, testing methods, operating procedures and construction techniques specific to areas containing NOA, design criteria (such as capping depths) to be used where NOA materials must be used, documentation of locations where NOA materials are placed, and methods for informing road users and maintenance staff when they are working where NOA materials were used.

   Effectiveness: This measure would be mostly effective at eliminating impacts associated with NOA exposure, and reducing impacts where NOA materials are encountered, used, and handled in project construction and reclamation activities. It would be minimally effective at reducing public concern regarding the presence of NOA in visible road dust, since the asbestos fibers are too small to be seen and the health impacts typically too far removed in time.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be highly effective at reducing air quality impacts associated with particulates, including both fugitive road dust and asbestos fibers from NOA. These measures would reduce human exposures and reduce risk to human health. It is anticipated that these measures would be implemented for the entire length of any alternative.

3.3 Biological Resources

3.3.1 Vegetation and Wetlands

See also Section 3.2.1, Geology and Soils, for erosion control measures.

3.3.1.1 Vegetation – General

1. **Potential BLM Mitigation Measure:** AIDEA would conduct baseline surveys to identify rare plants, prior to conducting surface disturbing activities to avoid impacts to rare plants species.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating impacts associated with rare plants. However, other environmental and engineering considerations may prevent shifting the road alignment to avoid identified rare plants. If the rare plant surveys discovered large local populations of rare plant species that could be avoided, then mitigation would be beneficial. If applied to only BLM-managed lands, the effectiveness would be limited to those lands.

2. **Potential BLM Mitigation Measure:** All restoration and revegetation activities would be performed in accordance with AIDEA's Revegetation Plan, as approved by the Authorized Officer. In order to minimize the risk of introducing invasive species, AIDEA's revegetation plan will rely on use of topsoil with live native vegetation where practicable, and on planting and reseeding as secondary options.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the introduction of invasive species. However, invasive species would likely spread during the restoration and revegetation activities from equipment unless other industry BMPs, such as wheel washes or regular equipment inspections, were implemented. Without any mitigation, non-native invasive species (NNIS) would likely be introduced and spread along the road corridor. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

3. **Potential BLM Mitigation Measure:** AIDEA would ensure that all areas where vegetation is cleared or fill is placed, including road embankments, are revegetated as soon as practicable, unless operation of the authorized road and facilities necessitates the area remaining unvegetated.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with vegetation removal and subsequent erosion of topsoil. This is a typical BMP (SWPPP) used to control erosion on Alaska construction projects.

4. **Potential BLM Mitigation Measure:** AIDEA would employ mitigation measures to reduce contamination of roadside vegetation through industry BMPs that prevent and minimize fugitive dust, stormwater runoff, **erosion**, and spills and leaks. Contaminant monitoring would continue throughout the life of the project, and adaptive management would be employed to modify mitigation measures to reduce contamination.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the risk of contamination of vegetation. This is a standard industry mitigation measure that could minimize, but not entirely eliminate, the contamination of roadside vegetation during construction and operation.

5. **Potential BLM Mitigation Measure:** AIDEA would establish requirements that vehicles used on the road be in good working condition and would do a visual inspection for any signs of leaks.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the risk of contamination of vegetation. This is a standard industry mitigation measure that would minimize or eliminate the release of petroleum products associated with vehicle use.

6. **Potential BLM Mitigation Measure:** At temporary construction camps, permanent maintenance camps, turnouts, or other places of common intended or unintended pedestrian traffic, boardwalks

would be built, used, and properly maintained in areas where repeated trampling would create visible trails or water tracks or would otherwise impede vegetation growth, or the route would be closed and closure enforced.

Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the risk of vegetation getting trampled and soils being compacted. The use and maintenance of boardwalks in areas of common pedestrian traffic would allow for unimpeded vegetation growth.

7. **Potential BLM Mitigation Measure:** Topsoil and vegetation would be stockpiled separately from overburden in a manner that prevents loss through erosion and allows for their use during the reclamation process.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the risk of erosion of topsoil and vegetation. This is a standard industry measure that would allow these materials to be used during the reclamation process. The use of live native vegetation during the revegetation process would minimize the spread of invasive species.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be partially effective at reducing impacts associated with vegetation, including rare plants, invasive species, contamination, and trampling. These measures likely would be required by land managers/owners such as the BLM, NPS, State, and Native corporations and by permitters such as USACE and ADF&G. Effectiveness of these mitigation measures across the length of the road would depend on implementation across landownership boundaries. In other words, if implementation of these measures were not continuous along the road corridor, the effectiveness would be reduced.

3.3.1.2 Wetlands

See also Section 3.2.5, Water Resources.

1. **Potential BLM Mitigation Measure:** The following mitigation measures would be incorporated to reduce impacts to wetlands and wetland functions by helping to maintain hydrologic connectivity between bisected wetlands and waterbodies. Design measures would be based on geologic and hydrologic studies to freely convey surface water across the road surface.

   a. Bridges and culverts would be installed at all identified drainage crossings, including rills and ephemeral channels, to help maintain hydrologic connectivity, minimize changes to watershed basin areas, and reduce likelihood of water impoundment degrading permafrost. An adequate number of culverts and/or bridges would be used to maintain hydrologic continuity and existing drainage patterns within wetland complexes, ephemeral channels, and perennial streams.
   b. Roadside ditches would only be used in limited cut areas where permafrost presence is unlikely. These efforts could help to maintain hydrologic connectivity between bisected wetlands and reduce the effects of diverting surface water flow to minimize impacts.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts of the project on the hydrologic connectivity of wetlands and waterbodies, and wetland functions. This is a standard industry measure. However, drainage pathways can be difficult to predict, and there is potential for some drainages to be missed or that culvert installation and/or maintenance would be inadequate.

2. **Potential BLM Mitigation Measure:** In wetlands, tundra mats or other appropriate types of ground protection would be used to minimize disturbance of ground vegetative cover outside the cut-fill footprint during non-winter construction, unless otherwise authorized by the Authorized Officer.

Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with disturbance of the vegetative cover in wetlands. The use of ground protection is a standard industry measure to minimize vegetation disturbance.

3. **Potential BLM Mitigation Measure:** Permafrost stabilization measures would include features to minimize the disruption of groundwater flow though the active layer above the permafrost covered by the roadbed, to protect groundwater-fed wetlands such as fens.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing risks to groundwater-fed wetlands. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

4. **Potential BLM Mitigation Measure:** Disturbance to uncommon wetlands such as patterned fens and moss-lichen wetlands would be avoided to the maximum extent practicable.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at eliminating impacts to uncommon wetlands. Avoiding uncommon wetlands, if practicable, is a common industry standard. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be mostly effective at reducing impacts associated with the hydrologic connectivity of wetlands and waterbodies, wetland functions, and disturbance of the vegetative cover in wetlands. These measures likely would be required by land managers/owners such as the NPS, State, and Native corporations and by permitters such as USACE and ADF&G. Effectiveness of these mitigation measures across the length of the road would depend on implementation across landownership boundaries.

3.3.1.3 Non-native Invasive Species

1. **Potential BLM Mitigation Measure:** AIDEA would prepare an Invasive Species Prevention and Management Plan (ISPMP) to prevent the introduction and spread of NNIS, including terrestrial and aquatic plant and animals. The ISPMP would incorporate a landscape management approach across landowner boundaries, BMPs, Early Detection Rapid Response (www.doi.gov/sites/doi.gov/files/National%20EDRR%20Framework.pdf), and reporting requirements to land managers. The ISPMP must be approved by the jurisdictional land manager prior to authorization of road construction and operations.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the spread of non-native invasive species (NNIS). Without any mitigation, NNIS would likely be introduced and spread along the road corridor.

2. **Potential BLM Mitigation Measure:** At a minimum, the ISPMP would address the following items:

   a. Compatibility with the BLM – Alaska Invasive Species Management 2010 Policy, available at: eplanning.blm.gov/epl-front-office/projects/nepa/37008/44249/47684/AK_BLM_Invasive_Species_Management_Policy_2010.pdf
   b. Methods and timeframe for conducting a baseline NNIS survey prior to initiating surface disturbing activities, and periodic surveys throughout the duration of the authorization.
   c. Methods of NNIS prevention and infestation management. The plan could include multiple methods of control and eradication depending on the size, density, location, and species present

within the infestation. Methods of control and eradication could include manual, mechanical, or chemical treatment, or disposal of invasive plants, animals, and infested soil.

d. Clear procedures for documenting and reporting detections of species of highest concern (list to be provided by BLM) to the Authorized Officer within 30 days of detection.
e. Specific practices, procedures, and BMPs for preventing the spread of NNIS, addressing inspection and washing/brushing of vehicles (including tires and undercarriage), and cleaning of equipment, clothing, and shoes.
f. Specific procedures to ensure that aircraft, vehicles/equipment, or materials that have traveled to, parked in, or been staged in areas infested with invasive plants are inspected and certified weed-free prior to being allowed on the right of way.
g. A program (procedures, timeframes, and documentation) for training all employees engaged in road construction or maintenance and all drivers authorized to use the road in invasive species awareness and abatement.
h. An adaptive management and monitoring framework to mitigate the introduction and spread of NNIS (including terrestrial and aquatic plants and animals) throughout the duration of the authorization and for at least five growing seasons after completion of reclamation.

Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the spread of NNIS. Without any mitigation, NNIS would likely be introduced and spread along the road corridor. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

3. **Potential BLM Mitigation Measure:** Permitted activities, including road and snow maintenance activities, would commence from areas known to not be infested with invasive plants (e.g., western end of the road) and progress toward known infested areas.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the spread of NNIS. However, invasive species would likely spread during the permitted activities from equipment unless other industry standard BMPs to clean equipment prior to use were implemented. Without any mitigation, NNIS would likely be introduced and spread along the road corridor. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

4. **Potential BLM Mitigation Measure:** All mineral materials (sand and gravel) used on the ROW would be inspected and certified weed-free in accordance with the State of Alaska's Weed Free Gravel Certification Program (plants.alaska.gov/invasives/weed-free-gravel.htm).

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the spread of NNIS. However, invasive species would likely spread during the permitted activities from equipment unless other industry standard best management measures to clean equipment prior to use were implemented. Without any mitigation, NNIS would likely be introduced and spread along the road corridor. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be mostly effective at reducing impacts associated with the spread of NNIS. These measures likely would be required by land managers/owners such as the NPS, State, and Native corporations and by permitters such as USACE and ADF&G. Effectiveness NNIS management on BLM-managed land would be compromised if these measures were not in place throughout the length of the road. If these mitigation measures are consistently applied across landowner boundaries, NNIS infestations may remain localized and small enough to be eradicated during seasonal monitoring and removal efforts.

3.3.1.4 Forestry, Timber, and Fire

1. **Potential BLM Mitigation Measure:** Prior to initiating clearing operations on federal land, AIDEA would provide the Authorized Officer with an estimate of the amount of merchantable timber (tree species 5 inches in diameter at breast height or larger), if any, expected to be cut, removed, or destroyed, and would pay the BLM in advance of such construction or maintenance activity, such sum of money as the Authorized Officer determines to be the full stumpage value of the timber to be cut, removed, or destroyed. Prior to any operations AIDEA if required, would enter into a timber sale contract with the BLM for timber designated for cutting on the ROW.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with merchantable timber resources. If this mitigation measure is applied to only BLM-managed lands, the effectiveness would be limited to those lands.

2. **Potential BLM Mitigation Measure:** AIDEA would prepare and submit for approval by the Authorized Officer a Timber Clearing, Salvage, and Utilization Plan prior to any clearing activity addressing, at a minimum, clearing equipment and methods, minimizing risks to public safety, avoiding fire fuel hazards, minimizing forest health risks, skidding, yarding, and decking management to minimize environmental impacts, erosion and sediment control during timber handling operations, timeframes for removal of timber from public lands, and plans, if any, for making timber available for disposal to the public. All timber clearing would be performed in accordance with the approved plan.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with timber resources.

3. **Potential BLM Mitigation Measure:** AIDEA would ensure that removal of timber and other woody vegetation is limited to only that necessary to facilitate activities authorized in the Grant of Right of Way, and that trees that will not be removed are not damaged.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at eliminating impacts associated with forestry resources.

4. **Potential BLM Mitigation Measure:** Use of open fires in connection with Ambler Road activities is prohibited on BLM-managed land unless approved by the Authorized Officer and performed in accordance with federal law, except that incineration of solid waste combustibles may be conducted in accordance with the grant stipulations. AIDEA would require all employees, contractors, subcontractors, and authorized drivers to build no fires except in designated fire rings designed for the purpose.

   Effectiveness: This mitigation measure, on its own, would be highly effective at eliminating the risk of wildfire. Without this mitigation measure, the risk of wildfire would increase and wildfire impacts could occur across landowner boundaries.

5. **Potential BLM Mitigation Measure:** The federal government would not be held responsible for protection of the AIDEA's structures or their personal property from wildfire.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at reducing impacts associated with wildfire.

6. **Potential BLM Mitigation Measure:** AIDEA would employ measures from Firewise Alaska (forestry.alaska.gov/Assets/pdfs/home/firewise09.pdf) to prevent wildfires from overtaking maintenance stations and communication towers.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to maintenance stations and communication towers from wildfire.

7. **Potential BLM Mitigation Measure:** AIDEA would promptly notify the Authorized Officer of any fires that occur on or near lands subject to the ROW grant. AIDEA would comply with the instructions and directions of the Authorized Officer concerning the use, prevention, and suppression of fires on BLM-managed land.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing the risk of wildfire, and the impacts of any wildfires that do occur. The prompt notification of any wildfires on or near lands subject to the ROW grant would lead to more effective wildfire management. Without this mitigation measure, the impacts associated with wildfire could increase across landowner boundaries.

8. **Potential BLM Mitigation Measure:** The BLM, through the Authorized Officer, reserves the right to impose restrictions on Ambler Road activities in any area to prevent the cause or spread of wildfire and ensure public safety during periods when fire danger is severe.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing wildfires and their impacts. Without this mitigation measure, the risk of wildfire would increase and wildfire impacts could occur across landowner boundaries.

9. **Potential BLM Mitigation Measure:** AIDEA would be held financially responsible for AIDEA's actions or activities that result in a wildfire. Costs associated with wildfires include, but are not limited to, damage to natural resources and costs associated with any suppression action taken on the fire.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at reducing impacts associated with wildfire.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be mostly effective at ensuring responsible forestry and timber management procedures are followed, and mostly effective at reducing impacts associated with wildfire. The measures described above likely would be implemented by land managers/owners such as the NPS, State, and Native corporations and by permitters such as USACE and ADF&G. Effectiveness of these mitigation measures across the length of the road would depend on implementation across landownership boundaries.

3.3.2 Wildlife – General (applicable to Fish and Amphibians, Birds, and Mammals)

1. **Potential BLM Mitigation Measure:** AIDEA would create and fund a fish and wildlife monitoring program that includes obtaining public input and providing public updates on monitoring results. Through the program, AIDEA would document conditions of fish, birds, and key wildlife species prior to construction to establish a baseline; monitor changes in habitat conditions and use during construction and operation of the road to characterize impacts; and contract with subject matter experts as needed to refine mitigation measures (subject to Authorized Officer approval) to increase their effectiveness. The program would include a point of contact for communities and fish and wildlife managers seeking and sharing information on conditions of fish and wildlife in the area affected by the project. See also Measure 7, below, regarding the Fish and Wildlife Protection Plan.

Effectiveness: This mitigation measure, on its own, would be highly effective at monitoring changes in the condition of fish and wildlife populations and would be a valuable tool in reducing impacts to fish and wildlife from the project if the program applied to the entire length of the Ambler Road. However, if the program is only implemented within the BLM-managed portions of the routes, then this measure would be partially effective under Alternatives A and B. Under Alternative C, this measure still would be partially effective; however, given the larger proportion of BLM-managed lands on that route, the area of effectiveness would be larger. It is unlikely that other land management agencies would require a similar but separate commitment from AIDEA. If other land management agencies were interested in monitoring fish and wildlife along the route, it is likely that a collaborative program between the BLM, AIDEA, and other land management agencies would be adopted and this would add significantly to the effectiveness of the program overall.

2. **Potential BLM Mitigation Measure:** AIDEA would ensure that their employees, contractors, and **subcontractors** do not harass or feed wild animals (including fish, amphibians, birds, and mammals). The threshold for harassment is intentionally causing an animal to alter its behavior. This would be part of training for drivers authorized to use the Ambler Road. Operators would prohibit their employees and the employees of agents, contractors, and subcontractors, while on duty or living at any camp or mobile camp, from feeding wildlife or leaving garbage or other potentially edible items that would attract wildlife, including birds. Garbage would be kept in bear-proof containers while awaiting incineration or backhaul.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to wildlife as a result of harassment by AIDEA employees, contractors, and subcontractors. All best efforts to educate employees would not entirely avoid negative interactions between humans and wildlife. Because this measure would be easy to implement and it would be more difficult to educate employees and contractors where they can and cannot intentionally harass wildlife, it is likely that this mitigation measure would apply to the entire route, so the effectiveness would not vary by alternative. This mitigation measure is likely similar to an AIDEA proposed design feature that would implement a wildlife interaction protocol.

3. **Potential BLM Mitigation Measure:** AIDEA would notify the Authorized Officer within 30 days if an animal is killed during the course of construction or operation of the road or associated facilities, including in defense of life or property.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at reducing impacts associated with wildlife. Although easy to implement and likely to be implemented by other land managers than the BLM, the measure would do nothing to prevent mortality of wildlife and is a measure intended to convey information rather than reduce impacts.

4. **Potential BLM Mitigation Measure:** AIDEA would ensure that food, garbage, and other potential wildlife attractants are kept secured while awaiting their use, removal, or incineration.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with wildlife interactions. Proper containment and disposal of wildlife attractants such as food and garbage may prevent some wildlife from approaching humans and, therefore, may reduce the potential for injury or mortality of wildlife or humans. It is assumed that AIDEA's proposed design feature to implement a wildlife interaction protocol would include measures to properly contain food and waste. However, if the proposed design feature does not include such measures, this potential mitigation measure would apply only to BLM-managed lands, although it is likely to be implemented also by the State of Alaska and other agencies. If only implemented on BLM-managed lands, it would be minimally effective on Alternatives A and B, but largely effective on Alternative C.

5. **Potential BLM Mitigation Measure:** All field crews, construction workers, maintenance workers, and drivers on the road would follow a wildlife interaction plan prepared by AIDEA or a designee detailing how they are to manage wildlife attractants (food and non-food materials) and respond to human-wildlife interactions. This would be included with the training for authorized drivers of the Ambler Road.

   Effectiveness: This mitigation measure is related to an ADEA design feature. On its own, this measure would be mostly effective at reducing impacts to wildlife as a result of human-wildlife interactions. All best efforts to educate employees would not entirely avoid negative interactions between humans and wildlife. This mitigation measure would apply to the entire route, so the effectiveness would not vary by alternative. This mitigation measure is likely similar to an AIDEA proposed design feature that would implement a wildlife interaction protocol. Because it is related to an AIDEA design feature, it is expected to apply across all land managing agencies.

6. **Potential BLM Mitigation Measure:** AIDEA would work with land managers and wildlife agencies to identify construction timing windows to protect wildlife. Timing design features related to this mitigation would be determined during the design/permitting phase.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to wildlife associated with construction of the Ambler Road. If this measure were applied only to the BLM-managed portions of the route it would likely prove costly, burdensome, and minimally effective for Alternatives A and B overall. However, it is likely that the measure would be implemented on the entire route by all land managing agencies under any alternative, so the effectiveness would not vary by alternative or land management composition.

7. **Potential BLM Mitigation Measure:** During the design/permitting phase, AIDEA would develop a Fish and Wildlife Protection Plan that would include measures to maximize opportunities for unfettered wildlife movement and minimize habitat fragmentation during construction and operation (see also Measure 1, above, regarding the fish and wildlife monitoring program). Where practicable, this would include design features such as:

   a. Burying infrastructure or facilities that may deter wildlife movement;
   b. Creating wildlife escapement design features in excavations;
   c. Siting and orienting infrastructure and facilities to allow maximum opportunities for unfettered wildlife movement;
   d. Using vegetation to provide screened and unfragmented movement corridors around infrastructure and facilities; and
   e. Following measures to minimize or eliminate visual or soundscape impacts that may deter wildlife movement.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts associated with wildlife movement and habitat fragmentation. Fragmentation is impossible to prevent. This measure would attempt to reduce the effects of fragmentation on wildlife through project design. If implemented only on BLM-managed lands, this measure would be minimally effective overall on Alternatives A and B, but moderately effective along the route as a whole on Alternative C. It is anticipated that land managers for non-BLM-managed lands would be supportive of implementing the plan.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be partially effective at reducing impacts to wildlife as a result of construction and operation of the Ambler Road. It is not possible to fully avoid or mitigate the impacts of the road to wildlife. These measures would be relatively easy and inexpensive to implement that would have partial effectiveness at reducing some impacts. Except as noted above, it is likely that these wildlife measures would be adopted by other agencies or implemented by AIDEA over the length of the alternatives, heightening their effectiveness.

3.3.3 Fish and Amphibians

See also Section 3.2.5, Water Resources, for related stipulations.

1. **Potential BLM Mitigation Measure:** AIDEA would submit culvert and bridge inspection and maintenance plans to the Authorized Officer for approval prior to construction and would adhere to the maintenance schedules and stipulations outlined in the plans.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with the potential for culverts and bridges to affect water quality or fish passage throughout the life of the project. If AIDEA were required to submit inspection and maintenance plans to the Approved Officer that included assessing fish passage conditions for culverts and bridges only within the BLM-managed portions of the routes, this measure would be ineffective at reducing potential impacts for most streams crossed by Alternatives A and B, since much of the land traversed by those routes are not managed by the BLM. Under Alternative C, this measure would be much more effective at reducing potential impacts given the large proportion of BLM-managed lands on that route.

2. **Potential BLM Mitigation Measure:** AIDEA would employ properly installed erosion and sedimentation measures during construction to minimize sedimentation impacts to fish habitat. AIDEA would also stabilize disturbed areas and employ BMPs at construction sites to direct stormwater away from fish-bearing waters.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing construction-related impacts associated with increased turbidity and sedimentation and the consequences of those impacts on fish and aquatic life. Employing measures to minimize erosion and sedimentation, stabilizing disturbed areas, and employing BMPs to direct storm-water away from fish habitat during construction is common practice for construction projects in Alaska. AIDEA is required to develop and adhere to SWPPPs during construction as well as maintenance activities along its entire route. If the BLM were to require AIDEA to employ additional measures beyond what is identified in their SWPPPs, such measures may further reduce impacts. If the BLM were to require this only on BLM-managed lands, this measure may be effective at further reducing impacts on streams crossed within a relatively small portion of the road. If limited to BLM-managed lands, this measure would be ineffective at reducing potential impacts beyond AIDEAs commitments for much of Alternatives A and B, but more effective for reducing impacts associated with Alternative C given the large proportion of BLM-managed lands on that route.

3. **Potential BLM Mitigation Measure:** Stream bed structures would be constructed such that the combination of structure height and subsequent water velocity allows all occurring fish species free movement within the water body. Any culvert that otherwise would be designed to convey less than the 100-year peak flood (1 percent exceedance probability) would be designed to convey at least the 100-year peak flood if it was a fish passage crossing.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with fish passage, assuming the mitigation measure would apply to all life stages for all species. If the BLM were to require AIDEA to employ such measures only on BLM-managed lands, this measure would be ineffective at reducing potential impacts for much of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route.

4. **Potential BLM Mitigation Measure:** All fish-bearing-stream crossings would be natural channel designs (e.g., U.S. Fish and Wildlife Service 2019), follow fish passage design guidelines, to facilitate fish passage for all life stages.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts associated with crossing structures to affect water quality and passage for all life stages of fish. If the BLM were to require AIDEA to employ such measures only on BLM-managed lands, this measure would be ineffective at reducing potential impacts for much of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route. While AIDEA has committed to using stream simulation design principles to design culverts in fish-bearing streams, impacts would be further reduced if BLM implemented this measure.

5. **Potential BLM Mitigation Measure:** AIDEA would protect known or suspected Fish Spawning Beds, Fish Rearing Areas, and Overwintering Areas from sediment where soil material is expected to be suspended in water as a result of Ambler Road activities. Settling basins or other sediment control structures would be constructed and maintained to intercept sediment before it reaches rivers, streams, or lakes. Where disturbances cannot be avoided, proposed modifications and appropriate mitigation measures would be designed by AIDEA and approved by the Authorized Officer.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts associated with increased sedimentation on fish spawning, rearing, and overwintering habitats used by resident and anadromous fish during construction, throughout operations and maintenance, and during reclamation activities. If the BLM were to require AIDEA to employ such measures only on BLM-managed lands, this measure would be ineffective at reducing potential impacts for much of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route.

6. **Potential BLM Mitigation Measure:** AIDEA would notify the BLM within 48 hours of any observation of dead or injured fish on water source intake screens or in holes used for pumping water. AIDEA would temporarily cease pumping from that hole until additional preventative measures are taken to avoid further impacts to fish.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing fish mortality from water withdrawal activities. However, the measure would be mostly effective at reducing the potential for such activities to repeatedly cause fish mortality for prolonged periods. If the BLM were to require AIDEA to employ such measures only on BLM-managed lands, this measure would be ineffective at reducing potential impacts for much of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route.

7. **Potential BLM Mitigation Measure:** During periods of fish spawning, rearing, and migration, AIDEA's activities on federal land may be restricted by the Authorized Officer with written notice. As needed, the Authorized Officer may furnish AIDEA a list of areas where such actions may be required, together with anticipated dates of restriction. The Authorized Officer would coordinate with ADF&G for appropriate fish habitat protection measures.

   Effectiveness: This mitigation measure, on its own, would be partially to mostly effective at reducing impacts from specific activities that could otherwise affect resident or anadromous fish during periods of spawning, rearing, and migration. If the BLM were to require AIDEA to restrict activities that could otherwise affect fish during these periods only on BLM-managed lands, the measure would be ineffective at reducing potential impacts for most of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route. If the activity would have lasting effects on habitats used by fish, but the activity would be restricted while fish are present, the measure would only be partially effective at reducing impacts.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be mostly effective, where employed, at reducing impacts associated with increased turbidity and sedimentation during construction and maintenance activities; ensuring fish passage is maintained throughout the life of the project for all life stages of fish and through regular inspections of culverts and bridges and that, where needed, corrective actions occur; ensuring all streambed structures allow for the free movement of all life stages of all fish species where fish occur; and minimizing potential impacts to fish during spawning, rearing, and overwintering by restricting activities. If AIDEA were to employ such measures only on BLM-managed lands, these measures would be ineffective at reducing potential impacts for much of Alternatives A and B, but more effective for Alternative C given the large proportion of BLM-managed lands on that route. These measures include design practices, some of which are likely to be required as part of State fish habitat and federal wetland permit conditions and therefore are likely to be implemented off BLM-managed lands. These measures do not remove the potential for aquatic impacts associated with contaminated soils or water from spills or leaks that would not be present under the No Action Alternative.

3.3.4 Birds

1. **Potential BLM Mitigation Measure:** AIDEA would ensure that vegetation clearing during all phases of construction would be scheduled to minimize impacts on migratory birds and any other birds on the BLM special status species list or watch list (lists to be provided by BLM and updated periodically). The primary mechanism to avoid and minimize impacts is to conduct vegetation clearing outside of the nesting season (May 1–July 15 for this region). If AIDEA chose to clear vegetation during this timeframe then AIDEA would have a qualified biologist survey any area where vegetation would be damaged by the project or associated activities within 48 hours prior to vegetation disturbance. If an active nest is located, an appropriate avoidance area (as determined by the qualified biologist) would be marked and avoided until the biologist determines that the nest has been naturally vacated. This measure is similar to a measure proposed by AIDEA.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing impacts to nesting birds where implemented. Measures to avoid vegetation clearing during the breeding season and avoid bird nests would greatly reduce the likelihood of direct impacts to nesting birds.

   AIDEA indicated in their application that "Construction on the pioneer road would likely take place year round, other than possible restrictions during spring break-up or bird nesting periods in compliance with the Migratory Bird Treaty Act (MBTA)." This would be somewhat consistent with the above Potential BLM Mitigation Measure. However, the MBTA does not prohibit incidental take (DOI Solicitor Opinion M-37050) such as would occur during vegetation clearing associated with the Ambler Road construction. Therefore, to comply with the MBTA, AIDEA would not currently be required to avoid construction during bird nesting periods. The BLM special status species policy and Alaska statewide land health standards afford protections to special status species and provide the framework for this Potential BLM Mitigation Measure. However, absent similar directives or a change in the DOI interpretation of the MBTA, it is unlikely that other land management agencies would implement a similar measure. Because these measures would only be effective on BLM-managed lands, incidental take of birds due to vegetation clearing could occur along the majority of the right of way for all alternatives.

2. **Potential BLM Mitigation Measure:** AIDEA would ensure that no vertical or near-vertical faces that may encourage bank swallow nesting are left on any slope, including on material stockpiles. If bank swallows establish nests, AIDEA would ensure that the face is not disturbed until after young are fledged or the nests are naturally vacated.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to nesting bank swallows, where implemented. This mitigation measure would discourage bank swallows from nesting in areas that may be affected by construction or operation activities, and if nesting were to occur, it prevents impacts to these nests. Because this mitigation measure is dependent on incidental observations of nesting activity, it would not be completely effective at preventing all impacts to nesting bank swallows.

   This mitigation measure would only be implemented on BLM-managed lands and it is unlikely that other land management agencies would implement a similar requirement. Therefore, injury or mortality of bank swallows and loss of nesting habitat is possible along a majority of the ROWs under all alternatives.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be only partially effective at reducing impacts to nesting birds along the entire length of the road. Because these measures would only be effective on BLM-managed lands, birds may be injured or killed and nesting habitat may be lost along the majority of the ROWs for all alternatives.

3.3.5 Mammals

1. **Potential BLM Mitigation Measure:** During periods of wildlife breeding, lambing, or calving activity, and during major migrations of wildlife, AIDEA's activities on BLM-managed land may be restricted by the Authorized Officer with written notice. From time to time, the Authorized Officer may furnish AIDEA a list of areas where such actions may be required, together with anticipated dates of restriction.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at reducing impacts to mammals during biologically important time periods. AIDEA's proposed design features (Chapter 2, Section 2.4.4 of the EIS) include similar and complimentary measures through the use of wildlife interaction and communication protocols. These measures provide opportunities for adaptive management of wildlife along the road.

2. **Potential BLM Mitigation Measure:** All wildlife would have the right of way on the Ambler Road. Vehicles would be required to slow down or stop and wait to permit the free and unrestricted movement of wildlife across the road at any location. During known caribou migration, the Authorized Officer may require temporary cessation of traffic.

   Effectiveness: This mitigation measure, on its own, would be highly effective at reducing the potential for injury or mortality of mammals on the road. This measure is similar to a proposed design feature (Chapter 2, Section 2.4.4 of the EIS), but which is limited just to caribou. As such, measures to reduce impacts to caribou would occur along the entire length of the road; however, measures to reduce potential impacts to other wildlife would only occur on BLM-managed lands if this mitigation measure were implemented. It is possible that other land management agencies would implement similar measures designed to avoid impacts to special status species or wildlife that are socially or economically important. Despite this mitigation measure or the proposed design feature, mortality of caribou and other wildlife should be anticipated as a result of the road because no mitigation measure can be completely effective.

3. **Potential BLM Mitigation Measure:** Snow bank height would be minimized to allow caribou passage. AIDEA would take particular measures to ensure that snow bank height is reduced during spring migrations.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing delays, deflections, or displacement of caribou and other mammals attempting to cross the road during winter. Snow bank height is 1 of several factors that may influence caribou behavior at the road. Implementation of this mitigation measure only on BLM-managed lands would have almost no effect for Alternatives A or B because very few caribou occur on the east end of those routes. Implementation of this mitigation measure on Alternative C would have a greater, but still limited, benefit to caribou because caribou use of BLM-managed lands along that route is substantially greater.

4. **Potential BLM Mitigation Measure:** Prior to starting activities, AIDEA would obtain the locations of known brown bear dens from current survey data for the purpose of avoiding both human/bear interactions and disturbance of bear dens.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at reducing potential impacts to denning brown bears. This mitigation measure would be highly effective along Alternative C, where much of the route is located on BLM-managed lands. Specifically, this could help to reduce impacts to denning brown bears in the Ray Mountains, where it is suspected that high quality denning habitat occurs in close proximity to the Alternative C route. In contrast, this mitigation measure would apply to a very small proportion of Alternatives A and B that does not include suitable brown bear denning habitat (i.e., alpine areas).

5. **Potential BLM Mitigation Measure:** During survey and construction, cross-country activity is prohibited within 1/2 mile of occupied grizzly bear dens identified by current survey unless alternative protective measures are approved by the Authorized Officer in consultation with the ADF&G. During maintenance and operations, cross-country activity originating from the Ambler Road is prohibited entirely.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at reducing potential impacts to denning brown bears. This mitigation measure would be highly effective along Alternative C, where much of the route is located on BLM-managed lands. Specifically, this could help to reduce impacts to denning brown bears in the Ray Mountains, where it is suspected that high quality denning habitat occurs in close proximity to the Alternative C route. In contrast, this mitigation measure would apply to a very small proportion of Alternatives A and B that does not include suitable brown bear denning habitat (i.e., alpine areas).

6. **Potential BLM Mitigation Measure:** Within the Tozitna North and Tozitna South Areas of Critical Environmental Concern (ACECs), aircraft associated with Ambler Road activities would be required to fly a minimum of 2,000 feet above ground level (AGL) from May 10 to June 30, unless doing so would endanger human life or be an unsafe flying practice. From July 1 to May 9, aircraft associated with Ambler Road activities would be required to fly a minimum of 1,000 feet AGL above these ACECs unless doing so would endanger human life or be an unsafe flying practice. Normal landings and takeoffs would be allowed.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts to wildlife within the ACECs as a result of aircraft activity associated with the Amber Road. Impacts to wildlife from aircraft would still be possible, but this measure would slightly decrease the magnitude and likelihood of impacts. Aircraft use as a result of the road would be limited; other aircraft not associated with the Ambler Road would not be required to adhere to this stipulation and could affect wildlife in the ACECs. This measure would be limited to Alternative C because Alternatives A and B do not cross ACECs. It is probable that the NPS would implement a similar measure (if Alternatives A or B are selected), but unlikely that other land management agencies would implement similar measures.

7. **Potential BLM Mitigation Measure:** To minimize wildlife entanglement and plastic debris pollution, erosion and sediment control products would be plastic-free, such as netting manufactured from 100 percent biodegradable, nonplastic materials like jute, sisal, or coir fiber.

   Effectiveness: This mitigation measure, on its own, would be minimally effective at eliminating impacts associated with wildlife entanglement and plastic debris pollution. The potential for wildlife entanglement in plastic erosion control products is not high. However, this is a measure that would be easily implemented and is not likely to be cost-prohibitive. This measure would do little to reduce impacts under Alternatives A and B, because BLM-managed lands constitute a small proportion of those routes. Under Alternative C, the effect would be greater as a larger proportion of those routes cross BLM-managed land. It is possible that, if the BLM were to adopt this mitigation measure, AIDEA would implement it across the entire route for consistency and ease of implementation. However, if the costs are prohibitive, it would not likely be implemented across the entire route. Other land management agencies, except potentially the NPS, are unlikely to implement a similar measure.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be partially effective at reducing impacts to mammals. Because BLM-managed land constitutes a small proportion of Alternatives A and B, if these mitigation measures are not adopted by AIDEA for other land management agencies, then their implementation would do little to reduce impacts across the entire project. Under Alternative C, these mitigation measures would have a greater affect as a result of the greater proportion of BLM-managed lands under Alternative C. No combination of mitigation measures can fully reduce the potential for behavioral disturbance, displacement, injury, or mortality of wildlife as a result of the Ambler Road. Impacts to wildlife will occur regardless, but these mitigation measures would be successfully in at least partially reducing these impacts.

3.4 Social Systems

3.4.1 Land Ownership, Use, Management, and Special Designations

For wild and scenic river crossings, see Sections 3.2.5, Water Resources, and 3.4.2, Transportation and Access.

1. **Potential BLM Mitigation Measure:** AIDEA, in final design, would work with private landowners to ensure that Native allotments and other private parcels would be entirely avoided wherever possible. AIDEA would minimize impacts of the road project (including materials sites, access roads, etc.) on nearby Native allotments and private parcels and on any existing development by means such as providing buffer space or using topography or existing vegetation as a screen.

   Effectiveness: This mitigation measure is expected to be mostly effective at avoiding overlap of the road and facilities with private property. For properties close to the road ROW, this measure would be minimally effective at protecting private property from proximity impacts such as noise. It is likely that other agencies would adopt this measure in an effort to protect the private property of allotments.

2. **Potential BLM Mitigation Measure:** AIDEA would minimize impacts within the Gates of the Arctic National Park and Preserve (GAAR) by moving material sites and maintenance stations outside of the Park Boundaries and by reducing the number of communications towers within GAAR boundaries as much as practicable.

   Effectiveness: Allowing only the road in GAAR, with necessary bridges and culverts, and not allowing material sites, maintenance stations, and airstrips, and reducing the number of communications towers in GAAR, would be effective in reducing the project footprint, disturbance, and industrial activity within the GAAR setting. If moving the road support facilities outside of GAAR would result in the facilities being located elsewhere along the route (as opposed to reducing the overall number of such facilities), the impacts associated with those facilities would still be incurred, but in locations outside a National Park System unit.

Summary of Effectiveness: The measures above would be effective at minimizing impact to different land ownership and management issues. They could be implemented separately or together. The GAAR measure applies only to alternatives A and B and is likely outside the jurisdiction of the BLM but could apply to other federal agency decisions. BLM and other landowning and permitting agencies likely also would be interested in avoiding use of Native allotments, so it is likely the allotment measure would be adopted by others, increasing its effectiveness.

3.4.2 Transportation and Access

1. **Potential BLM Mitigation Measure:** AIDEA's authorization (permit) program for drivers authorized to use the road would include education/training about ROW stipulations that apply to drivers. AIDEA would maintain documentation of such education/training and make the records available to BLM or other jurisdictional agencies on request. No drivers would be allowed to use the road without such education/training.

   Effectiveness: This mitigation measure is designed to ensure those authorized to use the road had the same base of information about use of the road and protection of resources along the road. On its own, this measure would be mostly effective at educating users about relevant ROW stipulations. This would support limited vehicle access and enhance drivers' awareness of their obligations to mitigate environmental impacts. The program's success would depend on AIDEA ensuring availability of clearly stated information for drivers and ensuring drivers were trained before allowing drivers on the road. It is not clear whether other land managing and permitting agencies would adopt this measure, but it appears it would be effective if any one agency adopted it.

2. **Potential BLM Mitigation Measure:** In keeping with operation of the Ambler Road as an industrial access road not generally open to the public, AIDEA would operate project airstrips for Ambler Road activities only, except for emergency landings. Public access to airstrips for recreation, hunting, or other general uses would not be allowed and would be monitored by construction camp/maintenance camp crews and Ambler Road security. Details regarding methods of restricting access to project airstrips would be included in a Public Access Plan.

   Effectiveness: This mitigation measure is designed to prevent impacts that could be associated with opening project airstrips to the general public. On its own, this measure would be highly effective at eliminating impacts associated with public access via airstrips. However, several airstrips do not occur on BLM-managed land and enforcement may require other land management agencies to adopt this measure. It is likely the NPS would adopt the measure if airstrips were on NPS-managed lands. The State and Native corporations could have reasons to want airstrips open to non-project uses, but overall it is more likely than not that all landowners would agree to prevent recreational/hunting use of the airstrips.

3. **Potential BLM Mitigation Measure:** AIDEA would prepare and submit a Public Access Plan inclusive of construction and operational periods to the Authorized Officer for review and approval. The plan would include types and locations of ramps and other suitable methods for allowing public access across the road ROW for subsistence and local over-snow travel purposes, and for preventing the potential for trespass along the road from crossing sites, road and trail intersections, and other locations. AIDEA would make provisions for suitable permanent crossings of the ROW for the public where the ROW crosses or runs along existing roads, foot trails, winter trails, RS2477 trails, easements (including Alaska Native Claims Settlement Act 17b public easements), or other ROWs or known routes identified through AIDEA coordination with subsistence communities in the region and land managers. Provisions for crossings would be in place during Phase 1 construction. To ensure continued subsistence access, AIDEA would maintain any current trail in its current location or replace that access as a parallel trail or provide a crossing in a suitable location as determined by the Authorized Officer.

   Effectiveness: AIDEA has identified most of these as design commitments for the project. This mitigation measure is adding the preparation of a plan to be approved by the Authorized Officer to ensure continued use across the road ROW to preserve freedom of movement across the landscape, particularly in winter and generally by snowmobile for local residents. On its own, execution of the plan would be highly effective at providing safe road crossings. It would be partially effective at preserving today's freedom of movement, because it is highly unlikely that sufficient crossings would be identified, marked, and known to address all possible travel routes. Inevitably, travelers would feel less "free," and some likely would cross at unauthorized locations. It is likely that other land management agencies would adopt this or a similar measure to retain common routes and general freedom of movement.

4. **Potential BLM Mitigation Measure:** In accordance with regulations at 43 CFR 2805.15(a), BLM would retain the right to access the lands covered by the grant at any time and to enter any facility AIDEA constructs on the right of way. BLM drivers would be allowed entry in authorized driver training and would be authorized to drive the road for grant administration, inspection, and other public land management purposes at no charge. Other agencies or landowners that have permit-compliance responsibilities for the road or mines or that need access for land management and other functions similarly would be authorized to drive the road, after training, at no charge. Requirements to have commercial driver's license that may apply to other classes of drivers on the road would not apply to agency personnel except where they were otherwise required to have such a license.

   Effectiveness: This mitigation measure is designed to allow for management and oversight of the public lands and would be highly effective at allowing the BLM and other agencies to meet their agencies' obligations. It is likely that all land management and permitting agencies would adopt this measure.

5. **Potential BLM Mitigation Measure:** Areas of approved restricted public access would be easily identifiable on the ground. AIDEA would provide appropriate signs, flagging, barricades, and other safety measures when regulating or prohibiting public access.

   Effectiveness: This mitigation measure is designed to prevent public trespass on the industrial use ROW and in construction work zones. On its own, this measure would be mostly effective at retaining public safety during construction and at gateways to the road (guard stations). Short of permanently fencing the entire alignment, this measure on its own likely would be only partially effective at preventing trespass (i.e., people could easily ignore signs and bypass barricades). It is likely that other agencies would adopt this or similar measures.

6. **Potential BLM Mitigation Measure:** Where the proposed alignment interferes longitudinally with traditional trails or adjudicated RS2477 routes AIDEA would maintain such routes in their current location by altering or refining the Ambler Road design or replacing those facilities with parallel facilities of equal or better condition. Location of security gates would be adjusted to ensure no unauthorized access.

   Effectiveness: This measure, on its own, would be highly effective in maintaining access to and use of the trail associated with the first 5.4 miles of Alternatives A and B. The additional cost associated with the design change would be offset by the benefit of allowing continued access to current users in this part of the corridor. Adverse impacts could result from this measure if the trail needed to be replaced or moved, which would require a larger construction footprint and lead to increased impacts to vegetation, habitat, and water resources. In addition, use of the trail could increase, which would have adverse effects on natural resources from increased off-road vehicle use and foot traffic. In general, other agencies likely would adopt similar measures for existing trails on their lands. Regarding the first 5.4 miles of Alternatives A and B, the measure is specific only to the BLM.

Summary of Effectiveness: The measures listed above, if implemented collectively, would be mostly effective at limiting uses of the road to those intended and allowing for both safe use of the road and reasonable crossings of the road. Considering the entrance to the road is on BLM-managed land, measures related to the control of access at the entry point would be effective along the entire length of the road. Residual impacts are likely to include minor trespass issues where the road is encountered between established crossing locations (e.g., by snowmobile). Maintaining the traditional trails or adjudicated RS2477 routes could have adverse impacts from construction and may increase public access in some segments of the Ambler Road. Most of these measures are likely to be adopted by other agencies to help protect existing access along and across the road and prohibit non-project access. The measures are mostly not interdependent and would be reasonably effective on their own if some agencies declined to adopt some specific measure.

3.4.3 Recreation and Tourism

1. **Potential BLM Mitigation Measure:** AIDEA would prohibit its agents, employees, and contractors, and their respective employees, from hunting, fishing, shooting, trapping, using vehicles off-road, or camping, while on duty or living at a camp.

   Effectiveness: This mitigation measure is intended to protect wildlife and local subsistence practices from new recreation activity. On its own, this measure would be mostly effective in maintaining the status quo and not increasing competition for resources in the area.

2. **Potential BLM Mitigation Measure:** AIDEA's agents, employees, and contractors, and their respective employees, would not use project equipment or personal vehicles, including those used for transportation to and from the job site, for the purpose of scouting for, or participating in, hunting, fishing, shooting, and trapping activities.

   Effectiveness: This mitigation measure is intended to protect wildlife and local subsistence practices from new recreation activity. On its own, this measure would be mostly effective in reducing the ease of access for new hunting and fishing activity.

Summary of Effectiveness: The two measures listed above are expected to be mostly effective in limiting change to existing use of the land for recreational purposes based on road-related workers inhabiting the area. The measures would be effective at forestalling competition between road-related workers (as new recreational hunters, trappers, and anglers in the area) and existing subsistence and recreational users. These measures would be relatively inexpensive to establish and are in character with other resource development project restrictions on workers, but these restrictions apply to individual liberties of employees outside while they are not working but still in the area. To achieve full effectiveness, it would be necessary for these measures to be in place throughout the length of the road and not just on BLM-managed land. It is likely the NPS and Native corporations would include similar measures on their lands, but it is not clear the State of Alaska would do so. Without State of Alaska participation, the effectiveness would be substantially reduced, particularly for Alternatives A and B where a larger percentage of the road and more of the camps would be on State lands.

3.4.4 Visual Resources

1. **Potential BLM Mitigation Measure:** AIDEA would submit to the BLM for review and approval a plan to minimize impacts from light fixtures and the appearance of facilities, and paint colors to be used during construction and operations phases of road activities.

   Effectiveness: This mitigation measure is designed to minimize the establishment of visually contrasting facilities and of light emission associated with the project in an environment otherwise influenced almost exclusively by relatively dim natural light (e.g., moon) after sundown in the winter months. The use of approved facility colors would further reduce visual impacts throughout the year, and in particular the summer season, with 24 hours of daylight in the project area. This measure on its own is likely to be partially effective, particularly in influencing the base design of facilities by selection of forms, textures, and colors with low contrast. However, camps and gatehouses would be expected to be new, engineered structure and to be lit and evident whenever the sky was dark, and headlights are assumed to be in use throughout the night on the road. These impacts could not be reduced to near zero without restricting all construction to underground and all activity to daylight hours.

2. **Potential BLM Mitigation Measure:** For temporary and long-term facilities, designs would use the minimum lighting intensity necessary to ensure safety; use localized task lighting; and incorporate measures such as diffusers, lenses, and shielding to reduce nighttime glare, light radiation, and backscatter into the sky.

   Effectiveness: This mitigation measure is designed to minimize light emission associated with the project in an environment otherwise influenced almost exclusively by relatively dim natural light (e.g., moon) after sundown in the winter months. The use of approved facility colors would further reduce visual impacts throughout the year, and in particular the summer season, with 24 hours of daylight in the project area. This measure, on its own, is likely to be partially effective, particularly in influencing the base lighting design and minimizing large or glaring lights. However, camps and gatehouses would be expected to be lit and evident whenever the sky was dark, and headlights are assumed to be in use throughout the night on the road. These impacts cannot be reduced to near zero without restricting all activity to daylight hours.

3. **Potential BLM Mitigation Measure:** Structure designs and equipment at temporary construction camps and permanent maintenance and operations facilities would use color, form, line, and texture to reduce contrast with background features. Reflectivity would be minimized.

Effectiveness: This mitigation measure is designed to minimize contrast of built facilities with the natural environment. This measure on its own is likely to be partially effective, particularly in influencing the base design of camps and facilities. However, camps and gatehouses would be expected to have engineered structures, including contrasting towers and boxy buildings that would contrast in line and form regardless. These impacts could not effectively eliminated.

4. **Potential BLM Mitigation Measure:** The exterior of structures associated with temporary construction camps and long-term maintenance and operations facilities would be colored covert green, shadow gray, or a similar color unless another color is specified in the project-specific stipulations as depicted on the BLM's Visual Resource Management Standard Environmental Colors Chart. For more information visit: www.blm.gov/programs/recreation/recreation-programs/visual-resource-management

   Effectiveness: This mitigation measure is designed to minimize contrast of built facilities with the natural environment based on color. This measure, on its own, is likely to be mostly effective. However, structures would be expected to be utilitarian, probably with metal siding and roofs, and to be reflective at certain sun angles, regardless of color.

5. **Potential BLM Mitigation Measure:** Non-enclosed steel structures (e.g., poles, fences, towers) would be powder coated and have a dull galvanized metal finish. Tall structures would be minimized and constructed in locations not conspicuous on the horizon, to the greatest extent possible.

   Effectiveness: This mitigation measure is designed to minimize contrast of built facilities with the natural environment based on line and color. This measure, on its own, is likely to be partially effective by reducing glare and ensuring tall structures were placed consciously. However, tall structures with visually contrasting vertical lines and some reflectivity would be installed, and communications towers would likely need to be placed in relatively conspicuous locations to achieve best communication between towers. Visual impact would occur despite mitigation.

6. **Potential BLM Mitigation Measure:** Other visual impact mitigation measures, subject to consistency with vegetation BMPs, would include:

   a. Restore the construction zone in a manner that facilitates reestablishment of the adjacent natural vegetation.
   b. Use root balls, salvaged native plant materials, and the surface layer removed from the construction footprint for redistribution on disturbed areas where feasible.
   c. Maintain a screening of existing natural vegetation between the Ambler Road and its facilities and the Dalton Highway, to the extent possible.
   d. Minimize locating Ambler Road facilities, new material sites, and construction or maintenance material stockpiles in areas that would be visible to the public in places with special visual resource values.
   e. Blend the Ambler Road facilities into the natural setting to the extent practicable when crossing or passing near places with high visual resource value, including GAAR, ACECs, the Dalton Highway corridor, existing communities, and streams used for recreation and transportation.
   f. Use revegetation species that are appropriate for the general area. See also Section 3.3.1, Vegetation and Wetlands.
   g. Re-grade construction disturbances to a condition that blends with the surrounding terrain and surface drainage patterns.
   h. Monitor reclaimed, disturbed construction areas and take remedial action where expected revegetation success is not achieved.

Effectiveness: This mitigation measure is designed to minimize contrast by requiring use of natural vegetation and natural contours to help the road and associated facilities blend in or be hidden, particularly in areas where people (viewers) are more likely to be present or highly sensitive. This measure, on its own, is likely to be partially effective. However, the road and associated facilities, including bridges on river corridors and lights near the Dalton Highway and certain communities, would be visible and contrasting.

Summary of Effectiveness: The measures above, if implemented collectively, would be partially effective in reducing the visibility of the project, but overall, a new road across a natural environment would be readily visible at a distance from higher elevations and from the air and in foreground views when approached regardless of these measures. Similarly, lighting measures are expected to protect viewers from piercing glare but would not be expected to eliminate the visual effect of new lights in what is currently a natural night sky environment. To best achieve effectiveness, it would be necessary for these measures to be in place throughout the length of the road and not just on BLM-managed land. It is likely the NPS would require similar measures on GAAR lands. It is likely that the State of Alaska and NANA Corporation would require similar vegetation measures, mostly in the interest of minimizing erosion, but may not have the same requirements for line-form-texture-color of facilities. Nonetheless, these measures are not unusual for resource development and road projects and likely would not be unduly expensive to implement if implemented during design. Particularly with Alternatives A and B, the BLM would have authority over a relatively small portion of the road corridor. Therefore, the overall effectiveness of the BLM proposed mitigation measures could be quite low if not also adopted also by other landowners.

3.4.5 Socioeconomics and Communities

1. **Potential BLM Mitigation Measure:** AIDEA would develop and implement a plan acceptable to the BLM and NPS that provides the following mitigation measures to address effects on socioeconomics:

   a. Time construction activities to minimize impact to high-use tourist and recreation seasons (e.g., river floating, wildlife viewing, hunting, snow machining, dog mushing).
   b. Time construction activities to minimize impacts to local lodges and other businesses (i.e., minimize summer and fall construction in recreational and tourist areas).
   c. Identify and promote work opportunities for local residents.
   d. Develop training programs for local residents so that they could be employed during construction and operations.

   Effectiveness: The plan would address community and tourist economic activities affected by the project and prepare area residents for road-related jobs. This mitigation measure, on its own, would be partially effective at reducing economic impacts and enhancing economic benefit. However, impacts to tourist activities and lodges would occur. It is highly unlikely that it would be practical to avoid construction in all areas and at all times that they might be used for tourism. Training programs could be mostly effective in promoting new jobs and preparing residents to apply, where implemented, but it is unlikely to be practical to implement trainings in all communities that might want them or might benefit.

2. **Potential BLM Mitigation Measure:** Avoid locating construction support and operations/ maintenance facilities (e.g., construction camps) in places with special visual resource values that would be observable to the general public or that would reduce the visual values of private properties.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing the impact of the project to private properties and tourism. By shielding project facilities from areas valued for their scenic quality, this measure would reduce impacts to property values. By protecting wilderness views, effects on visitors seeking wilderness experiences would be slightly reduced and the effect on the tourism economy would also be slightly reduced. The road construction and operational activities, however, would remain. If this measure is applied only to BLM-managed land, the effectiveness would be limited only to that portion of the alternative.

Summary of Effectiveness: The measures listed above, if implemented collectively, are expected to be partially effective at reducing impacts associated with socioeconomic conditions and communities. Reduced impacts would be beneficial to communities and tourists at the expense of project schedule delays and added design costs; however, the changes to the wilderness features of the area cannot be avoided. The presence of project construction equipment, constructed facilities, cleared areas, and large haul trucks cannot be reduced to a level of being imperceptible. It is likely that other agencies would adopt similar measures to protect existing businesses.

3.4.5.1 Public Health

1. **Potential BLM Mitigation Measure:** AIDEA would use only non-persistent and immobile types of pesticides, herbicides, preservatives, and other chemicals. Each chemical to be used and its application constraint would be approved by the BLM prior to use. AIDEA would avoid and minimize construction and operations activities related to chemical applications during sensitive periods in life cycles such as calving, denning, nesting, and migration. The use of pesticides and herbicides is regulated by ADEC's Environmental Health Division through 18 AAC 90 and may require a permit.

   Effectiveness: This mitigation measure is intended to avoid accumulation of chemicals within the ecological system and, by extension, to avoid health risks to humans. This measure, on its own, would be highly effective at eliminating impacts from persistent chemicals. It would not, however, eliminate chemical environmental and health risk from accidental spills and leaks or risks associated with other types of chemicals that may be approved by the BLM and used for the project.

2. **Potential BLM Mitigation Measure:** AIDEA would develop and implement a plan to educate workers, regional health care workers, and residents of all communities in the area potentially affected by the Ambler Road on the health effects of exposure to NOA, pesticides, herbicides, preservatives, and other chemicals. The plan would include opportunities for routine risk-based health screening of workers, nearby communities, and regular subsistence users for non-cancerous and cancerous diseases that could result from exposure to these compounds.

   Effectiveness: This mitigation measure is designed both to educate people about risks, so they might avoid the risks, and to screen people for health impacts related to the road. This measure, on its own, would be partially effective at reducing impacts to health. Extending screenings and even education to a broad area because of the construction of a road is outside the norm for road projects and would be potentially expensive to implement. The State of Alaska may be unlikely to implement this measure on a similar level. Screenings may be most effective at providing psychological comfort that diseases have not manifested for those who are concerned about ingesting tainted wild food, for example. However, regular screening may also raise anxiety because people may assume screening means an expectation of health problems.

3. **Potential BLM Mitigation Measure:** AIDEA would prohibit its employees, contractors, subcontactors, and their employees from visiting local communities while on-duty or while staying at project facilities except for the conduct of official business. When communities are visited for conduct of official business, AIDEA will keep records of purpose, date, location, and participants, and will make such records available to BLM or law enforcement agencies on demand.

Effectiveness: This mitigation measure is designed to protect local communities from undue outside public health influences such as exposure to disease, sexual exploitation, or distribution of alcohol or drugs. This measure, on its own, would be mostly effective at eliminating these risks. However, it is not clear that all land managing agencies would adopt the measure, and the BLM may not have sufficient authority to enforce it outside BLM-managed lands.

Summary of Effectiveness: The measures listed above, if implemented collectively, would be partially to mostly effective at reducing the targeted health impacts but would not eliminate health risks. It is likely that all land managing and permitting agencies would share concerns about public health, but as noted above it is not clear that all would implement these or similar measures at the same level.

3.4.6 Environmental Justice

Effects of the project on environmental justice populations would be addressed through implementation of mitigation measures related to subsistence resources (Section 3.4.7), socioeconomics (Section 3.4.5), and public health (Section 3.4.5). Any residual impacts to local communities noted in these areas would disproportionately affect low-income and minority populations.

3.4.7 Subsistence Uses and Resources

1. **Potential BLM Mitigation Measure:** AIDEA's road construction, operations, and closure/reclamation would not impede qualified rural residents from pursuing subsistence activities (Alaska National Interest Lands Conservation Act, Public Law 96-487).

   Effectiveness: This mitigation measure is federal law. The other measures below would help ensure effectiveness.

2. **Potential BLM Mitigation Measure:** AIDEA would consult directly and regularly with affected subsistence communities, represented in the subsistence working group formed by AIDEA (see Chapter 2, Section 2.4.4 of the EIS), on an ongoing basis, using the following guidelines:

   a. AIDEA would consult with directly affected subsistence communities to discuss the siting, timing, and methods of road construction and operations to help discover local traditional and scientific knowledge, including locations needed to cross the Ambler Road, resulting in measures that minimize impacts to subsistence uses, potentially to include ramps for road crossing locations (see also Section 3.4.2, Transportation and Access).
   b. During this consultation, AIDEA would share the results of road use monitoring (both permitted and unpermitted uses).
   c. AIDEA would make every reasonable effort, including such mechanisms as conflict avoidance agreements and mitigating measures, to ensure that road construction activities and operations and maintenance activities do not result in unreasonable interference with subsistence activities. In the event that no agreement is reached between the parties, the Authorized Officer would determine which road activities would occur, including the timeframes.
   d. AIDEA would designate a project liaison dedicated to receiving feedback from potentially affected communities.
   e. AIDEA would consult with affected communities in the development of monitoring plans for subsistence resources.

   Effectiveness: This mitigation measure is designed to maintain a discussion about the road and subsistence use patterns in the area. The measures, on their own, would be mostly effective in providing road operators and the working group each with information about what the other is thinking or doing. It may be minimally or partially effective at disseminating information to the broader communities but would be a forum to encourage such dissemination.

3. **Potential BLM Mitigation Measure:** AIDEA would notify workers and road users when subsistence activities are ongoing in the area and direct them to refrain from actions that may affect the activities (e.g., not removing trapline markers).

   Effectiveness: This mitigation measure is designed to educate road users and workers about subsistence and, on its own, would be mostly effective at minimizing disturbance to subsistence activity near the road.

4. **Potential BLM Mitigation Measure:** Subsistence activity impact mitigation would also include:

   a. Identifying locations and times when subsistence activities occur, and minimizing work during these times and in these areas to the maximum extent practicable.
   b. Scheduling work (e.g., blasting) to avoid conflict with subsistence activities when possible.
   c. Managing project-related aviation activities to avoid disturbance of hunters or prey species.

   Effectiveness: This mitigation measure, on its own, would be partially effective at reducing impacts to subsistence activities. It is likely that project activities, particularly during the construction process, would affect subsistence activities despite these measures.

5. **Potential BLM Mitigation Measure:** AIDEA would establish a meat recovery plan for wildlife killed as a result of construction activities, truck traffic on the road, air traffic on airstrips, and other project related activity. The plan would be developed in consultation with the subsistence working group, allowing proximate rural residents an opportunity to remove and use the carcasses for subsistence.

   Effectiveness: This mitigation measure, on its own, would be mostly effective at ensuring that animals killed accidently supplemented traditional subsistence harvests and were not wasted.

Summary of Effectiveness: The measures listed above, if implemented collectively, would be partially effective at reducing impacts associated with subsistence. Actual reductions in average subsistence harvests because of the project may be effectively forestalled by these measures, particularly those regarding sharing of information and modifying project activities as a result, and those that promote freedom of movement across the road and across the landscape. Such effectiveness would be enhanced with implementation of wildlife measures. However, some impacts are unknown. If major changes to caribou wintering grounds or migration patterns resulted after the road had been in place for several years, the impacts to subsistence communities avoided by the caribou could be substantial despite the mitigation measures. While the risk may not be high that such a major change would occur, it is possible or likely that no mitigation would alter the new wildlife pattern or restore the subsistence use pattern. It is likely that AIDEA would voluntarily undertake measures to reduce conflict between subsistence activity and project activity, but it is not clear that the State would require AIDEA to undertake such measures on its lands.

3.4.8 Cultural Resources

1. **Potential BLM Mitigation Measure:** Mitigation measures for historic properties are listed in a Programmatic Agreement (PA; Appendix J of the Ambler Road EIS). AIDEA would have to comply with the terms of the PA, which is an agreement with the BLM, USACE, NPS, Alaska Department of Natural Resources, Alaska State Historic Preservation Officer, Advisory Council on Historic Preservation, and AIDEA, related to implementation of Section 106 of the National Historic

Preservation Act (NHPA; 16 USC 470 et seq.). A Cultural Resources Management Plan has been implemented and agreed to as part of the PA.

Effectiveness: Per the NHPA regulations, the PA allows for a phased approach to compliance and addresses all project activities, regardless of land ownership, across all phases of the project. The measures outlined in the PA include identifying all cultural resources that may be present in the project area of potential effects, determining if those resources are eligible to the National Register of Historic Places, determining whether the project would adversely affect any eligible resources, and determining how those effects would be resolved through avoidance, minimization, or mitigation. This measure, on its own, would be mostly effective at ensuring that cultural resources were identified and considered; that consultation with PA Signatories and other interested parties occurred; and, for those resources that would be adversely affected, that the protocols and measures outlined in the PA were followed. Following the terms of the PA would satisfy the law. However, where sites or areas could not be avoided, the PA would not eliminate the impact. Instead, the PA would require mitigation measures to be developed through consultation and implemented prior to ground disturbance from the project. It is highly likely that other state and federal agencies would participate in implementing this measure, because all have an interest and mandate by law to protect historic resources and already have worked together to craft the PA.

2. **Potential BLM Mitigation Measure:** AIDEA would consult with the BLM, local communities, and Tribes to seek ways to avoid damaging or disturbing cultural landscapes, Traditional Cultural Properties, or other places of traditional cultural importance located along the ROW that are locally or regionally important but may not meet the criteria of a historic property.

   Effectiveness: This mitigation measure is designed to ensure consideration of places of traditional cultural importance along the ROW that may not be addressed in the Section 106 PA (Appendix J). The measure, on its own, would be mostly effective in ensuring information is shared that is relevant to the protection of culturally important places along the ROW. It may be partially effective at avoiding disturbance to those places. Other state and federal agencies may participate in this measure related to the lands they manage, because it is closely related to the PA work the agencies have been working on, but it does not have the same force of law as the PA.

3. **Potential BLM Mitigation Measure:** AIDEA's road construction, operations, maintenance, and closure/reclamation would be coordinated with local communities and Tribes to help ensure these activities would not limit access to Native American religious sites, would not limit use and possession of sacred objects, would protect the indigenous people's freedom to worship through ceremonial and traditional rites (as defined in the American Indian Religious Freedom Act, 42 USC 1996); and would avoid adversely affecting the physical integrity of any Sacred Sites that may be located on federal lands, per EO 13007 (May 24, 1996; 61 FR 26771).

   Effectiveness: This mitigation measure, on its own, would be mostly effective at ensuring access to Native American religious beliefs, practices, and sites was not impeded. It is likely other federal agencies would participate in this measure, because the laws behind them apply to all federal lands. State agencies may participate as well for their lands but are not compelled by law.

Summary of Effectiveness: The measures listed above, if implemented collectively, would be partially to mostly effective at ensuring impacts to cultural resources are considered and/or avoided or mitigated. Certain cultural resources are only identifiable by the community sharing the values, traditions, beliefs, or social institutions associated with such places. Therefore, the effectiveness would be partially dependent on the extent of information sharing by Tribes, communities, or other parties about these types of places, if any exist along the ROW. In addition, the effectiveness will be partially dependent on the types of cultural significance such places may have and whether impacts can be effectively mitigated.

4 References

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Attachment A:

BLM Mineral Materials Mining and Reclamation Plan Proposal Form

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Attachment A:

BLM Mineral Materials Mining and Reclamation Plan Proposal Form

While there is no requirement to use this form to apply for a mineral material mining authorization, all of the relevant information identified here is required for a mining plan to be determined complete.

NOTE 1: Applicants should contact BLM to request separate authorization for the following activities, which are outside the scope of activities authorized under a mineral material mining plan:

- Establishment and operation of camps on public lands for commercial purposes.
- Storage of materials or supplies not related to the production of mineral materials, including culverts, bridge railings, calcium chloride, or other road maintenance supplies.
- Secondary or value-added production processes, including operation of hot-batch plants, asphalt production, cement production, fabrication of components for off-site use, and similar activities not related to the production of mineral materials.

NOTE 2: Applicants would be required to provide a copy of the following documentation prior to beginning operations.

- The relevant approved Storm Water Pollution Prevention Plan (SWPPP)
- A certified Spill Prevention, Control, and Countermeasure Plan (SPCCP) if required by 40 CFR 112, or a Spill Contingency Plan (SPC) subject to BLM approval.

Providing those, even in draft form, as part of this mining plan would help expedite the analysis and approval.

Applicants would also be **required** to provide a copy of any other permits required by applicable State or Federal regulation (e.g., a Clean Water Act Section 404 permit, an Alaska Department of Fish and Game Fish Habitat Permit, etc.) **prior to** beginning operations. Thus, they are encouraged to pursue those with the relevant agency concurrently with this application.

MINING PLAN

- ☐ Project Name
- ☐ Prepared By
- ☐ Date

Operator Information

- ☐ Operator Name
- ☐ Mailing Address
- ☐ Phone Numbers (Office, Cell, and FAX)
- ☐ Point of contact

Permittee Information (if different than operator information)

- ☐ Permittee(s) Name
- ☐ Mailing Address
- ☐ Phone Numbers (Office, Cell, and FAX)
- ☐ Point of contact

General Plan Information

- ☐ Mineral Material type(s) to be mined
- ☐ Quantity per Year to be mined (cubic yards)
- ☐ Total quantity to be mined

General Schedule of Operations from Start through Closure

- ☐ Proposed date for mobilization to site
- ☐ Proposed date for start of mining
- ☐ Estimated date for end of mining
- ☐ Estimated date for beginning of reclamation
- ☐ Estimated date for completion of reclamation
- ☐ Estimated date(s) for period(s) of temporary or seasonal closure
- ☐ Other relevant milestone date estimates (e.g., planned change of mining method, etc.)

DESCRIPTION OF OPERATIONS

Location

- ☐ Legal Description: (Township, Range, section(s), quarter section(s))
- ☐ Highway milepost
- ☐ Site name (if known)
- ☐ Are non-native invasive plant species present at the site? (if known).

Equipment and Devices

- ☐ Provide a list or description of all equipment and devices that would be used in the operations and the purpose/use for each

Operating Practices

- ☐ Type of action/operation proposed (open pit, quarry, etc.)
- ☐ Mining methods or techniques proposed (dozer scraping, excavator, drag line, blasting, etc.)
- ☐ Estimated dimensions of excavation/workings (length, width, depth)
- ☐ Description of processing/washing/crushing/sorting to be conducted on site
- ☐ If water-based processes are proposed (washing), a detailed description of the water management plan, including water source, flow control, settling, and discharge rates and locations.
- ☐ Estimated average daily production (cubic yards)
- ☐ Estimated depth of overburden above usable materials
- ☐ Estimated maximum volume of material stockpiles
- ☐ Estimated volume of material stockpiles at completion of mining
- ☐ Estimated total surface disturbance (acres); include mining area, access, berms, stockpiles, fuel yards, sanitation facilities, etc.
- ☐ Description of overburden stockpiling (location, methods to prevent loss from erosion)
- ☐ Description of dust control practices
- ☐ Proposed daily hours of operation

Reclamation Plan

- ☐ Description of proposed reclamation practices and methods
    - Regrading and reshaping to conform with adjacent landforms
    - Placement of growth medium and establishment of self-sustaining revegetation
    - Measures to control erosion, landslides, and water runoff
- ☐ General reclamation schedule, from start to finish
- ☐ Description of final pit configuration (reference diagrams)
- ☐ Reclamation practices for roads/access features
- ☐ Post-reclamation disposition of access features (reclaimed, left for future access to the pit, etc.)

Monitoring Plan

A monitoring plan must be designed to demonstrate compliance with the approved plan of operations and other Federal and State environmental laws and regulations, provide early detection of potential problems, and supply information that would assist in directing corrective actions should they become necessary. Examples of monitoring programs which may be relevant to a given operation include water quality, air quality (dust control), slope stability, revegetation progress (during reclamation), noise levels (if near visitor services facilities), and wildlife mortality. Monitoring plans may incorporate existing State and/or other Federal monitoring requirements to avoid duplication. However, the submitted monitoring plan needs to include copies of and clearly reference these other plans.

Where applicable, the monitoring plan must include details on:

- ☐ Type and location of monitoring devices
- ☐ Sampling parameters and frequency
- ☐ Analytical methods
- ☐ Reporting procedures
- ☐ Procedures to respond to adverse monitoring results

Interim Management Plan

The interim management plan describes management of the project area during periods of temporary and seasonal closures to prevent unnecessary or undue degradation.

The interim management plan must include, where applicable, the following:

- ☐ Measures to stabilize excavations and workings
- ☐ Measures to isolate or control toxic or deleterious materials (e.g., if hazardous materials, including POLs, are left on site)
- ☐ Provisions for the secure storage or removal of equipment, supplies and structures
- ☐ Measures to maintain the project area in a safe and clean condition
- ☐ Plans for monitoring site conditions during periods of non-operation
- ☐ Schedule of anticipated periods of temporary closure during which you would implement the interim management plan

Description of Support Facilities

- ☐ Office and administrative facilities
    - o Description of structures and locations (reference project maps)
- ☐ Sanitation needs
    - o Human waste management methods (port-a-john, etc.)
    - o Cleaning and maintenance schedule
- ☐ Public safety considerations
    - o Proposed fencing, barriers, or barricades and the need/purpose for each
    - o Proposed signage and the need/purpose for each
    - o Description of any other proposed public safety features or devices
- ☐ Trash and solid waste management
    - o Methods for interim secure storage of garbage generated on site
    - o Schedule for incineration of solid waste combustibles
    - o Schedule for backhaul of non-combustible waste
    - o Description of burning/incineration facilities
- ☐ SWPPP or other water management plans
    - o Proposed means of stormwater diversion around workings
    - o Diversion ditches and discharge locations in case water is produced during mining operations
    - o Sediment and erosion control methods and devices
    - o Schedule for inspection and maintenance of sediment and erosion control devices
    - o Location of any planned water discharge
    - o Water needs and uses
    - o Water sources, including and methods and rates of water extraction or transfer
- ☐ Access
    - o Location(s) of each proposed road (reference project maps)

- Road type for each proposed road (haul, light vehicle, access, etc.)
- Road maintenance methods and schedules
- Proposed upgrades to existing roads
- The location of reasonable public passage or access routes through or around the area to adjacent public lands

☐ Hazardous materials, including, but not limited to, POLs and explosives

- SPCCP or SCP, as applicable
- Location of all hazardous materials storage (reference project maps)
- Location of refueling areas
- Blasting plan, if applicable

Project Maps and Diagrams

☐ Maps must be at an appropriate scale and of sufficient detail for BLM to discern the locations of:

- Excavation boundaries
- Types and location of material stockpiles
- Phasing plan (see attached example)
- Processing facilities
- Overburden areas
- Administrative facilities (office structures, etc.)
- Equipment storage areas
- Maintenance facilities and/or location
- Refueling areas
- Fuel storage
- All water bodies within the intended disturbance area
- Access features
- Public safety devices, including proposed fences, barricades, and signage

☐ Diagrams

- Pre-mining cross sections
- Post mining cross sections
- Post-reclamation cross sections

The BLM may require additional, site-specific information when resource status or conditions warrant.

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Appendix O

References

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Appendix P

Glossary

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Glossary

Active floodplain: The flat area along a water body where sediments are deposited by seasonal or annual flooding; generally demarcated by a visible high water mark.

Aerial: Consisting of, moving through, found in, or suspended in the air.

Affect: To bring about a change. As a verb, affect is most commonly used in the sense “to influence” or “impact.” The adjective “affected” means acted upon or influenced by.

Alluvial: Sedimentary material consisting mainly of coarse sand and gravel; made up of or found in the materials that are left by the water of rivers, floods, etc.

Alternatives: The different means by which objectives or goals can be attained. One of several policies, plans, or projects proposed for decision making. BLM is directed by the National Environmental Policy Act (NEPA) to “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.…” (40 Code of Federal Regulations [CFR] 1507.2, Section 102(2)(E))

Ambient: Used to describe the environment as it exists at the point of measurement and against which changes (impacts) are measured.

Ambient air quality standard: Air pollutant concentrations of the surrounding outside environment that cannot legally be exceeded during fixed time intervals and in a specific geographic area.

Anadromous: Fish that mature in the sea and swim up freshwater rivers and streams to spawn (e.g., salmon, Dolly Varden, Arctic cisco).

Aquatic: Growing, living in, frequenting, or taking place in water; used to indicate habitat, vegetation, and wildlife in freshwater.

Archaeological resource: Places where remnants, such as artifacts or features, of a past culture survive in a physical context that allows for their interpretation. Archaeological resources can be districts, sites, buildings, structures, or objects and can be prehistoric or historic.

Aufeis: Thick ice that builds up as a result of repeated overflow.

Biological Assessment (BA): A document prepared by or under the direction of a federal agency; addresses listed and proposed species and designated and proposed critical habitat that may be in the action area and evaluates the potential effects of the action on such species and habitat.

Bureau of Land Management (BLM): An agency of the United States government, under the U.S. Department of the Interior, responsible for administering certain public lands of the United States.

Calving area: A large area where large mammals, particularly ungulates such as caribou, congregate to give birth to their young.

Capital expenses: The money spent to purchase or upgrade physical assets (e.g., buildings, roads, machinery).

Caribou Study Community: Any community that is in game management subunits that overlap caribou herd ranges, and which have Federal Subsistence Board customary and traditional use determinations for those herds.

Cubic feet per second (cfs): 1 cfs equals 448.33 gallons per minute.

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

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the *Federal Register* (FR) by the executive departments and agencies of the federal government.

Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA): Authorizes funds administered by the U.S. Environmental Protection Agency (EPA) to identify and clean up hazardous waste sites; also known as Superfund.

Connected action: Connected actions are: a) actions (other than unconnected single actions) that may be: (1) connected actions, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they: (i) automatically trigger other actions that may require environmental impact statements; (ii) cannot or will not proceed unless other actions are taken previously or simultaneously; (iii) are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25(a)(i-iii)).

Conservation system unit: Any unit in Alaska of the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, or a National Forest Monument, including additions and expansions to these systems in the future (Section 102(4) of the Alaska National Interest Lands Conservation Act).

Consultation: Exchange of information and interactive discussion; consultation can be mandated by statute or regulation that has prescribed parties, procedures, and timelines, such as under NEPA, Section 7 of the Endangered Species Act (ESA), or Section 106 of the National Historic Preservation Act (NHPA).

Cooperating agency: Assists the lead federal agency in developing an Environmental Impact Statement (EIS). A cooperating agency may be any agency that has special jurisdiction by law or special expertise for proposals covered by NEPA (40 CFR 1501.6). Any federal, state, tribal, or local government jurisdiction with such qualifications may become a cooperating agency by agreement with the lead agency.

Council on Environmental Quality (CEQ): An advisory council to the president, established by NEPA. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

Criteria air pollutants: The 6 most common air pollutants in the United States: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (both PM_{10} and $PM_{2.5}$ inhalable and respirable particulates), and sulfur dioxide (SO_2). Congress has focused regulatory attention on these 6 pollutants because they endanger public health and the environment, are widespread throughout the

United States, and come from a variety of sources. Criteria air pollutants are typically emitted from many sources in industry, mining, transportation, electricity generation, energy production, and agriculture.

Cultural resources: The remains of sites, structures, or objects used by humans in the past, historic or prehistoric.

Cumulative action: Proposed actions, which, when viewed with the proposed action, potentially have cumulatively significant impacts related to 1 or more identified issues. Cumulative actions "should be discussed" in the same NEPA document (40 CFR 1508.25(a)(2)).

Cumulative effect/impact: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1508.7, 1508.25). Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

Decision maker: The BLM official (also termed authorized official, authorized officer, responsible official, and responsible manager) who has been delegated authority to approve an action and is responsible for issuing a decision to implement a proposed action.

Density: The number of individuals per a given unit area.

Deposit: A natural accumulation, including precious metals, minerals, coal, gas, and oil, that may be pursued for its intrinsic value, such as a gold deposit.

Design features: Measures or procedures incorporated into the proposed action or an alternative, including measures or procedures that could reduce or avoid adverse impacts. Because these features are built into the proposed action or an alternative, design features are not considered mitigation.

Development: The phase of mining operations that occurs after exploration has proven successful and before full-scale production.

Direct effect/impact: "...those effects which are caused by the action and occur at the same time and place" (40 CFR 1508.8(a)).

Draft Environmental Impact Statement (Draft EIS): The draft statement of the environmental effects of a major federal action, which is required under Section 102 of NEPA and released to the public and other agencies for comment and review.

Effect: Environmental change resulting from a proposed action. Effects can be both beneficial and detrimental. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action but are later in time or farther removed in distance, although still reasonably foreseeable. Indirect effects may include growth-inducing and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air and water and other natural systems, including ecosystems. Effect and impact are synonymous, and both are used in this document.

Employment: Labor input into a production process, measured in the number of person-years or jobs; the number of jobs required to produce the output of each sector. A person-year is approximately 2,000 working hours by 1 person working the whole year or by several persons working seasonally. A job may be 1 week, 1 month, or 1 year.

Endangered species: Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range; plant or animal species identified by the Secretary of the Interior as endangered in accordance with the ESA.

Environment: The physical conditions that exist in an area, such as the area that would be affected by a proposed project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance; the sum of all external conditions that affect an organism or community to influence its development or existence.

Environmental Impact Statement (EIS): An analytical document prepared under NEPA that portrays the potential impacts on the environment of a proposed action and its possible alternatives. An ElS is developed for use by decision makers to weigh the environmental consequences of a potential decision.

Environmental justice: The fair treatment and meaningful involvement of all people, regardless of natural origin or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Executive Order (EO) 12898 directs federal agencies to achieve environmental justice as part of their missions by identifying and addressing disproportionately high adverse effects of agency programs, policies, and activities, on minority and low-income populations.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geologic agents, including gravitation creep.

Essential fish habitat (EFH): As defined by the Magnuson-Stevens Fishery Conservation and Management Act, "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." In Alaska, there are 6 federal Fisheries Management Plans that identify EFH for fish species managed under a fishery management unit. For the purpose of interpreting the definition of EFH habitat, "waters" include aquatic areas and their associated physical, chemical, and biological properties; "substrate" includes sediment underlying the waters; "necessary" refers to the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" includes all habitat types that a species uses throughout its life cycle.

Ethnographic: Of or pertaining to the descriptive and analytical study of the culture of particular self-defined groups or communities.

Exception: A 1-time exemption to a lease stipulation, determined on a case-by-case basis.

Exploration: The search for economic deposits of minerals, gas, oil, or coal through the practices of geology, geochemistry, geophysics, drilling, shaft sinking, and mapping.

Exploratory unit: A prospective area delineated on the basis of geological or geophysical inference and permit the most efficient and cost-effective means of developing underlying resources.

Federal action: A BLM proposal is a federal action when: (1) the proposal is at a stage in development where the BLM has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal (40 CFR 1508.23); (2) the proposed action and effects are subject to BLM control and responsibility (40 CFR 1508.18); (3) the action has effects that can be meaningfully evaluated

(40 CFR 1508.23); and (4) effects of the proposed action are related to the natural and physical environment, and the relationship of people with that environment (40 CFR 1508.8, 40 CFR 1508.14).

***Federal Register* (FR):** the official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as EOs and other presidential documents. The FR is published by the Office of the Federal Register, National Archives and Records Administration (NARA).

Final Environmental Impact Statement (Final EIS): A revision of the Draft EIS that addresses public and agency comments on the draft.

Fisheries habitat: Streams, lakes, and reservoirs that support fish populations.

Fishery: The act, process, occupation, or season of taking an aquatic species.

Floodplain: The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a 1 percent or greater chance of flooding in any given year.

Fossil: Evidence or remnant of a plant or animal preserved in the earth's crust, such as a skeleton, footprint, or leaf print.

Frequency: The number of samples in which a plant or animal species occurs, divided by the total number of samples.

Fugitive dust: Particles suspended randomly in the air, usually from road travel, excavation, or rock loading operations.

Game Management Unit (GMU): A geographic division made by the Alaska Department of Fish and Game (ADF&G) for the management of fish and wildlife in the state. Different GMUs have different hunting and fishing seasons, bag limits, and other harvest rules.

Geology: The scientific study of the origin, history, and structure of the earth; the structure of a specific region of the earth's surface.

Geomorphic: Pertaining to the structure, origin, and development of the topographical features of the earth's crust.

Global warming: An increase over time of the average temperature of the earth's atmosphere and oceans. It is generally used to describe the temperature rise over the past century or so and the effects of humans on the temperature rise.

Greenhouse effect: A process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases (GHG) and is reradiated in all directions. Since part of this reradiation is toward the earth's surface and the lower atmosphere, it elevates the average surface temperature above what it would be in the absence of the gases.

Greenhouse gas (GHG): A gas that absorbs and emits thermal radiation in the lowest layers of the atmosphere. This process is the fundamental cause of the greenhouse effect. The primary GHGs that are considered air pollutants are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs).

Groundwater: Water found beneath the land surface in the zone of saturation below the water table.

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions. The place where an organism lives.

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

Hazardous waste: As defined by the EPA, a waste that exhibits 1 or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Hazardous wastes are listed in 40 CFR 261.3 and 171.8.

Historic property: Historic properties are defined in the National Historic Preservation Act (NHPA; 54 United States Code [USC] 300308) as any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places [NRHP], including artifacts, records, and material remains related to such a property or resource."

Human environment: Includes the natural and physical environment and the relationship of people with that environment. When economic or social effects and natural or physical environmental effects are interrelated, then the analysis must discuss all of these effects on the human environment (40 CFR 1508.14).

Hydrocarbon: A naturally occurring organic compound composed of hydrogen and carbon. Hydrocarbons can occur in molecules as simple as methane (1 carbon atom with 4 hydrogen atoms), but also as highly complex molecules, and can occur as gases, liquids, or solids. The molecules can have the shape of chains, branching chains, rings, or other structures. Petroleum is a complex mixture of hydrocarbons.

Hydrologic system: The combination of all physical factors such as precipitation, stream flow, snowmelt, and groundwater that affect the hydrology of a specific area.

Hyporheic zone: Where surface and groundwater interact beneath and adjacent to streams; it is critical for salmon spawning and egg incubation and regulates biological activity that affects stream health (see Hancock 2002 for more information).

Impact: see "effect."

Impermeable: Not permitting passage of fluids through its mass.

Impoundment: The collection and confinement, usually of water (in the case of mining, tailings materials), in a reservoir or other storage area.

Indirect effect/impact: Impact caused by an action but later in time or farther removed in distance, although still reasonably foreseeable. Effects that "…are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on water and air and other natural systems, including ecosystems" (40 CFR 1508.8(b)).

Infrastructure: The underlying foundation or basic framework; substructure of a community's built environment, such as schools, police and fire stations, hospitals, roads, airports, and water and sewer systems.

Insect-relief area: An area with relatively low numbers of insects that caribou use for relief from insects.

Irretrievable: Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the wildlife forage production from an area is irretrievably lost during the time an area is used as an oil or gas development site. If the use changes, forage production can be resumed. The production lost is irretrievable, but the act is not irreversible.

Irreversible: A term that applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Jurisdictional wetland: A wetland area delineated and identified by specific technical criteria, field indicators, and other information, for the purposes of public agency jurisdiction. The U.S. Army Corps of Engineers (USACE) regulates "dredging and filling" activities associated with jurisdictional wetlands. Other federal agencies that can become involved with matters that concern jurisdictional wetlands include the U.S. Fish and Wildlife Service (USFWS), EPA, and the Natural Resource Conservation Service.

Landform: Any physical, recognizable form or feature on the earth's surface having a characteristic shape that is produced by natural causes. Landforms provide an empirical description of similar portions of the earth's surface.

Landscape: The sum total of the characteristics that distinguish a certain area on the earth's surface from other areas; these characteristics are a result not only of natural forces, but also of human occupancy and use of the land. An area composed of interacting and interconnected patterns of habitats (ecosystems), which are repeated because of geology, landforms, soils, climate, biota, and human influences throughout the area.

Land management: The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

Land status: The ownership or management status of lands.

Land use allocation: The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of some specified use(s) such as campgrounds, wilderness, logging, and mining.

Land use plan: a set of decisions that establish management direction for land within an administrative area, as prescribed under the planning provisions of the Federal Land Policy and Management Act; an assimilation of land-use-plan level decisions developed through the planning process outlined in 43 CFR 1600, regardless of the scale at which the decisions were developed. The term includes both Resource Management Plans and Management Framework Plans.

Listed species: Species that are listed as threatened or endangered under the ESA.

Long-term impacts: Impacts that normally result in permanent changes to the environment such as the loss of habitat due to development of a gravel pit. For each resource, the definition of long term may vary.

Management area: An area delineated on the basis of management objective prescriptions.

Marine: Of, found in, or produced by the sea.

Migratory: Moving from place to place, daily or seasonally.

Mining District: The term "Mining District" applies traditionally to geographic areas described by miners and are often governed under bylaws drawn up by miners. The Ambler Mining District is an informal descriptive term applied to the approximate area mapped in this EIS and has no formal or legal standing. In contrast, the many individual mining claims and mining agreements that exist within the mapped area do have legal rights and responsibilities under state and federal law.

Mitigation: Steps taken to: (1) avoid an impact altogether by not taking a certain action or parts of an action; (2) minimize an impact by limiting the degree or magnitude of the action and its implementation; (3) rectify an impact by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate an impact over time by preserving and maintaining operations during the life of the action; and (5) compensate for an impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

National Environmental Policy Act (NEPA): An act declaring a national policy to encourage productive and enjoyable harmony between humankind and the environment; promote efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; enrich the understanding of the ecological systems and natural resources important to the nation; and establish a CEQ.

National Pollutant Discharge Elimination System (NPDES): A program authorized by Sections 318, 402, and 405 of the Clean Water Act (CWA), and implemented by 40 CFR 122. The NPDES program requires permits for the discharge of pollutants from any point source into waters of the United States.

Notice of Availability (NOA): The FR notice that an EIS (draft or final) or Record of Decision (ROD) is available. Publication of a notice of filing of an EIS by the EPA formally begins the public comment period.

Notice of Intent (NOI): This FR notice announces that an EIS will be prepared. Publication of this notice formally starts the scoping process.

Particulates: Small particles suspended in the air, generally considered pollutants.

Per capita income: Total income divided by the total population.

Permafrost: Permanently frozen ground.

Plant community: A vegetation complex, unique in its combination of plants, that occurs in particular locations under particular influences. A plant community is a reflection of integrated environmental influences on the site (e.g., soils, temperature, elevation, solar radiation, slope aspect, precipitation).

Pollution: Human-caused or natural alteration of the physical, biological, and radiological integrity of water, air, or other aspects of the environment that produce undesired effects.

Preferred alternative: The alternative the BLM believes would reasonably accomplish the purpose and need for the proposed action while fulfilling its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. This alternative may or may not be the same as the BLM or proponent's proposed action.

Proposed action: A proposal for the BLM to authorize, recommend, or implement an action to address a clear purpose and need. A proposal may be generated internally or externally.

Public scoping: A process whereby the public is given the opportunity to provide oral or written comments about the influence of a project on an individual, the community, and/or the environment.

Raptor: Bird of prey such as eagles, hawks, falcons, and owls.

Reasonably foreseeable action: Actions for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends.

Record of Decision (ROD): A document separate from, but associated with, an EIS that states the decision, identifies alternatives (specifying which were environmentally preferable), and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and, if not, why (40 CFR 1505.2).

Regulated air pollutants: Pollutants first set forth in the Clean Air Act of 1970 and are the basis upon which the federal government and state regulatory agencies have established emission thresholds and regulations. Regulated air pollutants include criteria air pollutants, HAPs, volatile organic compounds (VOCs), and GHGs. The same pollutant may be regulated under more than 1 regulatory standard.

Regulation: An official rule. Within the federal government, certain administrative agencies (such as the BLM) have a narrow authority to control conduct within their areas of responsibility. A rule (also called a regulation or rulemaking) is a statement published in the FR to implement or interpret law or policy (see Administrative Procedure Act, 5 USC 551(4) ["'rule' means the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy or describing the organization, procedure, or practice requirements of an agency…"]). A rule is generally published as a proposed rule and then as a final rule. Once a rule is published in final, it is codified in the CFR and remains in effect until it is modified by publication of another rule.

Resident: A species that is found in a particular habitat for a particular time period, such as winter or summer resident, as opposed to a species found only when passing through during migration.

Resource management plan (also known as Land Use Plan or Management Framework Plan): A set of decisions that establish management direction for land within an administrative area, as prescribed under the planning provisions of the Federal Land Policy and Management Act of 1976, as amended, Public Law 94-579, 90 Statute 2743; an assimilation of land use plan-level decisions developed through the planning process outlined in 43 CFR 1600, regardless of the scale at which the decisions were developed.

Right-of-way: Public lands that the BLM authorizes a holder to use or occupy under a grant (e.g., roads, pipelines, power lines, fiber optic lines).

Riparian: Occurring adjacent to streams and rivers and directly influenced by water. A riparian community is characterized by certain types of vegetation, soils, hydrology, and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

Scenic River: River designation, under the Federal Wild and Scenic Rivers Program, on the basis of undisturbed and scenic character. Scenic rivers are given special management criteria by federal agencies.

Scoping (internal and external): The process by which the BLM solicits internal and external input on the issues and effects that will be addressed, as well as the degree to which those issues and effects will be analyzed in the NEPA document. Scoping is a form of public involvement in the NEPA process. Scoping occurs early in the NEPA process and generally extends through the development of alternatives (the public comment periods for EIS review are not scoping). Internal scoping is simply the use of BLM staff to decide what needs to be analyzed in a NEPA document. External scoping, also known as formal scoping, involves notification and opportunities for feedback from other agencies, organizations, and the public.

Scoping process: A part of the NEPA process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an EIS (40 CFR 1501.7).

Sediments: Unweathered geologic materials generally laid down by or within waterbodies; the rocks, sand, mud, silt, and clay at the bottom and along the edge of lakes, streams, and oceans.

Sensitive species: Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations; species that have appeared in the FR as proposed for classification or are under consideration for official listing as endangered or threatened species.

Short-term impacts: Impacts occurring during project construction and operation, and normally ceasing upon project closure and reclamation. For each resource, the definition of short term may vary.

Significant: The description of an impact that exceeds a certain threshold level. Requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts, which should be weighted along with the likelihood of its occurrence. The CEQ regulations at 40 CFR 1508.27(b) include 10 considerations for evaluating intensity.

Sociocultural: Of, relating to, or involving a combination of social and cultural factors.

Socioeconomic: Pertaining to or signifying the combination or interaction of social and economic factors.

Soil horizon: A layer of soil material approximately parallel to the land surface that differs from adjacent genetically related layers in physical, chemical, and biological properties.

Solid waste: Includes garbage and/or refuse.

Spawning: Production, deposition, and fertilization of eggs by fish.

Subsistence: Harvesting of plants and wildlife for food, clothing, and shelter. The attainment of most of one’s material needs, such as food and clothing materials, from wild animals and plants.

Substantive comment: A comment that does 1 or more of the following: questions, with reasonable basis, the accuracy of information in the EIS; questions, with reasonable basis or facts, the adequacy of, methodology for, or assumptions used for the environmental analysis; presents reasonable alternatives other than those presented in the EIS; or prompts the BLM to consider changes or revisions in 1 or more of the alternatives.

Terrestrial: Of or relating to the earth, soil, or land; inhabiting the earth or land.

Thermokarst: Depressions and uneven ground settlements resulting from the thawing and melting of permafrost.

Third-party contracting: Contracting for the preparation of NEPA documents that is funded by the non-BLM proponent of an action. The BLM must still approve this analysis.

Threatened species: A plant or animal species likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future.

Traditional knowledge: An intimate understanding by indigenous peoples of their environment, which is grounded in a long-term relationship with the surrounding land, ocean, rivers, ice, and resources. This understanding includes knowledge of the anatomy, biology, and distribution of resources; animal behavior; seasons, weather, and climate; hydrology, sea ice, and currents; ecosystem function; and relationship between the environment and the local culture.

Waterbody: A jurisdictional water of the United States (see 33 CFR 328.4). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

Water quality: The interaction between various parameters that determines the usability or non-usability of water for onsite and downstream uses. Major parameters that affect water quality include temperature, turbidity, suspended sediment, conductivity, dissolved oxygen, pH, specific ions, discharge, and fecal coliform.

Wetlands (biological wetlands): Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include habitats such as swamps, marshes, and bogs (see jurisdictional wetlands).

Wild and Scenic Rivers: Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Wilderness: A wilderness, in contrast with those areas where humans and their works dominate the landscape, is recognized as an area where the earth and its community of life are untrammeled by humans, where humans are visitors who do not remain. An area of wilderness also means an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of human's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

References

Hancock, P.J. 2002. Human Impacts on the Stream–Groundwater Exchange Zone. *Environmental Management* 29(6):763-781.

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Appendix Q

Substantive Comments and BLM Responses

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Table of Contents

Acronyms

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AIDEA	Alaska Industrial Development and Export Authority
ANILCA	Alaska National Interest Lands Conservation Act
AS	Alaska Statute
BLM	U.S. Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
District	Ambler Mining District
DMTS	Delong Mountain Transportation System
DOT&PF	Alaska Department of Transportation and Public Facilities
EEA	Environmental and Economic Analysis
EIS	Environmental Impact Statement
GAAR	Gates of the Arctic National Park and Preserve
GHG	greenhouse gas
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	naturally occurring asbestos
NPS	National Park Service
O&M	operations and maintenance
POL	Petroleum, Oils and Lubricants
ROD	Record of Decision
ROW	right-of-way
SF299	Standard Form 299
SWPPP	Stormwater Pollution Prevention Plan

WAH	Western Arctic Caribou Herd

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1. Introduction

This document is intended to present the comments the Bureau of Land Management (BLM) received on the Ambler Road Draft Environmental Impact Statement (EIS). It also includes a description of the public comment process, how the BLM considered all comments, and a summary of responses to select substantive comments.

1.1. Draft EIS Comment Process

The National Environmental Policy Act (NEPA) requires that all substantive comments received before reaching a decision must be considered to the extent feasible, and that agencies must respond to all substantive written comments submitted during the public comment period for an EIS (40 Code of Federal Regulations [CFR] 1503.4). Comments must be in writing (including paper or electronic format or a court reporter's transcript taken at a formal public meeting or hearing), substantive, and timely, in order to merit a written response.

Although the BLM diligently considered each letter, form letter, comment form, email, public hearing testimony, etc. the comment analysis process involved determining if a comment was substantive or non-substantive. In performing this analysis, the BLM relied on Section 6.9.2, Comments, in the BLM NEPA Handbook H-1790-1 to determine what constituted a substantive comment.

Substantive comments do one or more of the following:

- **Question, with reasonable basis, the accuracy of information in the EIS** (may make factual corrections or point out errors)
- **Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis** (may suggest alternate method and discuss why it should be used, or suggest there is a specific flaw in the analysis or conclusions)
- **Present new information relevant to the analysis** (may provide new information about the project action or the project area, or a different source of credible research or data)
- **Present reasonable alternatives other than those analyzed in the EIS** (may present a different way to meet the stated purpose and need)
- **Cause changes or revisions in one or more of the alternatives** (may cause changes or revisions to one or more of the alternatives)

Non-substantive comments include the following:

- Comments in favor of or against the proposed action or alternatives without reasoning that meet the criteria listed above (e.g., "we disagree with Alternative X and believe the BLM should select Alternative Y" or "build/do not build Alternative X")
- Comments that only agree or disagree with BLM policy or resource decisions without justification or supporting data that meet the criteria listed above (e.g., "more grazing should be permitted")
- Comments that do not pertain to the project area or the project (e.g., "the government should eliminate all dams," when the project is about building a road)
- Comments that take the form of vague, open-ended questions (e.g., "why are you destroying the environment?")

The Ambler Road Draft EIS was made available for public review, and a public comment period was announced with publication of a Notice of Availability in the *Federal Register* on August 30, 2019. After the initial 45-day public comment period to receive comments on the Draft EIS, the comment period was extended by an additional two weeks. The public comment period officially ended on October 29, 2019, for a total of 60 days. Public comments were accepted via the online comment form on BLM's ePlanning website, mail, email, hand-delivery, fax, handwritten comment forms, and verbal testimony transcribed from public hearings.

The BLM held public hearings during the comment period at locations throughout the state and in Washington, D.C. A list of public hearing dates and locations are included below. Pursuant to Alaska National Interest Lands Conservation Act (ANILCA) Section 810(a)(1) and (2), the BLM conducted public hearings to gather comments regarding potential impacts on subsistence impacts resulting from the alternatives considered in the Draft EIS. The public hearings that doubled as ANILCA Section 810 hearings are noted by an asterisk in the list. Court reporters were made available at all meeting locations for attendees to provide verbal testimony if they desired. For additional information on the public hearings, see Appendix I, Collaboration and Consultation.

Public hearing dates and locations:

- September 10, 2019: Anchorage
- September 12, 2019: Washington, D.C.
- September 16, 2019: Kotzebue*
- September 17, 2019: Ambler*
- September 18, 2019: Kobuk*
- September 19, 2019: Shungnak*
- September 20, 2019: Noorvik*
- September 23, 2019: Fairbanks
- September 24, 2019: Huslia*
- September 25, 2019: Hughes*
- September 26, 2019: Tanana*
- September 27, 2019: Bettles*/Evansville*
- September 30, 2019: Stevens Village*
- October 1, 2019: Allakaket*
- October 1, 2019: Alatna*
- October 2, 2019: Anaktuvuk Pass*
- October 3, 2019: Coldfoot*/Wiseman*
- October 8, 2019: Noatak*
- October 9, 2019: Selawik*
- October 10, 2019: Kiana*
- October 11, 2019: Buckland*

Comments received covered a wide spectrum of thoughts, opinions, ideas, and concerns. The BLM recognizes that commenters invested considerable time and effort to submit comments on the Draft EIS. The BLM developed a comment analysis method to ensure that all comments were considered, as directed by NEPA regulations. This systematic process ensured the BLM identified, tracked, and considered all substantive comments (see definition of substantive comments described at the beginning of Section 1.1).

Upon receipt, each communication (e.g., letter, form letter, comment form, email, public hearing testimony, etc.) was assigned an identification number; logged into a database; and reviewed to identify, organize, categorize, and respond to substantive issues. The BLM coded substantive comments from each piece of communication to appropriate categories, based on content of the comment, and assigned a unique comment number to each substantive comment within that communication. The categories generally follow the sections presented in the Draft EIS, although some relate to financial issues, editorial concerns, or other issues. The BLM prepared responses to each substantive comment. The responses were developed to address the comment and to note if a change to the EIS was made.

The BLM received a total of 29,191 communications; 964 of these were considered unique submissions, and 28,227 were part of form letter campaigns; form letters are discussed further in Section 1.2. Within the communications received, the BLM identified and responded to 2,390 substantive comments. Section 1.3 summarizes the most common substantive issues raised by the commenters. All substantive comments and their associated responses are posted on BLM's ePlanning website for the project (www.blm.gov/AmblerRoadEIS).

Many comments received throughout the comment analysis process expressed personal opinions or preferences, had little relevance to the adequacy or accuracy of the Draft EIS, or represented commentary on management actions that are outside the scope of the EIS. These comments did not provide specific information to assist the BLM in making a choice among or change to the action alternatives or mitigation measures, did not suggest new alternatives, and did not take issue with methods or analysis used in the Draft EIS. The BLM did not address these comments further in this document as they were deemed non-substantive.

The BLM read, analyzed, and considered all comments, including those of a personal or philosophical nature and all opinions, feelings, and preferences for one element or one alternative over another. However, because such comments were non-substantive, the BLM did not respond to them. It is important to note that, while the BLM reviewed and considered all comments, none were counted as votes.

Subject matter experts reviewed comments that recommended additional studies, data, scientific literature, or additional analysis to be incorporated into the analysis; new information and citations were incorporated into the Final EIS as appropriate. Comments citing editorial changes to the document were reviewed and incorporated as appropriate. The Final EIS has been technically edited and revised to fix typos, missing references, definitions, and acronyms, and provides other clarifications as needed. The comments and responses and updates to the EIS were reviewed by multiple levels of BLM management to ensure that the document and responses reflect BLM policy and are consistent with other BLM planning documents and studies.

In accordance with ANILCA Section 810, the BLM flagged comments received regarding subsistence uses and impacts. These included comments related to resource abundance, resource availability, animal/plant habitat, access to resources, adequacy of mitigation, disagreement with the subsistence or Section 810 analysis, or issues with the process/hearings. Subsistence-related comments were reviewed and considered by BLM's subsistence subject matter expert, who incorporated new or revised information into the final Section 810 analysis (Appendix M, ANILCA Section 810 Final Evaluation).

Because this project crosses the Gates of the Arctic National Park and Preserve (GAAR), the National Park Service (NPS) is preparing an Environmental and Economic Analysis (EEA) to analyze potential routes across GAAR. BLM flagged substantive comments that specifically mentioned the NPS EEA, or impacts to GAAR. Such comments were forwarded to the NPS for their consideration in the EEA. BLM coded and responded to GAAR comments that were determined to be substantive under NEPA as defined previously.

1.2. Letter Campaigns

Several organizations and groups held standardized letter/email campaigns to submit comments during the public comment period for the Draft EIS. Through this process, their constituents were able to submit the standard letter or a modified version of the letter indicating support for the group's position on the EIS or proposed project. Individuals who submitted a modified standard letter sometimes added new comments or information to the letter or edited it to reflect their individual concerns. The BLM received 28,227 form-letter campaign submissions, most of which were identical to each organization's master letter. Modified letters with unique substantive comments were given their own communication number and were coded for substantive comments individually where appropriate.

1.3. Summary of Substantive Comments

Substantive comments were coded into several topic areas, including: Alternatives, Purpose and Need, Physical Effects, Social Effects, Biological Effects, Indirect and Cumulative Impacts, Outreach Process, Mitigation, Legal Issues, Editorial Issues, Financing Concerns, and Other. Within these primary topic areas, subtopics were assigned as appropriate when numerous commenters made similar comments regarding a specific aspect of the overarching topic. This summary provides discussion of several of the more common substantive comments received during the Draft EIS comment period. All substantive comments received and individual responses to those comments have been posted on BLM's ePlanning website for the project (www.blm.gov/AmblerRoadEIS).

1.3.1 Purpose and Need

Comment – Purpose and Need Statement:

Several commenters expressed concerns regarding the purpose and need for the project, indicating their viewpoint that the need was skewed towards what is desired by Alaska Industrial Development and Export Authority (AIDEA), the project applicant. Some suggested that the need was speculative. Year-round access as an element of the need was specifically questioned.

Response:

AIDEA put forth their need for the project in their Standard Form 299 (SF299) application (available on BLM's ePlanning website for the project), and that need is summarized in Section 1.3 of the EIS. AIDEA has submitted an application in part to support exploration and mine development in the Ambler Mining District (District). The BLM is required to respond to AIDEA's application and that has necessitated preparation of an EIS.

While AIDEA's needs are informative to a degree, the BLM did not take AIDEA's needs at face value, but rather investigated the needs in great detail to inform the federal purpose and need statement. BLM's purpose and need statement was prepared in accordance with the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR 1502.13) and BLM's NEPA handbook through a process that involved researching the mineral resources in the District, consultation with cooperating agencies, and U.S. Department of the Interior (DOI) solicitor review. The need for the road is not speculative and has in fact been recognized by Congress in ANILCA Section 201(4)(b). The lack of surface access and cost of transportation impinge on the ability for the District to develop. Appendices G, Alternatives Development Memorandum, and H, Indirect and Cumulative Impacts Associated with the Ambler Road, provide research and analysis on the District and summarize the process for the development of the purpose and need statement.

The BLM took a hard look at the question of whether year-round access should be a requirement of the purpose and need as requested by AIDEA. Because of the anticipated volume of materials needing shipment, the mines are anticipated to need year-round access, as stated in the project purpose and need statement (Chapter 1, Introduction, of the EIS). The need for supplies to be brought in and for ore concentrate to be hauled out is anticipated to occur around the clock, all year. Red Dog Mine was evaluated for this very condition. The BLM determined that the ice conditions, required lightering, and storage employed at Red Dog's seasonal operation marginally worked for 1 mine, but that it would not work for 4 mines as is anticipated for the District. The operating window of ice free conditions was determined not practical given the additional resources and mining prospects in the District. Additional detail is provided in Appendix G.

1.3.2 Alternatives

Comment – Other Alternative Modes and/or Alignments:

Several commenters questioned why other alternative modes (e.g., rail, barge, dirigible, etc.) or alternative routes (e.g., connecting to western ports) were not examined, or why these alternatives were not discussed in Chapter 3, Affected Environment and Environmental Consequences, discussion in the EIS. Commenters suggested that the BLM failed to analyze a reasonable range of alternatives.

Response:

In accordance with the CEQ NEPA implementing regulations (40 CFR 1502.14), the BLM has rigorously explored and objectively evaluated all reasonable alternatives for this project and discussed reasons why other alternatives were determined not to be reasonable. This analysis is summarized in Chapter 2, Alternatives, of the EIS with additional detail included in Appendix G.

The BLM is required to examine a range of alternatives and identify the reasonable alternatives. Where infinite variety in alternatives is possible, a reasonable range must be identified. The BLM identified a range of alternatives and has explained in Appendix G its methods for determining which alternatives were reasonable and were retained for more detailed analysis, and which were not reasonable and were eliminated from further consideration.

The BLM, under its NEPA responsibility, considered AIDEA's proposed alternatives (A and B) and rigorously explored and objectively evaluated all reasonable alternatives to the proposed action. Based on the purpose and need for the project, the BLM identified potential alternatives from a number of sources, including alternatives proposed by AIDEA, routes studied by the Alaska Department of Transportation and Public Facilities (DOT&PF), and routes and concepts suggested by the public during and after formal scoping. The BLM evaluated alternatives through an iterative process based on scoping comments received, input from cooperating agencies, and a review of available data compiled for this EIS. NEPA does not require a detailed analysis of alternatives in an EIS if they are not reasonable alternatives. To determine whether an alternative was reasonable, the BLM considered an alternative's effectiveness at satisfying the purpose and need, technical and economic feasibility, the practicality of the alternative, and whether the alternative substantially duplicated others evaluated. Both quantitative and qualitative metrics were used to evaluate alternatives during a multi-step screening process. All alternatives screened out were considered on multiple criteria. For details on the modes and routes examined and the reasons some were not carried forward for detailed analysis, see Appendix G.

This early screening necessarily takes place with a less detailed amount of data than evaluation done for reasonable alternatives evaluated in the EIS. Early screening, in part, allows for an EIS to focus on the most reasonable of the alternatives without requiring research into areas or issues where no alternative would be selected because the alternative would not satisfy the project purpose and need or because of feasibility issues, etc.

AIDEA and the BLM have examined options to ship ore concentrate to market by various modes (rail, air, barge, ice road, and all-season road) and via various surface routes, including those to the west coast of Alaska, as explained in Chapter 2 and Appendix G.

The BLM determined a reasonable alternative would connect to an existing port, or to the existing land transportation system for connection to an existing port to allow for transport of materials to/from the mines. Because of the anticipated volume of materials needing shipment, the mines are anticipated to need year-round access, as stated in the project purpose and need statement (Chapter 1 of the EIS), and to need such access for 50 years. The need for supplies to be brought in and for ore concentrate to be hauled out is anticipated to occur around the clock, all year. Alternatives that could not provide year-round access were judged to not satisfy the stated project purpose and need and, therefore, to not be reasonable alternatives.

The BLM considered multiple routes that went west to the coast. These included alternatives that would have terminated at the Delong Mountain Transportation System (DMTS) port, Cape Blossom near Kotzebue, Nome, and Cape Darby on Norton Sound. A major concern with any route to the west is the lack of an adequate port, even at Kotzebue, Nome, and the Red Dog Mine. In the case of the DMTS port, it was determined that it did not have the capacity to serve the District as well as the Red Dog Mine and would require the equivalent of a new port. The DMTS, Cape Blossom, Selawik Flats, and Cape Darby proposals were all deemed unreasonable based on a combination of reasons related to inadequacy of port connections/cost to upgrade or build ports, increased impact on caribou herds and/or streams involving anadromous fish, and increased overall costs for the project. Because there is no port on the lower Kobuk River or Hotham Inlet, these alternatives were deemed not reasonable.

A seasonal ice road was considered unreasonable because of the need to reconstruct it each winter, its unreliability in the face of a changing climate, and it not providing year-round surface access and therefore not satisfying the project purpose and need.

Water barge/boat options were considered unreasonable because of reliability and seasonal issues associated with shallow water, and/or the need for dredging and environmental issues associated with dredging. Barging would not provide year round access, on rivers like the Kobuk and upper Koyukuk near Hughes, and would not provide for the daily barge traffic that would be necessary to support the mines that are reasonably foreseeable. These issues were examined for rivers in the District. A road-to-barge alternative was carried forward for route screening and was found not reasonable for the same general purpose-and-need and technical-feasibility issues associated with a barge-only option. While the route examined was a road to Kiana and barge on the Kobuk River to Kotzebue Sound, the issues would be the same for a route that would follow Alternative C toward Hughes and then diverge to Huslia for connection to a barge on the Koyukuk and Yukon Rivers. Barge routes were screened out because a water-only route would not provide "year-round" surface access and, therefore, would not satisfy the project purpose and need. Additionally, the Kobuk River would be too shallow for reliable seasonal access and/or would require dredging. The impacts of dredging would also make this mode not reasonable for environmental reasons.

The quantities of materials, liquefied natural gas and diesel fuels, food, and large mining equipment to be imported and of concentrated ore to be exported are not conducive to air transport. Airplanes or helicopters using runways or helipads would not provide surface access and, therefore, would not adequately support hauling mining equipment and heavy loads. Operating costs were noted as excessive and unreasonable given the loads in question. Air access would require speculative assumptions about whether this mode would be effective in support of mining operations and, therefore, was determined not to be reasonable. Blimps/dirigibles were screened out for similar reasons; blimps/dirigible are not proven as common practice in mining operations, particularly in the Arctic.

Six different railroad routes were considered. The AIDEA's coordination with the Alaska Railroad indicated that a rail line would require a parallel road for maintenance access, meaning the footprint of the rail and its maintenance road would be at least equal to the footprint of the road alternative (32-foot top), and would therefore still provide a corridor that unauthorized people might be able to access (i.e., it would not offer a benefit of helping to minimize potential trespass). Rail routes were not evaluated in detail in the EIS for a combination of reasons, including their economic feasibility, practicality, and environmental considerations. There was determined to be no substantial advantage to rail and several disadvantages compared to AIDEA's proposed action (i.e., a road).

The BLM fully evaluated the impacts of the various land ownerships that Alternatives A, B, and C would need to cross. The BLM recognizes that AIDEA does not have eminent domain authority and will need to negotiate access with Doyon and other private landowners. The BLM does not have control over AIDEA's negotiating approach with private landowners. Presumably, if AIDEA is unable to reach agreement with private landowners for access across those lands, the project would be unable to proceed (impacts of this situation are evaluated as part of the No Action Alternative). The BLM agrees that if AIDEA would need to come back to the BLM with variations on the proposed routes to avoid private lands, those changes would require additional NEPA analysis, causing the BLM to re-evaluate or supplement the EIS analysis.

Comment – Alternatives across GAAR:

Several commenters expressed concern regarding the routes examined across GAAR, and suggested that routes avoiding GAAR should have been investigated.

Response:

AIDEA has filed an application pursuant to ANILCA. ANILCA 201(4) established GAAR, setting out its purposes and general management requirements for conservation. At the same time, the need for surface access across the Preserve was recognized by Congress in Section 201(4)(b) of ANILCA, which states: “Congress finds that there is a need for access for surface transportation purposes across the Western (Kobuk River) unit of the Gates of the Arctic National Preserve (from the Ambler Mining District to the Alaska Pipeline Haul Road) and the Secretary shall permit such access in accordance with the provisions of this subsection.” Congress recognized that the lack of surface access and cost of transportation impinge on the ability for the District to develop and ordered the Secretary to grant access across the Preserve.

AIDEA proposed a route across GAAR: Alternative A. The NPS reviewed AIDEA’s application and requested additional analysis to try to find a route that had “fewer or less severe adverse impacts upon the preserve.” As a result, AIDEA proposed Alternative B, which crosses through the narrowest part of the Preserve. Based on these 2 routes, NPS determined AIDEA had sufficient alternative routes for analysis that were economically feasible and prudent. Ultimately, AIDEA submitted a single application form—SF299—to the BLM and the NPS, proposing a route with 2 options where it passed through the Preserve portion of GAAR. The NPS and BLM are analyzing AIDEA’s proposal in separate documents: an Environmental and Economic Analysis (EEA) for NPS for the route across GAAR, and an EIS for the BLM.

The BLM and NPS are sister agencies within the DOI, and are coordinating on the development of the required environmental documentation for the project. The BLM and NPS recognize that ANILCA only waives the NEPA process for the crossing of GAAR. NEPA analysis is required for the remainder of the route, and analyses for National Historic Preservation Act (NHPA) Section 106 and ANILCA Section 810 compliance are still required for the entire alignment, including across GAAR. The BLM is the lead agency conducting the Section 106 and Section 810 analyses. Because ANILCA specifically exempts the decision across GAAR from NEPA, the NPS has taken the lead on documenting impacts within GAAR through the EEA required by ANILCA. Each document references the other, and the decision makers have access to and benefit from the analyses in both the EEA and EIS. The NPS shared a draft of the EEA with the BLM so that material from the EEA could be incorporated into the EIS, and so that the BLM could ensure that the EIS was consistent with the EEA's content regarding GAAR. The EIS is consistent with ANILCA 201(4). Note that the EIS includes acreage impact calculations for impacts within GAAR as part of the overall impacts for each alternative.

The NPS Final EEA document is expected to be published at approximately the same time as the BLM's Final EIS.

ANILCA 1107 addresses the requirements for terms and conditions to be put on any right-of-way (ROW) issued by the federal government across conservation system units in Alaska. Appendix N, Potential Mitigation, of the EIS presents a refined set of terms and conditions that would accompany any ROW approved for the Ambler Road.

In accordance with the CEQ NEPA implementing regulations (40 CFR 1502.14), the BLM has rigorously explored and objectively evaluated a wide range of potential transportation modes and routes across the landscape. Appendix G explains why several other shorter routes, including those to the west and around the southern edge of the Preserve, were determined not reasonable. Other alternatives roughly parallel to the AIDEA proposed routes appeared to have few advantages over the proposed alternatives and several disadvantages, including effects to waters and wetlands and poor construction soils. Given that Congress explicitly wrote into law a provision for access through the Preserve, the BLM did not need to study an alternative that would avoid the Preserve. Nonetheless, they did identify and evaluate in detail a reasonable alternative (Alternative C) that does not cross GAAR. The criteria and thought processes to identify the reasonable alternatives are documented in Appendix G.

1.3.3 Physical Environment

Comment – Gravel Mining:

Several commenters expressed concerns regarding gravel mining and that the impacts of such on the environment should be considered. There was also concern expressed regarding separate permitting for the road and gravel material sites.

Response:

Gravel mining for the road is considered a direct impact. Gravel/fill requirements were determined from preliminary engineering by DOWL for AIDEA using the same methods so that the alternatives could be compared equally. Estimated total gravel/fill material requirements were included in the Draft EIS in Section 3.2.2, Sand and Gravel Resources, and have been added in Appendix C (Chapter 2 Alternatives Tables and Supplemental Information), Table 1. The quantities of gravel given are for the full build-out of the proposed road (and other AIDEA proposed facilities such as airstrips), otherwise known as Phase 3 of construction, and represent the amount of gravel estimated to be needed for the 2-lane road (including the previous construction phases). Preliminary studies from AIDEA identified sufficient potential material sites along the routes to construct, operate, and maintain the road project. The Geology and Soils Section (3.2.1) of the EIS presents differences between the alternatives' soil types.

The footprint of all alternatives include the proposed gravel material sites, access roads and other ancillary facilities proposed by AIDEA. Impact acreages discussed in resource sections throughout Chapter 3 include these components. Appendix N outlines potential mitigation measures for material site permitting.

With respect to the characterization of sand and gravel resources required for the hypothetical baseline scenario of the mines, Appendix H, Indirect and Cumulative Impacts Associated with the Ambler Road, Section 2.1, identifies that no estimate was performed and that material sites local to the District are assumed. The specifics of the gravel mining needs and availability of materials clean of naturally occurring asbestos (NOA) for the mine would need to be developed under the separate NEPA analysis for each mine.

Regarding the concern raised related to authorizing "portions of the project under separate permits, such as an authorization for the road ROW and separate authorizations for material extraction and sales" or the suggestion that the BLM is "delaying the review and approval of these project components", it is very common that at a NEPA level of analysis, the kinds of details necessary to permit a gravel or material site are not fully known. While the sites proposed are based on limited material testing as well as geologic and soil mapping and interpretation by registered engineers, permitting will require further testing and engineering to finalize the plans. The analysis in the Final EIS is sufficient for BLM to make a reasoned choice among the alternatives for issuance of the road ROW. Once a single alternative has been selected, assuming it is one of the action alternatives, the proponent then can enter final design and develop the more detailed engineering and testing needed to support an authorization to construct and authorization for material extraction and sales.

Comment – Fugitive Dust and Air Quality:

Several commenters expressed concern regarding fugitive dust from the roadway and its effects on air quality, water quality, and potential for adding to permafrost melt.

Response:

The air quality discussion has been augmented for the Final EIS (see Section 3.2.7 and Appendix D, Chapter 3 Physical Environment Tables and Supplemental Information, Tables 20 through 26). Greenhouse gas (GHG) emissions have been quantified for the road construction phase; estimated road traffic during production; and transport of product to Fairbanks and point of sale via rail to the Port of Alaska. It would be speculative to quantify GHG emissions from mining, exploration, and operation before such actions are proposed. It is anticipated that GHG emissions from those actions would be analyzed by the agencies with jurisdiction over the action at the time the actions are proposed. Effects on water quality are analyzed in Section 3.2.5 and effects related to permafrost melt are analyzed in Sections 3.2.1 and 3.2.2.

AIDEA proposes to use water and dust palliatives to reduce fugitive road dust. Covering trucks has been successful in reducing ore dust leaking from trucks themselves, and was instituted at Red Dog Mine in response to the presence of chemicals found off the road. AIDEA has committed to design stipulations (see Chapter 2, Section 2.4.4 of the EIS) to develop a Dust Control Plan, which will be incorporated into the ROW permit and carried into AIDEA's contract requirements with any road operator authorized by AIDEA. Under a potential mitigation measure, AIDEA would develop a monitoring plan for approval by the BLM Authorized Officer to demonstrate compliance with the plan of operations and other federal and state environmental laws and regulations. See Appendix N for more detail.

Comment – Permafrost Melt:

Several commenters expressed concern regarding the potential for the proposed road and anticipated mining operations to hasten the melt of permafrost in the project area, as well as concern regarding the compounding of the road's effects with ongoing climate change effects on permafrost.

Response:

The affected environment discussion in Chapter 3, Section 3.2.7, describes the effects of climate change generally. Chapter 3, Section 3.2.1, details the effects on permafrost, and Section 3.2.5 describes inter-related effects of climate change and melting permafrost (e.g., slope failures, etc.) on water quality. The BLM anticipates that warming and potential thawing of the permafrost would occur with or without the road construction. It is for that reason that the BLM has identified climate change as reasonably foreseeable, and has evaluated the effect as a cumulative effect, contributing to impacts from the road on a number of resources. These impacts are summarized in Chapter 3 of the EIS, and additional detail is provided in Appendix H.

Climate change impacts and permafrost disruption could cause instability to the road and mines, change drainage patterns, alter vegetation and habitat, and affect flooding. The challenges of constructing on permafrost, as well as thawing permafrost, are well known in Alaska and factored into the cost estimates, material estimates, and impact assessment for the proposed project. AIDEA has committed to extensive geotechnical investigations to inform engineering design to identify appropriate materials, design, and insulation as part of the project. Chapter 2, Section 2.4.4, of the EIS describes several design features proposed by AIDEA to minimize permafrost degradation, which include embankment insulation, air convention embankment, thermosyphons, sunsheds, snowsheds, or air ducts. Potential mitigation measures in Appendix N could require AIDEA, through maintenance and monitoring, to address infrastructure issues that arise across the lifespan of the project, and remove the road and re-contour the land when it is complete. Another potential mitigation measure in Appendix N for reducing permafrost melt could require AIDEA to construct the road to full depth embankment (Phase 2), without the prior construction actions to create a pioneer road.

Comment –Asbestos Concerns:

Several commenters expressed concern regarding NOA, known to occur in the project area, being released during construction and operation. They suggested additional analysis and data collection.

Response:

The presence of soils and materials with NOA, and the impacts of encountering NOA materials, are disclosed in Chapter 3, Section 3.2.1, of the EIS. Additional details on NOA can be found in Appendix D, Table 3, and Volume 4, Map 3-2. Design features proposed by AIDEA to address these issues are presented in Chapter 2, Section 2.4.4, of the EIS. Potential stipulations and mitigation measures to determine the specific extents have been identified in Appendix N. The process to quantify and geo-locate specific information requires design-level geotechnical investigations that are not warranted for an EIS or the selection of a preferred alternative. The EIS discloses multiple times that AIDEA will need to conduct testing to determine the presence of NOA, and should the project require the use of any NOA materials, AIDEA will follow procedures in State regulations.

The road alignment and design is intended to minimize exposure of the underlying materials. In its comments on the Draft EIS, AIDEA committed to "avoid the use of materials containing NOA to the greatest extent feasible and to using only materials that have no more than 0.1 percent asbestos as opposed to the 0.25 percent asbestos allowed under 17 Alaska Administrative Code (AAC) 97. No construction materials with more than 0.1 percent asbestos would be used for capping materials (in the exposed road bed). If any NOA-bearing materials are used, the guidelines developed by DOT&PF would be followed."

AIDEA's SF299 application anticipated that 2 inches of new, non-NOA capping materials would be applied on the road yearly, as part of ongoing maintenance efforts. Potential mitigation measures have been identified in the Final EIS, Appendix N, to reduce the risk of ongoing releases of asbestos to the air and water. These include a comprehensive plan addressing design, operating procedures, sampling procedures, worker training and protections, and construction techniques; and avoiding siting construction camps in areas of known asbestos. Appendix N also describes the potential mitigation measure to prepare a fugitive dust control plan that would be used to mitigate for these effects. It is anticipated that design commitments from AIDEA and proposed mitigation measures would acceptably limit the public health risks from asbestos exposure to local communities, road workers, and subsistence users and others crossing or passing near the road.

Comment – Water Resources:

Several commenters expressed concerns regarding the construction of culverts and bridges, their effect on fish, and concern regarding pooling of water during times of heavy rain or melt.

Response:

Potential impacts to water resources are described in Chapter 3, Section 3.2.5, of the EIS. Appendix N describes the mitigation measures that are intended to minimize these impacts. Chapter 3, Section 3.2.5, discloses information about the road's potential to result in increased sedimentation levels and, therefore, affect the water quality of streams and other waters crossed by any of the alternatives. Chapter 3, Section 3.3.2, summarizes potential impacts to fish and aquatic life from increased levels of sedimentation. Appendix H, Section 3.4.2, also discusses impacts to fish and aquatic life from reasonably foreseeable activities that could result in increased sediment input into streams and other aquatic habitats in the project area and beyond.

Impacts related to culvert and bridge installation are discussed in multiple locations throughout the EIS. AIDEA's design intent of culverts and bridges is to minimize these impacts. The numbers of culverts presented in the EIS are based on the information provided by AIDEA using their current level of design. AIDEA made an estimate at the application stage of the number of major, moderate, and minor culverts they would need for the project. The EIS analysis was conducted based on that estimate, and indicated that impacts would be likely if culverts were sized inappropriately. However, at the construction stage, they would be required to use culverts sized appropriately for the drainage and to meet fish passage requirements when applicable, even if their application stage estimate was different. Final design will be based on site specific conditions and will be guided by the applicable mitigation measures selected from Appendix N.

Mitigation measures in Appendix N, Sections 3.2.5 and 3.3.1, are included to minimize the potential impacts to hydrologic connectivity of wetlands and riparian areas, minimize changes to surface and groundwater flow, and to minimize adverse changes to water quality. Bridges will be designed to pass the 100-year discharge and culverts will be designed to pass the 50-to 100-year discharge. Field investigations to identify critical areas and detailed information on soils, permafrost, and final route selection will be determined in the final design process. The effectiveness of these potential mitigation measures are also addressed in Appendix N.

AIDEA would develop a monitoring and maintenance plan for culverts to prevent them from being blocked by mud and debris. The plan would include a mechanism for funding culvert repairs and replacements and would be submitted to the Alaska Department of Fish and Game (ADF&G) for approval. Additionally, the BLM added a new potential mitigation measure that would require AIDEA to create and fund a fish and wildlife monitoring program (Appendix N, Section 3.3.2) to document fish and wildlife conditions prior to construction to establish a baseline; monitor changes in habitat conditions and use during construction and operation of the road to characterize impacts; contract with subject matter experts as needed and to further refine mitigation measures in real time as it relates to fish and wildlife; and serve as a point of contact for communities and fish and wildlife managers seeking and sharing information on conditions of the resources in the area affected by the project.

Construction of bridge piers and abutments will be completed under an Alaska Department of Environmental Conservation (ADEC) regulated Stormwater Pollution Prevention Plan (SWPPP) and ADF&G Title 16 Fish Habitat permit (if applicable) to minimize impacts on water quality and to aquatic species. Determinations of 100-year discharges, floodplain areas, and flow requirements of crossings will be determined during final design.

1.3.4 Biological Resources

Comment – Effects on Caribou Herds:

Several commenters expressed concerns regarding effects of the Ambler Road on the caribou herds, including changes in migration patterns, roadway fatalities, and increased hunting pressure. Concerns were also expressed regarding subsistence hunting. Suggestions indicated missing data or pointed out other impacts that should be disclosed.

Response:

The potential impacts of the road on caribou, including habitat fragmentation, altered movement, disturbance, displacement, and short- and long-term impacts are discussed in Chapter 3, Section 3.3.4, of the EIS. Changes in herd size, shifts in range, changes to hunting regulations, and traditional knowledge information were included in evaluating effects.

The EIS used the best available data to describe potential impacts to caribou within the project area. As required by 40 CFR 1502.22, where information is incomplete or unavailable, the BLM has disclosed the lacking information and has determined that sufficient information exists to make a reasoned choice among alternatives.

The EIS acknowledges that large infrastructure projects have the potential to fragment populations or impede movement, and that some caribou that encounter the road may be impeded (e.g., delay in crossing the road, deflect away from the road, or will not cross). However, many examples in Alaska indicate that herds may be resilient to these changes. Because of its similarity to the proposed Ambler ROW, the Dalton Highway study (Nicholson et al. 2016) on the Central Arctic Herd, was used in conjunction with studies on the Fortymile Herd and the Nelchina Herd to demonstrate resiliency of Alaskan caribou herds to infrastructure projects. The Western Arctic Caribou Herd (WAH) has been studied in reference to the DMTS road that services the Red Dog Mine (Wilson et al. 2016). The EIS analyzed potential impacts related to WAH summer-winter migratory routes further generally as well as under each alternative, and has proposed potential BLM mitigation measures in Appendix N. These mitigation measures would reduce, but not eliminate, impacts on caribou and other mammals.

Traditional and local knowledge regarding the caribou herds was provided during the Draft EIS comment period, and comments on caribou distribution that were provided by local residents have been incorporated into a separate subsection of Section 3.3.4 in the Final EIS titled “Traditional Knowledge”.

Appendix E, Chapter 3 Biological Resources Tables and Supplemental Information, Table 20 details habitat loss by herd and range type, including seasonal ranges. Although the text only includes discussion of the total range, the potential impacts to all range types is disclosed in Appendix E, Table 20 and throughout Chapter 3, Section 3.3.4. Refer to Volume 4, Map 3-23 for utilization contours of the area surrounding the Ambler Road alternatives.

The potential for increased predation on caribou by predators that may use the road as a travel corridor was disclosed in the EIS under the subheading “Caribou Impacts” in Impacts Common to All Alternatives, under Road Impacts, under Environmental Consequences in Section 3.3.4. References provided during the Draft EIS comment period have been reviewed and incorporated into the Final EIS in an expanded discussion of potential increases in predation of caribou as a result of the road, as appropriate.

AIDEA would operate the Ambler Road as a private industrial access road; the road would not be open to general public use for any purpose, including hunting access. However, the BLM acknowledges trespass usage of the road may still occur, and addressed such usage in Chapter 3 (pages 3-76 and 3-89) of the Draft EIS.

Potential impacts on subsistence use of the WAH is disclosed in Section 3.4.7 of the Draft EIS.

Comment – Effects on Fish Habitat:

Several commenters expressed concerns regarding effects of the Ambler Road on fish spawning areas and corresponding effects on subsistence fishing. Concerns were also expressed related to the effect of contaminants and fugitive dust on fish. Suggestions indicated missing data or pointed out other impacts that should be disclosed. In particular, commenters has questions about whether adequately sized culverts would be installed to maintain fish passage.

Response:

The EIS identifies impacts to fish and fish habitat (including impacts from potential contaminants) in Chapter 3, Section 3.3.2, and Appendix H, Section 3.4.2. Appendix E, Table 16 contains a list of all fish species in the project area. As suggested by 40 CFR 1501.7, the analysis focused on issues identified during scoping as potentially significant and, therefore, salmon and sheefish were examined in greater depth. Mapped habitat information is found in Volume 4, Map 3-17 for salmon and Map 3-18 for non-salmon species. Information on potential contaminants is found in Chapter 3, Section 3.2.3, and Appendix H, Section 3.3.3. The effects of potential contaminants on water quality are discussed in Chapter 3, Section 3.2.5 and Appendix H, Section 3.3.5. The risks to subsistence resources and lifestyles are summarized in Chapter 3, Section 3.4.7 and detailed in Appendices L (Subsistence Technical Report) and M.

The EIS used the best available data to describe potential impacts to fish and aquatic resources within the project area. As required by 40 CFR 1502.22, where information is incomplete or unavailable, the BLM has disclosed the lacking information and has determined that sufficient information exists to make a reasoned choice among alternatives.

AIDEA has committed to using stream simulation principles to design culverts at all fish-bearing streams to provide fish passage and minimize potential adverse impacts to fish and aquatic life; this commitment has been updated in Chapter 2, Section 2.4.4 of the EIS. Additional design features proposed by AIDEA have also been added to this section.

Additional information on the effectiveness of the potential mitigation measures has been included in Appendix N. It is likely that fisheries studies will be conducted prior to road construction, if the project is approved, to better inform road design, and so that site-specific mitigation measures are more effective and protective of fish populations.

Appendix H details impacts on fish from reasonably foreseeable actions, like development of mines in the District. Appendix H, Section 3.4.2, explains the potential effects of acid mine drainage on fish. As stated in this section, the introduction of metal and mineral-rich runoff, specifically from acid mine drainage, can impact the ecology of entire watersheds (Limpinsel et al. 2017). Acid mine drainage is toxic to fish, algae, zooplankton, and aquatic invertebrate populations at the ecosystem, metabolic, and cellular levels (Limpinsel et al. 2017). Local people that use fish for subsistence foods could be impacted if contaminated fish were consumed. Appendix H, Section 3.4.2, has been revised to disclose that if acid mine drainage were to affect fish in the Kobuk River watershed, humans that consume those fish could be exposed to toxins concentrated in fish tissues.

Cumulatively, the road and reasonably foreseeable future development has the potential to have impacts to fish and aquatic life at the population level, which could lead to impacts on subsistence use practices in the region (as was stated in the Draft EIS). Proper construction and management would minimize, but not eliminate, the potential for the road and reasonably foreseeable future development to adversely affect fish. The degree to which a fish stock, or population, may be affected—for example, what percentage of a specific stock would be affected—cannot be quantified with the information currently available, especially since detailed mining plans have not yet been submitted.

As stated in the Draft EIS, spills have the potential to degrade habitat quality and affect the long-term health of individual fish and fish populations. The extent of potential impacts of a spill would depend on the material spilled, characteristics of the receiving habitat, and the speed and success of spill response. Habitat located near road crossing sites, which includes spawning, rearing, feeding, wintering, and migratory habitat, would be most susceptible to contamination from potential spills (see Volume 4, Maps 3-17 and 3-18). In the event of a vehicle rollover, lid-locking mechanisms on closed container vehicles could be damaged and toxic ore concentrate released into the environment and potentially into waterways (see Chapter 3, Section 3.4.2, Transportation and Access). If such a spill occurred, particularly if near a stream, it could alter water chemistry, cause fish mortality, degrade habitat quality and function, disrupt behavior (e.g., migration patterns), and cause population-level effects.

The EIS was updated to include additional information about the potential affects to fish that may result from accidental spills into waterways and to clarify that even very small amounts of copper and other trace metals are known to adversely affect salmon and other fish species, and that a spill of such materials into fish habitat has the potential to affect fish populations in project area waters. Appendix H, Section 3.4.2, was also updated to describe more information about potential impacts to fish and invertebrates from exposure to metals and other contaminants.

1.3.5 Social Systems

Comment – Subsistence:

Numerous comments were received concerning the effects of the project on subsistence hunting and fishing activity.

Response:

BLM's analysis addresses impacts to subsistence uses to project area communities, including the loss of subsistence areas as a result of current, pending, and reasonably foreseeable development. Indirect and cumulative impacts to subsistence are summarized in Appendix H, Section 3.5.7, based on the past, present, and reasonably foreseeable future actions identified in Section 2 of that appendix.

The BLM provided analysis on the subsistence resources that could affect subsistence users in the region. Appendix L details subsistence use and anticipated impacts. Additionally, the BLM prepared an ANILCA Section 810 Evaluation (Appendix M) that examined potential:

- Reduction in the abundance of harvestable resources used for subsistence purposes;
- Reduction in the availability of resources used for subsistence caused by alteration of their distribution, migration patterns, or location; and
- Legal or physical limitations on access of subsistence users to harvestable resources.

To share these findings, and because the project has the potential to "significantly restrict subsistence uses", the BLM provided notice and conducted public hearings as required by ANILCA Section 810. As a result, public hearings were held during the Draft EIS comment period in the potentially affected communities of Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Buckland, Coldfoot, Evansville, Kiana, Kobuk, Kotzebue, Noatak, Noorvik, Selawik, Shungnak and Wiseman.

Cumulative impacts from potential community access and resultant development is considered as a reasonably foreseeable action in Appendix H, and the resultant impacts to hunting pressures, habitat fragmentation, and disturbance to wildlife from this activity are discussed in Appendix H, Sections 3.4.4 (Mammals) and 3.5.7 (Subsistence).

The EIS describes the potential for the road to restrict access for subsistence users and disclosed potential impacts (see Appendices L and M). AIDEA has committed to creating locations where subsistence users would be able to cross the road, and AIDEA would also create a subsistence committee to help plan the locations for crossings. The BLM will consider the access impacts and AIDEA's commitment to maintaining access in making its decision.

The potential impacts to subsistence resources are a primary impact evaluated in the EIS and are a key consideration the BLM is weighing in making its decision. The final determination required by ANILCA 810(a)(3) will be made in the ROD after consideration of input on the Draft EIS and final dispensation of mitigation measures. The decision will be made in accordance with ANILCA 810(d), which states: "After compliance with the procedural requirements of this section and other applicable law, the head of the appropriate Federal agency may manage or dispose of public lands under his primary jurisdiction for any of those uses or purposes authorized by this Act or other law."

Comment –Tourism, Recreation, and Wilderness:

Several commenters expressed concerns regarding the intrusion of the road on wilderness areas and areas of solitude, and the effect of this on tourism and recreation. Some indicated that the road would bring in outside hunters, which would impact resources for subsistence hunters.

Response:

The basic impact to solitude and primitive types of recreation in undeveloped areas and on backcountry rivers is addressed in a combination of the discussions of lands (Chapter 3, Section 3.4.1), recreation and tourism (Section 3.4.3), visual environment (Section 3.4.4), and acoustical environment/noise (Section 3.2.6).

The discussion of nature-based tourism has been supplemented in the Final EIS in Chapter 3, Section 3.4.3, Recreation and Tourism, and Section 3.4.5, Socioeconomics and Communities, to better indicate effects on the tourism industry. Information has also been added to the Recreation and Tourism discussions in Chapter 3 (Section 3.4.3) and Appendix H (Section 3.5.3) regarding the value of wilderness and wilderness characteristics, whether the land is designated as federal wilderness or not.

No recreational user, including commercial recreation and tourism services or independent local Alaskans, would have access to the road and would therefore not be able to end their trip at the road crossing and take a vehicle to the Dalton Highway. This is explained in Appendix H under General Public Access (Section 2.2.1). Impacts to GAAR and the recreational experience there, and the recreational experience of those who start a trip within GAAR and float out of GAAR, are discussed in Chapter 3, Recreation and Tourism (Section 3.4.3).

Regarding trespass and effects on hunting and caribou herds in particular, Chapter 3, Section 3.3.4, Mammals (particularly in the Caribou section), discloses the impacts from potential trespass on the Ambler Road for hunting. Note that the road will not be open to public use; therefore, use of the road for hunting access will not be allowed. Permitted road users and gatekeepers will be required to report trespassers.

1.3.6 Indirect and Cumulative Effects

Comment – Reasonably Foreseeable Actions:

Several commenters expressed concern regarding potential of the proposed road to open up large areas for further industrialization and development (e.g., more mining, roads to extract western Alaskan coal resources, connection to Nome). Commenters felt these effects are reasonably foreseeable and need to be evaluated.

Response:

The BLM analyzed past, present, and reasonably foreseeable actions in a broad geographic area, including future actions beyond those related to development in the District. Appendix H, Section 2.1, focuses on the mining development scenario in the District; Section 2.2 discusses indirect road access scenarios, including potential for public access, commercial deliveries and potential infrastructure to support that, fiber optics, and other mining leases; Section 2.3 discusses past, present, and other reasonably foreseeable development, including climate change, Dalton Highway improvements, oil and gas development, and the Red Dog Mine.

According to 43 CFR Section 46.30, "Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a Responsible Official of ordinary prudence would take such activities into account in reaching a decision." To identify actions, the BLM held a workshop with cooperating agencies (State of Alaska, Northwest Arctic Borough, and NPS) and others to identify reasonably foreseeable actions that could contribute to potential impacts. A large number of activities were considered. First, they needed to be reasonably foreseeable; second, they needed to contribute to potential cumulative effects to be included in the cumulative impact analysis.

AIDEA has applied for a 50-year ROW grant and has committed to removing the road and other facilities at the end of that term. BLM's analysis in Appendix H has determined that it is reasonably foreseeable that the mining interests in the District would be developed and played out in that 50-year timeframe. The BLM has evaluated community access to the road for commercial deliveries (as proposed by AIDEA) that is reasonably foreseeable. If other actions that are not currently reasonably foreseeable should cause AIDEA to wish to extend the terms of the lease at some point in the future (or if another entity like local communities wished to extend the use of the road), they would need to apply for a separate ROW grant and the decision regarding that application would be subject to a separate or supplemental NEPA analysis.

Comment – Evaluation of Mines:

Numerous commenters stated that the EIS should have included likely mining scenarios. Commenters requested that this analysis evaluate the impact mines would have on environmental conditions in the District, the tributaries and rivers, and the people who live in the area, including actual mining activity, the toxic materials and chemicals used in the mining and extraction process, toxic runoff, permafrost disruption, climate change, spills and accidents, toxic tailings ponds left in perpetuity, wildlife, fish, subsistence, etc. Commenters stated that because the purpose of this road is to access a mining district, the BLM needs to fully consider the impacts of these mines and any infrastructure related to the mines or roads (e.g., gravel mines for road construction, processing facilities, tailings disposal areas, ore/export terminals, gas lines, contamination, etc.).

Response:

AIDEA has proposed a road for access to the District, with the assumption that providing access will indirectly lead to mining exploration and development. The BLM identifies that the purpose of the project is for technically and economically practical and feasible year-round industrial surface transportation access **in support** of mining exploration and development (Chapter 1, Section 1.4).

No specific mining application/permit request for the District has been presented to date. As a result, the mining developments are not ripe for decision, and are not treated as connected actions in this EIS. The BLM NEPA Handbook states: "Connected actions are limited to actions that are currently proposed (ripe for decision). Actions that are not yet proposed are not connected actions, but may need to be analyzed in the cumulative effects analysis if they are reasonably foreseeable." As suggested by this guidance, the BLM evaluated mining development as an indirect and cumulative impact in Appendix H. When officially proposed, each mine would go through its own site-specific NEPA analysis and permitting process, which would provide further detail and analysis regarding the specific impacts of each mine operation.

Even though a specific mining permit has not been filed, the BLM has made an informed judgment that if the road is built, mining development would be reasonably foreseeable. This judgment is based on the information contained in Appendix H and through input from cooperating agencies, AIDEA, and other stakeholders. The EIS considers the impacts associated with the proposed road project alternatives, and examines potential induced and cumulative impacts of future actions such as mines. The BLM has analyzed the effects of a reasonably foreseeable mining scenario within the District as part of the indirect and cumulative effects discussion in Appendix H.

To evaluate the indirect and cumulative effects of reasonably foreseeable development, the BLM obtained feedback from the public, industry experts, and AIDEA about their experience and opinions and used that information, combined with BLM's own knowledge and experience, to develop a reasonably foreseeable mining scenario. This mining scenario was developed based on existing claims, the potential size of those claims, and the anticipated lifespan of the mining operations. The analysis included an anticipated development schedule for the road and mines, including other potential mining leases along the road alignments. The potential size and scale of the mines is described in Appendix H, Section 2.1, and the operational development timeframe and lifespan of the mines is estimated in Appendix H, Tables 2-2 and 2-10.

Appendix H discusses the mining scenario and its impacts, including all resource categories and down river impact potential (permafrost, climate change, water quality, fish and wildlife, socioeconomics, subsistence, hazardous waste, effects to the Dalton Highway, risks associated with transport of hazardous materials and fuels, impacts of a new population of mine workers, etc.). Subsistence impacts are detailed in Appendices L and M, including impacts from caribou herd migration changes. The detailed analysis from Appendix H is summarized in the Indirect and Cumulative Effects subsections of Chapter 3 under each resource topic.

The Ambler Road EIS does not authorize mineral exploration or development in any way. Potential mine EISs would contain spill risk analyses specific to their footprint, affected environment, and operations plans. With respect to water quality concerns, as stated in Appendix H, Section 3.3.3, a mine is required to obtain the necessary construction and operational permits and approvals. This includes water quality related permits from the ADEC. Prior to permit issuance for water quality related permits, such as an Alaska Pollution Discharge Elimination Permit, the mine is required to demonstrate that water treatment meets federal and state requirements prior to discharge. Water quality is monitored throughout the life of the mine and as part of the long-term monitoring. As described in Appendix H, Section 2.1.5, long-term monitoring varies but could extend 50 or more years beyond the life of the mine, and could be perpetual. If monitoring identifies a potential issue during operation or as part of long-term monitoring, additional measures would be evaluated and implemented as appropriate. The permits and approvals issued for each mine would include terms and conditions for construction and operation of the mine, including reclamation and closure at the time they are ripe for evaluation and approval. The permits and approvals are applicable to mine owner and operator regardless of whether that changes over time.

As explained in the reasonably foreseeable mining scenario detailed in Appendix H, it is assumed that any mining operation would construct additional roads (spur roads) as needed to access specific mine sites. Appendix H acknowledges these as part of the mining development and impacts of the mines.

Appendix H explains that workers (including those from area communities) are expected to be transported to mine sites via air. Employment effects are described in Appendix H, Section 3.5.5. Job estimates and wages related to mining are summarized in Appendix H, Table 3-4. The anticipated lifecycle of the mines is reported in Appendix H, Table 2-10.

The economics for the mining projects are summarized in Appendix H, Section 3.5.5, and are based on the exploration completed to date and projected available resources in the District. Two economic studies have been conducted that disclose economic projections: one by Cardno in 2015 and one by the University of Alaska Center for Economic Development in 2019. The BLM is aware mineral resources are not the same as mineral reserves. Because mining activity in the District is reasonably foreseeable, the BLM is required to make a good faith effort to identify the indirect effects of that activity. Therefore, even though better information on proven reserves would be helpful, the BLM is required to make an informed judgment and to estimate future impacts of the road based on available information. The projection of mining activity determined to be reasonably foreseeable and reported in Appendix H was completed by a mining engineer registered in Alaska with decades of experience and was reviewed by mining development and permitting subject matter experts at the BLM and ADNR.

Comment – Climate Change:

Several commenters noted that climate change has resulted in melting of permafrost, increased run-off, increased flooding events, etc. They expressed concern that over the 50-year lifespan of the project, the combined effects of the project and continued climate change would affect resources such as caribou, fish, wetlands, etc. Increased flooding events could cause overflowing of tailing ponds associated with the mine operations if the ponds are not designed in consideration of climate change effects. Overflow from waste ponds would affect caribou, fish and other wildlife, which would, in turn, affect subsistence living, and have an economic effect as well. Comments stated that cumulative effects of the road, gravel mining, mine operations, and climate change all need to be considered.

Response:

The EIS acknowledges that climate change is and will continue to impact the Arctic in the future, regardless of whether the project is constructed. Some of these anticipated effects are summarized in each section in the EIS, and detailed in Appendix H. Climate change and its potential effects on various resources, including but not limited to thawing of permafrost, drying or changing vegetative communities, changing wildfire regimes and management, water quality and fish habitat, caribou, subsistence, etc., are addressed in various locations throughout Chapter 3 of the EIS and Appendix H. Specifically, see Chapter 3, Section 3.2.7, Air Quality and Climate Change. The potential effects of climate change on subsistence are addressed in Appendices L and M.

Appendix H, Section 3.4.2 has been revised to include more information about potential long-term impacts of climate change to freshwater fish and aquatic resources, and specifically acknowledge that fish use of habitats may change, and that streams that may not currently be considered important for fish may become more important in the future as conditions change in response to changing climactic conditions. The BLM agrees that it is difficult to anticipate the changes that may occur in the future, and the EIS discloses that such predictions are difficult to make.

The BLM has added potential mitigation to Appendix N, Section 3.3.2, that if adopted would require AIDEA to create and fund a permanent fish and wildlife program to document fish and wildlife conditions prior to construction to establish a baseline; monitoring changes in habitat conditions and use during construction and operation of the road; contract with subject matter experts as needed, to further refine mitigation measures in real time as they relate to fish and wildlife. If adopted, this measure could help to address potential changes in fish and wildlife and assure the long-term effectiveness of mitigation measures.

The BLM also added a potential mitigation measure that would require AIDEA, if adopted, to develop and implement a culvert monitoring plan to help prevent culverts from being blocked; the plan would include a mechanism for funding culvert repairs and replacements and would be submitted to ADF&G for approval. If this measure were adopted and implemented, it may be helpful to address possible changes to habitat conditions, habitat use, and measures to protect fish habitat. Climate trends will be evaluated in determining the 100-year floodplains and in sizing culverts and bridges during development of final construction plans.

The impact of the soil disturbances and the potential for dust to accelerate warming of soils, leading to increased thawing of permafrost is addressed in Chapter 3, Section 3.2.1. The potential for the road to cumulatively compound the impacts of climate change and the corresponding potential impacts on various resources are discussed in Appendix H. These sections have been modified slightly and acknowledge cumulative effects of the project on the global climate and the potential effects of climate change on other resources in the project area. GHG emissions from the road operations has been added to the EIS in Chapter 3, Section 3.2.7, and Appendix D.

1.3.7 Other

Baseline Data

Comment – Baseline Data was Insufficient:

Several commenters expressed concerns that baseline data was lacking and, therefore, the analysis in the EIS was insufficient. Many commenters suggested additional studies be conducted.

Response:

According to 40 CFR 1502.22, when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency will make clear that such information is lacking. A number of topics are called out within Chapter 3 of the EIS and the appendices where information is incomplete or unavailable. The BLM evaluated the data to determine if any missing information would be relevant to determining reasonably foreseeable significant adverse impacts or was essential to making a reasoned choice among alternatives and, if it was, whether the overall costs of obtaining it would or would not be exorbitant. Where information was relevant and essential, and the costs were not exorbitant, that information was collected (e.g., wetland delineation, updated engineering for Alternative C, economic analysis, etc.).

As required by 40 CFR 1502.22, the EIS makes clear to the reader where information is lacking, explains the relevance of the information, and summarizes the existing credible scientific evidence that is relevant to evaluating reasonably foreseeable significant adverse impacts on the human environment. The BLM has evaluated the impacts in the EIS based upon research methods and theoretical approaches that are accepted in the scientific community. Based on a review of the data that are available, summarized, and cited in the EIS and in accompanying appendices, sufficient data exists to allow the BLM to make a reasoned choice among the alternatives. If the project moves forward, additional studies and information would be generated during later permitting and final engineering design. Some potential mitigation measures identified in Appendix N include provisions for data collection and monitoring.

Outreach

Comment – Concerns with Comment Period, Hearing Protocols, Notice, and Consideration of Comments:

Several commenters expressed concerns that the timeframe for providing comments was too short. Some commenters did not feel that 3 minutes was sufficient for providing testimony. Some commenters indicated they did not know about the availability of the document until late in the process. Some commenters questioned how their comments would be considered.

Response:

The comment period for the Draft EIS was extended from October 15 to October 29, 2019, to provide additional time for comments in reaction to numerous requests received. A total of 60 days was provided.

Information was provided to rural communities in a number of ways to solicit input on the Draft EIS. The Draft EIS was published on BLM's ePlanning website, and notice was emailed to the project mailing list, ads were published in local papers and on social media, fliers were hung in villages, and published in the *Federal Register*. A paper copy was mailed to each community to be available for review by community residents. In accordance with ANILCA and because of potential subsistence impacts, Public Hearings were held in 18 rural villages, in addition to Anchorage, Fairbanks and Washington, D.C.

During hearings, participants were given 3-minute time limits. This afforded all participants a chance to speak. After all who wanted to speak had a chance to make a statement, participants wishing to add to their previous testimony were given additional time to speak. Federal officials and the court reporter remained at each hearing until all those who wanted to give testimony had completed their statements. All testimony was heard, recorded, and entered into the record, and no one was left wanting more testimony time at any of the hearings. At some hearings held in rural communities, people giving testimony were not limited to 3 minutes so that residents there could take all the time they needed to provide the BLM their comments.

BLM's role during NEPA is to engage the public in understanding significant impacts, identify and disclose impacts to the public in the Draft EIS, revise the document as necessary, and then take the public comments into consideration in making a decision. The BLM has collected and reviewed the input received on the Draft EIS and will take all comments into consideration in making a decision.

The BLM offered numerous opportunities for area residents to weigh in with written comments, including via email, the BLM ePlanning website, comment forms at meetings, and oral testimony at 21 hearings/meetings. The BLM reviewed the comments and has responded to the substantive comments, updating the EIS document where appropriate. All comments received, regardless of the form in which they were provided, are taken into consideration in reaching a decision on the project.

Comment –Tribal Consultation:

Several commenters expressed concerns that the tribal governments should have had more input into the project development process.

Response:

The BLM made a concerted effort to involve tribes in an ongoing and meaningful dialogue. This involved sending letters to tribes notifying them of the NEPA and Section 106 process and offering the opportunity for government-to-government consultation. Tribes were also invited to become cooperating agencies and participate in EIS development (8 cooperating agency meetings were held). The BLM also created a project email list that included email contacts for tribal representation for the affected area and provided email updates at multiple stages. During scoping, the BLM held an extended scoping period and meetings in 8 villages, and 2 teleconferences with the Western Arctic Caribou Herd Working Group, to provide opportunities for tribes and rural communities to share comments or concerns. The BLM held several government-to-government meetings with tribal governments that requested it. The BLM also held 4 Section 106 consultation meetings and invited tribes to participate to discuss concerns, share information, and review and comment on the draft Section 106 Programmatic Agreement. For the Draft EIS availability and public hearings, email notifications were sent to the email list, advertisements were published in multiple local newspapers, and Facebook posts were published. The BLM held 18 hearings in villages throughout the affected area (plus 3 in urban areas) so that everyone would be afforded the opportunity to weigh in. Appendix I summarizes the outreach conducted.

Legal

Comment – BLM EIS and NPS EEA - ANILCA Exemption of GAAR from NEPA:

Several commenters felt that adequate evaluation of the effects across GAAR were not being considered in the analysis. They requested additional impact analysis of the effects of the project within GAAR.

Response:

ANILCA specifically exempts the location decision across GAAR from NEPA and instead requires preparation of an environmental and economic analysis (EEA). NPS has taken the lead on documenting impacts within GAAR through the EEA. BLM’s EIS analyzes the impacts in GAAR as part of the overall impacts of the proposed action and alternatives, while the EEA focuses more narrowly on impacts within GAAR. Note that the EIS includes acreage impact calculations for impacts within GAAR as part of the overall impacts for each alternative. The decision makers will have access to and benefit from the analysis in both the EEA and EIS.

The BLM and NPS recognize that with respect to authorizing a right-of-way across GAAR, ANILCA only waives the NEPA process. Section 106 and Section 810 compliance are still required. The BLM is the lead agency conducting the NHPA Section 106 and ANILCA Section 810 analyses. Similarly, the USACE will use this EIS for its permitting decision under Section 404 of the Clean Water Act. BLM’s ANILCA Section 810 analysis and NHPA Section 106 analysis will be used by each federal agency in making their decisions.

Comment – Segmentation and Connected Actions:

Several commenters expressed their opinion that construction of the road and development of the mines should be considered connected actions. They felt that separating mine development from development of the road constitutes segmentation.

Response:

Segmentation occurs when an action is broken down into small parts to avoid the appearance of a significant impact of the total action. In a transportation project, segmentation can occur when a transportation need extends throughout an entire corridor, but the environmental issues are discussed on only a segment of the corridor. The Ambler Road EIS discloses environmental impacts on the entire corridor regardless of land ownership, including on state and private land and includes a discussion of mining related impacts in Appendix H as indirect and cumulative impacts.

The BLM has not segmented the mining impacts from the road impacts. Because there is no mine proposal, the BLM cannot evaluate more specific mine impacts. Nonetheless, recognizing that the purpose of the road is to encourage mine development in the District, the BLM has included the impacts of mines as reasonably foreseeable actions and considers the mining impacts to be indirect. See Appendix

H, which documents all reasonably foreseeable future actions and analysis of their impacts. In particular, reasonably foreseeable mining development is described in Section 2.1; a community access scenario in Section 2.2; and other past, present, and future projects are described in Section 2.3 of Appendix H.

Regarding the mines being potentially connected actions, the following from the most recent BLM guidance is relevant: "Connected actions are limited to Federal actions that are currently proposed (ripe for decision). Actions that are not yet proposed are not connected actions but may need to be analyzed in the cumulative effects analysis if they are reasonably foreseeable." Furthermore, "The NEPA process is focused on agency decision-making (40 CFR 1500.1(c), 40 CFR 1508.18, 40 CFR 1508.23). Therefore, a non-Federal action, even if "closely related" to a proposed BLM action, will not be a connected action pursuant to the Council on Environmental Quality regulations, because connected actions are limited to Federal actions. Rather, if the non-Federal action or its effects can be prevented or modified by BLM decision-making, then the effects of the non-Federal action are properly considered indirect effects of the BLM action and must be analyzed as effects of the BLM action (40 CFR 1508.7, 40 CFR 1508.25(c)) (see section 6.8.2, Direct and Indirect Effects)." See www.blm.gov/policy/pim-2018-023 for more details. Potential pursuits of mining developments within the District that are not currently proposed are not federal actions; therefore, they are not connected actions. As a result, the BLM has analyzed the effects within the District as indirect and cumulative effects. See Appendix H for details on this impact analysis.

Mitigation

Comment – Mitigation of Impacts:

Several commenters expressed concerns or comment regarding BLM's proposed mitigation or suggested new additional mitigation measures for the various resources affected by the proposed Ambler Road.

Response:

Appendix N discusses potential mitigation measures to minimize harm and mitigate for the potential impacts of the project alternatives as required by NEPA. The discussion covers all topics discussed in the EIS. Appendix N was updated for the Final EIS based on comments received on the Draft EIS.

Private vs Public Road

Comment - The Ambler Road will not Remain Private:

Numerous comments were received expressing concern that the Ambler Road, similar to what happened with the Dalton Highway, would start out as a private road, but would eventually become a public road. Several commenters stated that conversion of the Ambler Road to a public road should be considered reasonably foreseeable, citing the Dalton Highway as the precedent. The commenters stated that, therefore, the effects of the road being open to the public should be discussed in the EIS, including impacts from recreational traffic, dust, noise, trash, hunting, wildlife harassment, and human and vehicular pollution by urban residents, which commenters suggested would be many times that described in the EIS. Many commenters believe that allowing commercial use of the road for delivery of fuel and goods will be the first step towards public use.

Response:

Regarding comparisons to the Dalton Highway: There appears to be misconception regarding whether the Dalton Highway was intended to be a public road or not. The 1974 ROW grant from the BLM was for a "public road". Specifically, the Dalton Highway grant, titled *Grant of Right-of-way for Public Road*, stipulates: "The right-of-way shall be used for only the construction, operation, and maintenance by the State of a public road and related public facilities." In contrast, the request for the Ambler Road ROW is not for a public road. AIDEA's application specifically requests ROW for a project "being designed as an industrial access road to provide ingress to the Ambler Mining District (the District). The road would provide surface transportation access to the mining district to allow for expanded exploration, mine development, and mine operations at mineral prospects throughout the District. Access to the road would be controlled and primarily limited to mining-related industrial uses, although some commercial uses may be allowed under a permit process."

The opening of the Dalton Highway to the general public after nearly 20 years of its northern end being open to industrial traffic only is a different situation than the proposed Ambler Road. The Alaska Supreme Court in 1994 ruled that the ROW grant from the federal government to the State of Alaska was for a "public road," and that this "public road" intent was echoed in the Declaration of Policy in Alaska law related to the Dalton Highway (Alaska Statute [AS] 19.40), and that the DOT&PF had powers to govern use of the road (e.g., close it, or open it to the public). See *Turpin v. North Slope Borough*, 879 P.2d 1009 (Alaska 1994). The Ambler Road ROW grant is proposed specifically to be for limited access and not open to the public, and it would not be under the control of DOT&PF. Therefore, the Dalton Highway situation is not a precedent for a legal mechanism to open a future Ambler Road to the public. This information has been added as a footnote in Appendix H, Section 2.2.1. Information also has been added to the text in Section 2.2.1 to further describe the legal and contractual requirements that would keep the road from being opened to the public.

Regarding conversion to public access being reasonably foreseeable: The BLM evaluated the likelihood of the industrial access road converting to public access at some point in the future, and determined that public access is not reasonably foreseeable for the following reasons:

- AIDEA proposed a private industrial access road, not a public access road. Its road design and cost estimates do not include the kind of design provisions that would be necessary for a public access facility. The BLM must analyze the project that was proposed by the applicant.
- The road as proposed by AIDEA would not meet standards for public access facilities. To meet standards and accommodate public access, the proposed road would need to be redesigned. Public access highways have very different design criteria than private industrial access roads. These criteria go beyond just the width of the lanes, including grades, sight distance around curves, the slope of embankments, signage, clear zones, guard rail placement, etc. AIDEA's proposal does not include such features. Each of these more robust design features adds to the cost of the road's design and construction. AIDEA has not proposed a road, or developed a cost estimate for a road that would meet these criteria and does not intend to. Because of AIDEA's more limited design, vehicles will be required to carry 2-way radios and be in contact with operations personnel. Drivers will be required to have a commercial driver's license and have specialized training through a permit system to be overseen by AIDEA. For all of these reasons, the BLM determined the road would not be appropriate for use by the general public. Converting AIDEA's proposed road to one open to the public would take considerable additional design efforts and construction cost.
- Because the first 20-plus miles of Alternatives A and B and much greater mileage of Alternative C cross BLM-managed land, to convert the Ambler Road to a public road would require evaluation of a different purpose and need for the project and a new or supplemental NEPA analysis. The impacts of public access would need to be evaluated in that document. Similarly, to obtain wetland permits from the USACE (e.g., to straighten curves or make embankment slopes traversable) would likely trigger a new or supplemental analysis that would require the USACE to evaluate the impacts of public access. The BLM has legal authority to close the road to the public within the BLM ROW (43 CFR 8364.1) and to require AIDEA to restrict access (43 CFR 2805.12(a)(8)). Any application to modify the ROW to allow public use would require additional NEPA analysis.
- Since AIDEA is a public corporation governed by its Board of Directors, that Board would have to vote and agree to any proposed sale of the road to allow for conversion of the road to public use. The

public agency wishing to take over the road would essentially have to buy out AIDEA and its partners' (bond holders') positions.

- AIDEA plans to issue revenue bonds as a principal tool to finance the construction of the project. These taxable bonds would be sold through private placements to various potential buyers (e.g., banks, investment funds, high-net worth individuals, etc.). All financial risks will be borne by the investors and bondholders. AIDEA plans to pre-fund a reclamation reserve fund with revenue bond proceeds to provide for adequate reclamation when the removal and reclamation is needed.

Comment – Controlling Access to the Ambler Road:

Several commenters expressed concern regarding how AIDEA plans to prevent the public from using the road as well as the airstrips, suggesting that because it is there, people will use it whether or not they are supposed to. Commenters asked how access to the Ambler Road will be controlled. Some commenters asked about access for emergency situations.

Response:

Road access will be by permit only, and only commercial transportation vehicles will be allowed to provide service to District operations. To ensure only legitimate entities with a strong business case for their project will be using the road, anyone wishing to use the road will have to apply for permission and each user will, at a minimum, be required to reimburse some portion of the construction and operations and maintenance (O&M) costs through a user fee; have equipment that meets stringent requirements; have drivers trained on Ambler Road rules; and have appropriate insurance coverage naming AIDEA, its road operator, and the owners of land crossed by the road as additional insured parties.

The specific amounts of the road-user fees have not been determined by AIDEA to date. The fees for commercial deliveries to communities may be calculated on a different basis than the mining company lease agreements. The commercial delivery scenario is described in Appendix H, Section 2.2.2. In that section, a sentence has been added indicating fees and insurance requirements would apply, as stated by AIDEA. The BLM would not stipulate the fees charged but, as indicated in Appendix N, would stipulate conditions of road use for AIDEA and for those authorized by AIDEA.

The airstrips proposed by AIDEA will not be available for use by the public (except perhaps in an emergency landing situation). During construction, these airstrips would be associated with construction camps, and they would be operated and monitored by construction personnel. Some airstrips would be retained following construction to support ongoing road maintenance and operations. These airstrips would be associated with permanent maintenance stations, and they would be operated and monitored by road maintenance personnel. AIDEA proposes the maintenance stations would operate year round. Because of the year-round presence and monitoring by personnel, trespass use of the airstrips is not anticipated.

AIDEA has proposed guard stations at each end of the road and in other locations if needed. Guard stations would be staffed by personnel around the clock for the life of the road. Regular patrols by maintenance personnel and a communications system that makes it policy that authorized drivers report unauthorized road users would further deter and address unauthorized uses. Chapter 2 of the EIS, under Operations, and Appendix H, Section 2.2.1, explain gates and security.

While the road would only be open to industrial users or commercial deliveries authorized by AIDEA, AIDEA has indicated they would make the road available to support emergency operations such as firefighting, medical transports, or search and rescue. It is likely that if the project moves forward, agreements with AIDEA to cover such use would be negotiated.

As mentioned in Appendix H, Section 2.2.1, the general public would be allowed to cross the proposed road using traditional overland transportation (e.g., snowmobile, dog team, on foot). AIDEA may specify certain areas for safe crossing and has agreed to build ramps to help travelers get over the road embankment. Road use by the general public for purposes other than to cross would not be allowed. Security patrols and authorized drivers would be in continual radio contact and are expected to report unauthorized users of the road.

Cost Estimates

Comment – Project Cost Estimates:

Several commenters expressed concern regarding the cost estimates prepared for the project.

Response:

The project cost estimates reported in the EIS were prepared for AIDEA by engineers licensed in the State of Alaska, and were based on unit costs for similar conditions. O&M costs took into consideration the Dalton Highway and the Red Dog Road projects as examples for inputs. The estimates were updated in April 2019. These initial estimates present the total anticipated expenditure for construction, operations, and maintenance. Appendix C, Table 1, summarizes the cost estimates, and AIDEA's SF299 application provides details on the cost estimates completed for AIDEA. A footnote has been added to Appendix C, Table 1, to explain where the calculations were derived from and how the BLM used information from AIDEA.

If the project moves forward, additional engineering design efforts would be completed to refine the initial cost estimate. Before the project moves forward, AIDEA's Board would need to approve the project's financing plan. AIDEA has indicated they would not move forward until they have sufficient interest from mining companies. The bond market would also be expected to require additional due diligence on projected returns on investment.

Comment – Cost Associated with Addressing Permafrost Issues:

Several commenters expressed concern that costs associated with addressing permafrost issues were not considered in project cost estimates. Others questioned whether the likelihood of melting permafrost causing mud slides or requiring other slope maintenance was factored into the cost estimates for maintenance of the roadway.

Response:

Cost estimates in an EIS typically are based on early conceptual design of multiple alternatives using similar methods and are meant to capture the biggest cost factors for comparison of the alternatives based on a similar level of effort. They are intended to provide decision makers with the relative cost of the alternatives but not necessarily with the final cost. EIS estimates are not based on advanced or final design, and typically include the large cost elements and not the fine details. The cost estimates presented in the EIS were derived from AIDEA and its engineering team; the engineering team was comprised of engineers licensed in the State of Alaska who are aware of Arctic construction issues, including permafrost, so they were able to take this into account in developing the cost estimates. Detailed surveys of land/soils/permafrost typically are not undertaken until a single alignment has been selected. However, the engineering design necessary to build a sustainable road would be completed before final authorization to occupy the ROW. The EIS acknowledges presence of permafrost soils in the study area and discloses the potential impacts of permafrost melting (Chapter 3, Section 3.2.1, Geology and Soils). As noted in Chapter 2, geotechnical field studies and thermal modeling has been proposed, and specific measures incorporated during final design to control permafrost thawing. Design features would be refined during the design/permitting phase and would be incorporated into ROW authorization and applicable permits.

Comment – Cost and Impacts Associated with Removal of the Road:

Several commenters expressed concern that costs and impacts associated with removing the road once it has served its useful purpose were not included.

Response:

Appendix C, Table 1, has been augmented with cost estimates for road closure and reclamation. New totals combining costs for construction plus reclamation have been included in the table, and a footnote has been added to explain the derivation of the data and how the BLM used information from AIDEA.

Discussion of road closure and reclamation impacts has been added throughout the EIS as a part of the overall proposed project. These additions include:

- A summary of AIDEA's stated plan for closure and reclamation has been augmented in Chapter 2, Section 2.4.3, under the subheading Project Lifespan/Closure/Reclamation.
- A reclamation plan, with multiple commitments, has been added in Appendix N, Section 1.4, and reclamation has been addressed in other sections of Appendix N.
- AIDEA provided an estimated cost for reclamation, and it has been added to the cost rows at the bottom of Appendix C, Table 1.
- Multiple sections of Chapter 3 include new text to disclose the anticipated impacts and benefits of road closure and reclamation, particularly where those impacts may differ from similar impacts during initial construction.

Financing

Comment – Funding for the Ambler Road:

Numerous commenters expressed concern regarding funding of the roadway. Some questioned why the mining companies are not funding the road. Others were concerned that the State of Alaska might ultimately end up paying for the road, or paying off the bonds if mining interests do not pan out. A few commenters expressed concern over the State of Alaska's bond rating should the mines not pan out.

Response:

AIDEA's mission is to promote, develop, and advance economic growth and diversification in Alaska by providing various means of financing and investment. Therefore, a project like the Ambler Road Project is in keeping with that mission. AIDEA has the expertise within the State to determine the economic feasibility of the project, and is overseen by a Board of Directors appointed by the Governor of Alaska who will also consider the economic feasibility of the project as additional design and project refinement occur.

Financial capability to construct, operate, maintain, and terminate a project are among the determining factors when the BLM weighs the decision whether to authorize a project. AIDEA's proposal includes plans for funding and reclaiming the road upon closure, and AIDEA will be required to fulfill that obligation. How AIDEA funds the project is up to them; however, they will be required to provide a financial guarantee (i.e., surety bond, policy of insurance), making funds accessible to the BLM to cover the cost of reclamation in the event they are unable to do so. The financial guarantee mechanism must meet the requirements of BLM regulation and policy.

AIDEA plans to issue revenue bonds as a principal tool to finance the construction of the project. These taxable bonds would be sold through private placements to various potential buyers (e.g., banks, investment funds, high-net worth individuals, etc.). If the project is not successful, the investors or bondholders who purchased bonds to finance the project assume the risk of the project's revenues falling short. Maintenance of the road will be paid from road user fees. The project will not be constructed until agreements with the road users to fund long-term O&M of the project are in place. AIDEA indicates they will not issue bonds until the O&M agreements are in place. Reserve funds would be set up to cover short-term shortfalls should payments from users be inadequate to make payments.

AIDEA will pay the State of Alaska a dividend from road revenues for the life of the project, so the project would add to State general fund revenues if successful. No State revenue will be used for construction, operation, or maintenance costs. The road will also benefit the public through job creation and royalties that will come back to AIDEA, local governments, and Native corporations (see Appendix H, Section 3.5.5).

AIDEA plans to pre-fund a reclamation reserve fund with revenue bond proceeds to provide for adequate reclamation when removal and reclamation is needed.

AIDEA has separate bonding authority and a separate bond rating from the State of Alaska. Bonds issued by AIDEA do not become a liability of the State and, therefore, would not affect the State's bond rating. Before the project moves forward, AIDEA's Board would need to approve the project's financing plan. The bond market would also be expected to require additional due diligence on projected returns on investment.

A new paragraph under the subheading "Funding and Costs" has been added in Chapter 2, Section 2.4.3, of the EIS. That paragraph briefly explains AIDEA's proposed funding plan for the project.

Comment – Operations and Maintenance of the Road:

Several commenters expressed concern regarding how O&M of the Ambler Road will be carried out.

Response:

AIDEA foresees forming a subsidiary corporation to manage O&M of the road. This information has been added in Chapter 2, Section 2.4.3, under "Operations." Road maintenance will be undertaken by the road operator using funds generated through lease agreements between AIDEA and the mining companies for use of the road. This is explained in part under "Operations" in Chapter 2, Section 2.4.3, and explained further under a new added subsection, "Funding and Costs," in that section.

Comment – Ability to Reclaim the Road if Mining Interests do not Pan Out:

Several commenters expressed concern that the proposal assumes that mining exploration will reveal sufficiently lucrative mining interests to fund the O&M of the road, and concern that if mining interests do not pan out that Alaskans will foot the bill for reclamation and clean up. With a 50-year anticipated lifespan, financial risks are inevitable. Some commenters expressed concern that the road would need to remain open beyond the 50-year anticipated lifespan.

Response:

AIDEA proposed the 50-year length of the ROW term based on its understanding of the mineral potential in the District. The BLM developed a mining scenario that evaluated an anticipated development schedule for the road and the mines, including leases along the road alignment. This was discussed in Appendix H. Based on that effort, the BLM confirmed that the 50-year time horizon was reasonable. Speculating on actions that that might cause the road to remain open beyond 50 years is not reasonable. If other actions that are not currently reasonably foreseeable should cause AIDEA to wish to extend the terms of the lease at some point in the future, they would need to complete a separate or supplemental NEPA analysis at that time.

The subsection in Chapter 2, Section 2.4.3, on "Project Lifespan/ Closure/Reclamation" has been augmented; costs for reclamation have been added to Appendix C, Table 1; and the impacts of reclamation have been more explicitly stated throughout Chapter 3. Appendix H, Table 2-10, lays out a timeline of anticipated development, including anticipated reclamation and closure at the end of the 50-year lease.

AIDEA has applied for a 50 year ROW lease and has committed to removing the road and other facilities (e.g., buildings, bridges, culverts, fiber optic cable that will be buried in the road embankment, etc.) at the end of that term. AIDEA will be required to fulfill that obligation; how they fund reclamation is up to them. However, they will be required to provide a financial guarantee (e.g., bond, surety, insurance, etc.), making funds accessible to the BLM to cover the cost of reclamation in the event they are unable to do so. The financial guarantee mechanism must meet the requirements of BLM regulation and policy (BLM IM 2019-03). Prior to accepting any financial assurance, AIDEA would furnish a report to the BLM Authorized Officer estimating all costs for the BLM to fulfill the terms and conditions of the grant if the holder is not able to do so. This estimate would be prepared by an independent State-certified engineer who is approved in advance by the Authorized Officer, and would include, but not be limited to, Davis-Bacon wages potentially incurred by the BLM, hazardous material liabilities, decommissioning, and interim and final reclamation. All costs of preparing and submitting this report would be borne solely by the holder.

AIDEA has indicated they plan to pre-fund a reclamation reserve fund with revenue bond proceeds to provide for adequate reclamation when the removal and reclamation is needed. The BLM has added additional discussion to the EIS related to the impacts of removing/reclaiming the road. A new paragraph under the subheading "Funding and Costs" has been added to Chapter 2, Section 2.4.3. That paragraph briefly explains the proposed funding for the project.

Comment – Responsibility for Cost of Unplanned Events such as Accidents or Spills:

Several commenters expressed concerns regarding how clean up of spills or other unplanned events would be covered.

Response:

AIDEA has indicated they will have insurance and a financial mechanism to create a maintenance fund in place to cover the cost of unplanned events such as accidents or spills. Insurance policies will be obtained in accordance with the requirements of the various landowners of land the road crosses. Insurance will cover liability to the owners and operator. In addition, the vehicles using the road will be required to have commercial insurance and to include the road operator as an additional insured on vehicle and operations insurance policies. Depending on the cause of an accident or a spill, these various insurance policies would offer coverage for the costs.

Comment – Approving the Ambler Road ROW prior to Applications from Actual Mine Developers:

Several commenters indicated that they felt the application for the Ambler Access Road is premature. They felt that agreements with mining companies should be in place to ensure there will be adequate money to pay off the construction bonds and operate and maintain the road before the road ROW is approved by the BLM. Several commenters suggested that building a road to access the mineral deposits in the District should not be considered before the mineral deposits themselves have been determined to be viable through a full feasibility assessment.

Response:

AIDEA has filed an application pursuant to ANILCA, and the BLM is required to respond to that application. ANILCA does not specify that there needs to be an agreement with any mining company or assurance that tariffs will pay for the road for an application to be submitted or acted upon. In Section 201(4)(b) the law states "Congress finds that there is a need for access for surface transportation purposes across the Western (Kobuk River) unit of the Gates of the Arctic National Preserve (from the Ambler Mining District to the Alaska Pipeline Haul Road) and the Secretary shall permit such access in accordance with the provisions of this subsection."

Regarding economic viability, AIDEA has proposed to sell bonds to finance the project. This means that ultimately the bond market will determine if this project is viable. To provide sufficient information to the market, AIDEA will need to provide additional detailed design information and more refined cost estimates. AIDEA has indicated that the road will not be constructed until agreements with the road users to fund long-term O&M of the project are in place. AIDEA will not issue bonds until these O&M agreements are in place.

Under 43 CFR 2804.26, the BLM can deny an application if the applicant cannot demonstrate the technical or financial capability to construct the project or operate facilities within the ROW. To date, AIDEA has demonstrated that it has the technical and financial capability to construct, operate, and maintain the proposed project within the ROW. For example, AIDEA has successfully developed similar industrial projects, such as the DMTS and has demonstrated sufficient capitalization to carry out the proposed project. A new paragraph under the subheading "Funding and Costs" has been added in Chapter 2, Section 2.4.3. That paragraph briefly explains AIDEA's proposed funding plan for the project.

1.3.8 Summary

The BLM has fully evaluated and disclosed the potential impacts of the proposed Ambler Road. The BLM has provided qualitative, quantitative, and spatial analysis to disclose potentially significant impacts and provided special technical reports covering the issues anticipated to be most significant based on scoping comments. The EIS analysis includes quantitative impact calculations in tabular form; qualitative analysis that describes differences in the quality, magnitude, and duration of impacts; and spatial analysis in over 30 maps that discloses location information of the routes and associated impacts. Potential mitigation measures to address impacts are discussed in Appendix N. The BLM has reviewed the comments made on the Draft EIS and has provided responses to the substantive comments (see BLM's ePlanning website for the project [www.blm.gov/AmblerRoadEIS] for the specific substantive comments and BLM's responses). The BLM will consider comments received on the Draft EIS in making its decision on a Selected Alternative and in determining which mitigation measures to require in its ROD.

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Appendix R

Analysis of Data Availability per 40 CFR 1502.22

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Acronyms

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AIDEA	Alaska Industrial Development and Export Authority
ANILCA	Alaska National Interest Lands Conservation Act
ATSDR	Agency for Toxic Substances and Disease Registry
BLM	Bureau of Land Management
BMPs	Best Management Practices
CA	Cooperating Agency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DHSS	Department of Health and Social Services
DOI	Department of the Interior
DOT&PF	Department of Transportation and Public Facilities
EIS	Environmental Impact Statement
GAAR	Gates of the Arctic
HIA	Health Impact Assessment
IDT	Interdisciplinary team
LiDAR	Light Detection and Ranging
NEPA	National Environmental Policy Act
NNIS	Non Native Invasive Species
NOA	Naturally Occurring Asbestos
NPS	National Park Service
PA	Programmatic Agreement
SME	Subject Matter Expert
TK	Traditional Knowledge

USACE	U.S. Army Corps of Engineers
WAH	Western Arctic Herd

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1. Background

In accordance with Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations (Title 40, Code of Federal Regulations [CFR], section 1502.22, stated below), this document provides an analysis of incomplete and unavailable information identified in resource assessments developed for the Ambler Road Environmental Impact Statement (EIS) and based on agency and public comments submitted during EIS scoping and during the Draft EIS comment period. Although the resource assessments and comments consider the strengths and weaknesses of available scientific data, BLM analysts were able to complete thorough analyses of potential impacts of the proposed Ambler Road and to draw informed conclusions from the information available. The analysis in this document addresses those items that were noted as data gaps (missing or incomplete information) during scoping and through finalization of the EIS. As noted in Table 1, many of the identified data gaps were ultimately filled.

The BLM and other federal and state agencies evaluated the possible types of decisions that might need to be made to successfully issue right-of-way grants and permits for the Amber Road. The evaluation included the following steps

- **Application Review.** This assessment started with a review of AIDEA's application. After receiving AIDEA's application, each federal agency reviewed the application for completeness and required AIDEA to supplement the application prior to deeming it complete and allowing the NEPA process to begin.
- **Scoping.** During scoping, the BLM specifically requested agencies, tribes, and the public to identify sources of information that would aid in the evaluation of impacts.
- **Data Gap Analysis Report.** During the first phase of the EIS development, the BLM commissioned a data gap analysis to evaluate the available data relative to the key issues identified during scoping. The BLM shared that data gap analysis with cooperating agencies as a means of confirming the availability of data each agency might have in its possession. Resource experts reviewed the report relative to the EIS resource topics and issues identified in internal, cooperating agency, and public scoping. Possible knowledge gaps were identified in the Data Gap Analysis, and the process identified potential studies or actions to fill knowledge gaps or improve the best available science. These assessments were compiled in the Data Gap Analysis Report (available on BLM's ePlanning website for the project, www.blm.gov/AmblerRoadEIS). Based on the Data Gap Analysis Report, the BLM distilled the data gaps into the list analyzed below and considered whether existing available information would be sufficient for evaluating impacts and making a reasoned choice among alternatives. Many items in the list identify existing information, which at the time the list was generated had not yet been collected. Because it had not yet been collected, it was identified as a gap. Where relevant and obtainable, that information was collected and used in the EIS analysis. Other data, which were not available, but which were deemed essential to the analysis, required additional original data collection. These data were procured and included such items as engineering alignment, material availability and cost estimates for Alternative C; desktop wetland delineation for Alternatives C and the eastern 50 miles of Alternatives A and B; a health impact report; and an indirect and cumulative impact assessment report, among others.
- In comments on the Draft EIS, several commenters stated that the Draft EIS had not complied with NEPA because the BLM purportedly failed to gather sufficient data to fully evaluate impacts of the road. In general, several agency and public comments on the Draft EIS noted potential knowledge gaps and recommended additional studies. Because of these lingering questions about potential data

gaps, the BLM prepared this appendix to provide additional documentation on the decision making related to data used and collected for the EIS.

2. Methods

This document catalogs the potential data gaps and recommended studies identified in the Data Gap Analysis Report and, by extension, in the EIS, providing a structured analysis of those potential data gaps and recommended studies that track with the requirements of 40 CFR 1502.22. Each such item of "incomplete or unavailable information" underwent a review process to ensure consistency with 40 CFR 1502.22, the relevant text of which reads:

> **1502.22 Incomplete or unavailable information.**
>
> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.
>
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
>
> (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement: (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

A potential data gap or recommended study was considered relevant if it could be connected to reasonably foreseeable significant adverse impacts described in the EIS. All relevant potential data gaps and recommended studies identified by agencies and in public comments were evaluated to determine whether the information was essential to a reasoned choice among alternatives. To be essential, the information must provide a means for making a clear and meaningful distinction between alternatives. Lastly, if missing information was determined to be relevant and essential, the potential means of obtaining the information was evaluated to determine whether the cost of obtaining the information would be exorbitant.

Environmental analysts used a structured review approach illustrated by Figure 1. This approach, taken directly from the language of 40 CFR 1502.22, consists of 3 steps. Each step asks a question, the answer to which determines whether the analysis of the potential knowledge gap and recommended study either progresses to the next step or requires no further review. Where analysts answered "Yes," they documented and moved on to the next question. Where analysts answered "No," they recorded the reasoning behind the answer, often concluding the review of that potential knowledge gap and recommended study. The completed analysis for all catalogued statements was then reviewed by supervisory and legal specialists, who confirmed the analysis and determined that it satisfied 40 CFR 1502.22 (and Department of the Interior NEPA regulations at 43 CFR 46.125).

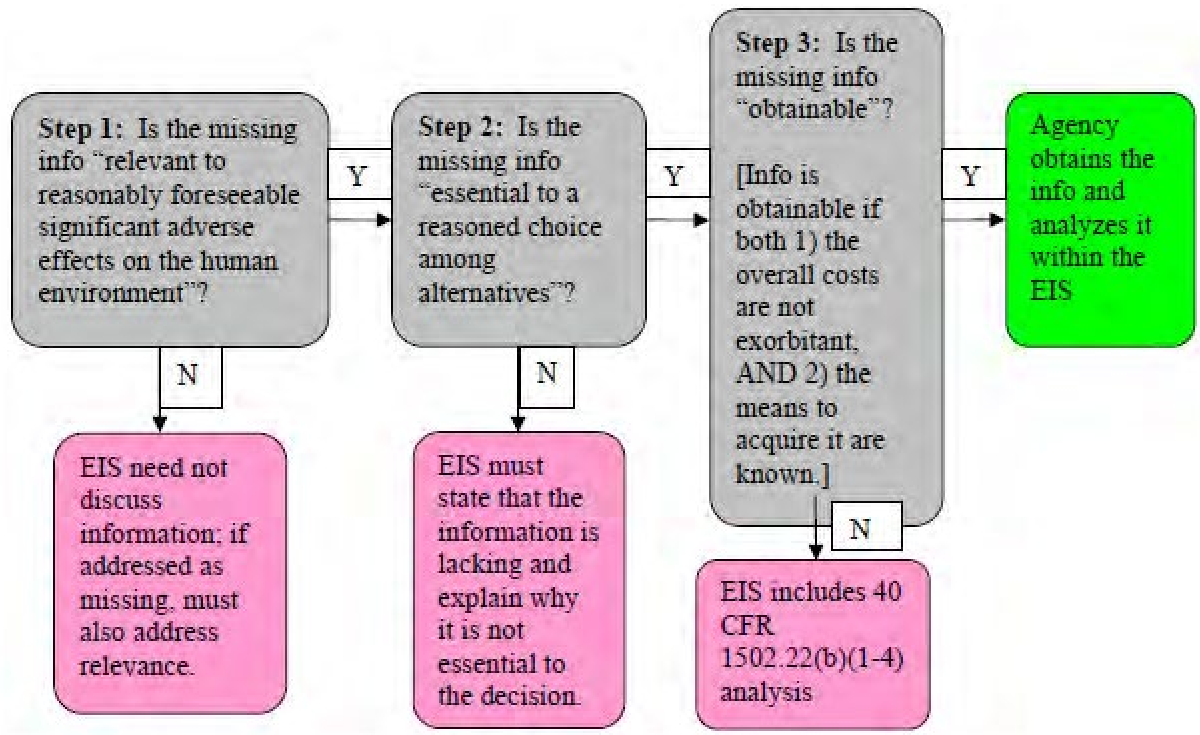

Figure 1: Three-step process used to evaluate data in accord with 40 CFR 1502.22

3. Results

Some cataloged potential knowledge gaps and recommended studies did not progress to Step 2 of the 1502.22 incomplete and unavailable information analysis, because they were determined to not be relevant to reasonably foreseeable significant adverse effects on the human environment described in the EIS. Relatively few potential data gaps and recommended studies progressed to Step 3 of the analysis, because analysts determined that while many were broadly relevant to the important issues at hand, many were not essential for making a reasoned choice among alternatives. Step 3 required discussion about "whether the cost of obtaining the missing information is exorbitant, or the means of doing so unknown." Formal cost estimates were not generated, but the BLM considered the extent of the study area, the timing and duration that the study would require, and the level of effort for accomplishing the data collection and analysis. Means of doing so typically were not an issue, but time and the cost related to the time needed, especially considering the length of the 3 alternatives (211 to 332 miles) and the broad area of Interior

Alaska under study, were cost-related considerations. In many cases, it was noted that the information may not be highly relevant and especially may not be essential to a reasoned choice among alternatives, nonetheless, because it was readily available it was obtained and used in the EIS.

Considerations included:

- There will always be some level of incomplete scientific information (especially regarding dynamic ecosystems). However, there is often enough information to formulate and support sound scientific judgments. Scientists frequently agree on larger issues and trends despite the lack of a particular detail of the information. Also, some information is not of a type that would alter scientific judgments or otherwise affect decision making. Additionally, some information is not significant or relevant enough to be considered essential to a reasoned decision among alternatives.
- Whether there are some adverse effects that would certainly occur under the specific circumstance to which the incomplete information applies. For instance, it is already presumed that a large fuel spill could cause significant adverse impacts on wildlife and other resources, through direct and indirect effects; thus, it is not essential for the decision maker, who is already made aware of the probability and severity of these potential impacts, to understand every particular mechanism through which these adverse impacts could occur. Additional information specific to how spilled fuel may affect caribou foraging, for example, is not required for an understanding of the probability and severity of risks associated with each alternative.
- Whether there is a commonality of potential impacts among all action alternatives, which lessens the utility of incomplete information to the decision-maker. For example, in the unlikely event of a large spill, it is well-understood that environmental impacts could be severe. The severity of potential impacts would be nearly identical under any action alternative; therefore, very specific types of information relevant to species, particular life history traits, or behavior do not help substantially in distinguishing among alternatives.
- Whether the existence of other environmental laws and regulations would or mitigate significant adverse effects on particular resources. For example, comprehensive regulatory standards under the Clean Air Act are presumed sufficient to preclude air quality impacts from reaching a level of significance for potential future mines. A lack of specific information regarding air quality impacts related to potential future mines is in this sense less useful to the decision-maker, who is assured that no matter which alternative they select, significant adverse effects on air quality will be further studied in subsequent NEPA and permitting process and likely be avoided or minimized through those processes, but also that each of the alternatives would result in the same indirect impacts in the Ambler Mining District.

The Yes/No responses for each potential knowledge gap or recommended study and the reasoning supporting each "No" response are provided below. Table 1 presents more than 150 items considered.

Table 1: Analysis of data availability

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Phys	Provide floodplain information in the form of regional rating curves using Rosgen methods to delineate the bankfull height, area, and width of channels as well as the area and width of the area prone to flooding.	Yes, floodplain info is relevant, because blocking streams would cause flooding (potentially catastrophic). However, this level of engineering detail would not typically be generated at the NEPA stage. Standard engineering practice is well established to provide cross drainage. This level of information is a design issue for refinement of the crossings.	This level of detail is not essential to a choice among alternatives. All alternatives would be designed to same standard. This level of design detail is not necessary during NEPA but would be considered during refinement of crossings during design. AIDEA has committed to providing the requisite engineering.	Not applicable because not essential.	3.2.5	3.2.5
Bio	Vegetation communities should be evaluated to Viereck Level III, at a minimum, and wetlands delineation should be evaluated to NWI subclasses with appropriate modifiers (e.g. water regime), at a minimum, in order to be able to assess impacts from all alternatives equally and meaningfully.	Yes, vegetation and wetland info is relevant, particularly wetlands, because project footprint would impact plants and fill wetlands that nationally are scarce. However, acreage of plant communities and wetlands would be small overall compared to what is available in the project area and possibly not significant given the amount of wetlands and vegetation across the region. That is, the loss of the veg and wetlands would not be catastrophic.	More detailed vegetation information is not essential to choice among alternatives. Wetlands mapping essential especially to USACE decision making regarding permitting has been obtained. Effect to vegetation in general can be based on project footprint (loss of vegetation) without knowing specifically quantities of specific plants. Wetland mapping was obtained from aerial photography for all alternatives.	Not applicable for vegetation because not essential. Existing vegetation mapping is sufficient. However, cost of field work over some 500 miles of alignment would be exorbitant and time intensive and would improve data but still not be expected to confirm with finality that there are no unknown or extremely rare species. Wetland mapping is obtainable and was obtained from aerial photography for all alternatives and was used in the EIS.	3.3.1	3.3.1
Bio	Less-refined stream mapping data available for Alternative C compared to Alternatives A and B. Provide additional stream mapping coverage in GIS (also see Vegetation and Wetlands section).	Refined stream mapping for Alternative C is relevant.	Determined important to have additional data so Alternative C had same relative information as Alternatives A and B.	It was determined through consultation with USACE to have desk-top wetland mapping effort which would also provide improved knowledge of streams for Alternative C.	3.2.5 Water; 3.3.1 Wetlands; 3.3.2 Fish	3.2.5 Water; 3.3.1 Wetlands; 3.3.2 Fish

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Socio	Subsistence Study Area: Both the 50-mile criterion and use area within 30 miles criterion for a subsistence study community have been used in other similar large-scale linear development projects in Alaska. To identify these communities with use areas within 30 miles of project alternatives would require additional research and compilation of subsistence use area data, and therefore the compilation of existing subsistence use area data to identify additional study communities and potentially affected subsistence uses represents a data gap.	The compilation of existing subsistence use area data for communities within the buffer and outside the buffer exist and is relevant to determining which communities may have use areas that overlap the alternatives and therefore which may experience impacts. Communities even at a distance are relevant to impacts related to wide-ranging resources (caribou, fish). As crucial resources, impacts to these resources could be significant.	The existing subsistence use area data is essential to a choice among alternatives, because the alternatives may affect subsistence practices and resources differently and would affect different communities.	The BLM obtained and compiled the existing data that had been identified as not in hand when the Data Gap Analysis was prepared. This was the information pertaining to communities within 30 and 50 miles of the alternatives. The BLM included the compiled information in the EIS analysis. The BLM also contracted to hold a subsistence workshop to supplement available information and also included WAH Working Group communities as part of the study, many of which are outside the 50-mile buffer.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	Additional research and data compilation would be required to identify harvest and use area data (and associated baseline indicators) for earlier time periods.	It is not likely that earlier-time-period info would be relevant to future significant adverse impacts, because current patterns are most relevant. Current patterns are the "affected environment" baseline. More historical data could confirm whether current use areas are the same or have changed.	Not essential to choice among alternatives, because sufficient relevant, recent information exists.	Not applicable because not essential. However, existing data was compiled, obtained, and used in the EIS. The BLM held a subsistence workshop to supplement available information.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	Long-term subsistence mapping studies are most useful for documenting the location and timing of subsistence activities. Due to the lack of long-term use area mapping studies within the last 10 years, a data gap exists for updated long-term subsistence mapping studies in the 8 study communities of Ambler, Hughes, Huslia, Kobuk, Manley Hot Springs, Rampart, Shungnak, and Tanana. Seven additional communities (Alatna, Allakaket, Bettles, Coldfoot, Evansville, Minto, and Wiseman) have long-term subsistence mapping collected by SRB&A within the last 10 years.	The missing info could be relevant to understanding use patterns and impacts to subsistence in the named communities, some of which are located near the alternatives and are particularly relevant.	The missing info is not essential because information does exist for impacted communities, and the SRB&A unpublished data was used and some has since been published. BLM determined it was possible to characterize impacts and make a reasoned choice based on existing data.	Not applicable because not essential. Further, the missing info is not reasonably obtainable because of time constraints and cost, considering the broad area and number of communities involved. Mapping studies typically require more than one season.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	Subsistence study communities lacking long-term use area data include: Hughes and Huslia. All but three of the 42 WAH working group (WG) study communities (Fairbanks, Nome, and Koyukuk) have caribou harvest data available.	Missing data regarding Hughes and Huslia appears to be the same issue as above and is addressed above.	Missing data regarding Hughes and Huslia appears to be the same issue as above and is addressed above.	Missing data regarding Hughes and Huslia appears to be the same issue as above and is addressed above.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Socio	Twelve subsistence study communities are lacking updated comprehensive household harvest surveys in the last 5 years: Alatna, Allakaket, Ambler, Bettles, Coldfoot, Evansville, Huslia, Kobuk, Manley Hot Springs, Minto, Shungnak, and Wiseman. The community of Huslia has harvest data that are greater than 20 years old.	The missing info could be relevant to understanding use patterns and impacts to subsistence in the named communities, some of which are located near the alternatives and are particularly relevant.	The missing info is not essential to a choice among alternatives because information does exist for impacted communities, and BLM determined it was possible to characterize impacts and make a reasoned choice based on existing data.	Not applicable because not essential. Further, he missing info is not reasonably obtainable because of time constraints and cost, considering the broad area and number of communities involved. Comprehensive household harvest studies typically require more than one season.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	For WAH WG communities, the data gap assessment recommends updated caribou harvest surveys for communities lacking recent caribou harvest surveys (i.e., within the last 5 years). There are 28 WAH WG communities lacking recent caribou harvest surveys. Seven of these communities are within 50 miles of the project and are also being recommended for updated comprehensive household harvest surveys. The remaining 21 communities recommended for caribou-only harvest surveys are Atqasuk, Buckland, Elim, Fairbanks, Galena, Golovin, Kaltag, Kiana, Kivalina, Kotlik, Koyukuk, Noatak, Nome, Noorvik, Nulato, Shaktoolik, St. Michael, Unalakleet, and Wales.	The missing info could be relevant to understanding use patterns and impacts to subsistence in the named communities, some of which are located near the alternatives and are particularly relevant.	The missing info is not essential to a choice among alternatives because information does exist for virtually every community. BLM determined it was possible to characterize impacts and make a reasoned choice based on existing data	Not applicable because not essential. Further, missing info is not reasonably obtainable because of time constraints and cost, considering the broad area and number of communities involved. Comprehensive household harvest studies and caribou harvest studies typically require more than one season. Information does exist for virtually every community. BLM determined it was possible to characterize impacts and make a reasoned choice based on existing data	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	Prior to any workshops, existing sources of TK, including scoping testimony, should be reviewed for their relevance to the project so that they can be incorporated into the EIS.	Existing sources of traditional knowledge are not a data gap. They are important and were reviewed.	Existing sources of traditional knowledge are not a data gap. They are important and were reviewed.	Existing sources of traditional knowledge were obtainable. They are important and were reviewed and used. BLM also commissioned a workshop and engaged in government-to-government consultation to supplement existing information.	Traditional Knowledge subsections have been included in Mammals (3.3.4) and Subsistence (3.4.7) sections. Rural Lifestyle subsection has been added in Socioeconomics (3.4.5)	
Bio	Sufficient and up-to-date information on raptor nest locations, nesting habitat, and species assemblages for all alternatives. Consider aerial raptor nest surveys, following appropriate survey methods, within approximately 3.5 miles of all alternatives to provide commensurate data.	No, missing raptor data is not relevant to significant adverse impacts on birds. No rare raptors suspected to occur. Individual raptors could be affected, but population effect highly unlikely. Mitigation measures can influence final design and construction effort to protect raptors. No catastrophic impact expected.	No, raptor nest data not essential to choice among alternatives. Alternatives would be treated the same in terms of stipulations for bird protection.	Not applicable because not essential. However, field work for bird surveys over some 500 miles of alternatives would be cost and time intensive.	3.3.3	3.3.3

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Bio	The following recommendation was raised: migratory bird and/or breeding bird surveys be conducted for all alternatives throughout all major land cover types present, at a level of effort sufficient to complete an analysis of potential impacts to migratory birds in the EIS. This may be done prior to construction, but for the environmental analysis phase, a stipulation such as the following may suffice: all vegetation clearing and habitat disturbance should occur outside the nesting window.	No, bird nest survey data are not relevant to significant adverse impacts on birds. No rare birds suspected to occur. Individual birds could be affected but population effect highly unlikely. Stipulations can be used during final design and construction effort to protect individual bird nests. No catastrophic impact expected.	No, bird nest data not essential to choice among alternatives. Alternatives would be treated the same in terms of stipulations for bird protection.	Not applicable because not essential. However, field work for bird surveys over some 500 miles of alternatives would be cost and time intensive.	3.3.3	3.3.3
Bio	The Allakaket Tribal Council suggested that AIDEA collect additional data at fish spawning locations within the corridor before and after project construction.	Yes, fish spawning habitat data is relevant to potential impact on fish populations and by extension for subsistence because large accidental spills (e.g. tanker rollover, mine accident) could be toxic to fish and spawning beds and could catastrophically affect population.	No, additional data at fish spawning locations are not essential to choice among alternatives. All alternatives would have the same traffic and general risk of spill. Large toxic spills in water possible but unlikely. Data exists on salmon and sheefish spawning habitat in the project area. Refinement of data would be collected to support ADF&G permitting, which provides adequate protection.	Not applicable because not essential. However, field work for fish spawning in hundreds or even thousands of water crossings over some 500 miles of alternative alignments would be cost and time intensive.	3.3.2	3.3.2
Cultural	Historic aerial photographs, topographic maps, and high resolution LiDAR imagery should be examined to understand where areas of high archaeological potential may be located and to guide pedestrian field survey in the Project area.	Probability of archaeological sites could be relevant to helping understand likelihood of significant impact but would not be determinative.	No, not essential to choice among alternatives. All alternatives would be treated the same per the PA which provides a programmatic approach to complying with Section 106. Ground surveys would be undertaken. Design would avoid sites discovered wherever possible. Treatment of sites would be per PA. However, knowing more about general probability would be helpful in comparing alternatives. Studies for probability of historic sites have been undertaken.	Not applicable because not essential. However, the BLM did undertake studies for probability of historic properties.	probability modeling reported in 3.4.7	3.4.7
Socio	If a new borough forms within the project area, how might it impact the project? Conduct additional research to identify status of new borough.	A new borough is not part of the existing affected environment and is not reasonably foreseeable and therefore is not relevant.	NA	NA	NA	NA

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Phys	While there are some limited studies on the potential ranges of exposures to asbestos from driving or living near a gravel road with measurable amounts of asbestos in the gravel, and in asbestos found in fish and wildlife tissue, the lack of data about asbestos concentrations in the possible gravel sources along the alternative routes, means these are data gaps at this time.	Sufficient data is available to indicate that NOA occurs along all alternatives. The missing information about what is specifically in the proposed material sites could be relevant to understanding the likelihood of asbestos material being used in road construction and thus to the potential for health effects.	No, the missing information is not essential to a choice among alternatives. All alternatives are known to have NOA occurrences. AIDEA has stated it has identified approximately twice the gravel actually needed in order to be able to avoid NOA and has committed to following guidelines meant to avoid and minimize asbestos in road dust. All alternatives are treated the same on this topic, and material testing would occur during final design.	Not applicable because not essential. However, field work to sample more than 100 potential material sites would be cost and time prohibitive.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.
Socio	Use of asbestos-laden gravel is a concern, especially related to potential human health impacts. Gravel material source site identification should assess presence/absence of asbestos.	Sufficient data is available to indicate that NOA occurs along all alternatives. The missing information about what is specifically in the proposed material sites could be relevant to understanding the likelihood of asbestos material being used in road construction and thus to the potential for health effects.	No, the missing information is not essential to a choice among alternatives. All alternatives are known to have NOA occurrences. AIDEA has stated it has identified approximately twice the gravel actually needed in order to be able to avoid NOA and has committed to following guidelines meant to avoid and minimize asbestos in road dust. All alternatives are treated the same on this topic, and material testing would occur during final design.	Not applicable because not essential. However, field work to sample more than 100 potential material sites would be cost and time prohibitive. AIDEA has committed to testing materials as they move through the design phase and avoiding using materials at a level lower than State law allows.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.
Socio	The Alaska DHSS' technical guidance for Health Impact Assessments (HIAs) in Alaska (p.32) recommends the following key sources for health information: literature review for published public health studies; state public health surveillance (reportable illnesses, vital statistics, Alaska trauma registry, Health Facilities Data Reporting Program); tribal health databases (cancer registry, diabetes registry, trauma registry); hospital health records (Resource and Patient Management System, Cerner); and other sources of health-related information (uniform crime reports, family violence reporting community subsistence information system). This data has not been reviewed or obtained.	The information exists but needed to be compiled for the study area. The information is relevant to understanding health baseline and trends in the study area and may be relevant to determining health impacts.	The information was determined to be essential to a choice among alternatives.	The information exists and was obtainable and has been collected, and is summarized in a Health Impact Assessment completed for the project.	Health Impact Assessment and 'Public Health' sections of 3.4.5.	Health Impact Assessment and 'Public Health' sections of 3.4.5.

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Socio	Stakeholder engagement is another element that may need to be conducted as part of the HIA.	This is a procedural suggestion, not an identification of incomplete or unavailable information. Stakeholders were engaged and their comments considered through the EIS public scoping and comment period, government-to-government consultation and cooperating agency reviews. This item is not addressed further.			Health Impact Assessment and 'Public Health' sections of 3.4.5.	Health Impact Assessment and 'Public Health' sections of 3.4.5.
Socio	Numerous scoping comments identified the need for an HIA as well as address the concern for increased substance abuse and violence due to bringing in more drugs and alcohol. No project-specific public health data have been collected for the project.	The information exists but needed to be compiled for the study area. The information is relevant to understanding health baseline and trends in the study area and may be relevant to determining health impacts.	The information was determined to be essential to a choice among alternatives.	A Health Impact Assessment was completed which collected project area data and addressed these topics.	Health Impact Assessment and 'Public Health' sections of 3.4.5.	Health Impact Assessment and 'Public Health' sections of 3.4.5.
Socio	No known data on the relative risks of eating/drinking foods with asbestos. Investigate and consult with Agency for Toxic Substances and Disease Registry (ATSDR) and others.	The information could be relevant to health effects of asbestos-laden dust. Breathing asbestos is known to cause significant health effects in humans, but ingesting through food and drink is less known.	The information is not essential to a choice among alternatives. All alternatives are known to cross areas of NOA. AIDEA has stated it has identified approximately twice the gravel actually needed in order to be able to avoid NOA and has committed to following guidelines meant to avoid and minimize asbestos in road dust. All alternatives are treated the same on this topic, and material testing would occur during final design.	Not applicable because not essential. However, a Health Impact Assessment was completed and addressed asbestos. Asbestos also considered separately in the EIS based on existing information.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.
Phys	For future investigations of asbestos content of soils, rocks, and gravel, it is recommended to perform both an analysis that does not involve grinding/milling of the soils, such as the ASTM 7521 method, and a milling sample preparation technique, such as the draft CARB 435 method, be used to analyze soils for asbestos content.	Sufficient data is available to indicate that NOA occurs along all alternatives. The missing information about what is specifically in the proposed material sites could be relevant to understanding the likelihood of asbestos material being used in road construction and thus to the potential for health effects.	No, the missing information is not essential to a choice among alternatives. All alternatives are known to have NOA occurrences. AIDEA has stated it has identified approximately twice the gravel actually needed in order to be able to avoid NOA and has committed to following guidelines meant to avoid and minimize asbestos in road dust. All alternatives are treated the same on this topic, and material testing would occur during final design.	Not applicable because not essential. However, field work to sample more than 100 potential material sites would be cost and time exorbitant.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.

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Bio	The 2017 GIS data set, mapped by ABR, for the northern and southern corridors of Gates of the Arctic National Park and Preserve for Alternatives A and B, is needed to ensure these data are available for future assessment. Obtain data from ABR.	The data are available and may be generally relevant to understanding the type and extent of impact to the biological environment but may not be particularly relevant to the BLM's primary area of inquiry and would not cover Alternative C.	The missing information is not essential to a choice among alternatives. These data are refinements of DOWL wetland data. Obtaining wetland data is essential, particularly for the USACE responsibilities, but these particular data are not.	Not applicable because not essential. However, these specific data exist, and BLM obtained them and used them in the EIS. In addition, BLM acquired similar wetland data for the three current action alternatives in order to have comparable data for all. The information is included in the EIS.	3.3.1	3.3.1
Bio	The 2009 ABR report, An Ecological Land Survey and Landcover Map of the Arctic Network (Jorgenson et al. 2009), reports field data that includes geomorphological and soil classification. Data contained within the report would be useful as supplementary information for vegetation types in the vicinity of Alternatives A and B, which have sections of the route within these park boundaries. The geomorphological and detailed soil classification could be used as supplemental data to inform NWI and HGM mapping for these alternatives.	The data are available and may be generally relevant to understanding the type and extent of impact to the biological environment but may not be particularly relevant to the BLM's primary area of inquiry and would not cover Alternative C.	The missing information is not essential to a choice among alternatives, although they could be useful as supplementary information in the EIS. Obtaining wetland data is essential, particularly for the USACE responsibilities, but these particular data are not.	Not applicable because not essential. However, these specific data/studies exist and BLM has obtained the information and used it in the EIS. In addition, BLM acquired wetland data for the three current action alternatives in order to have comparable data for all. The information is included in the EIS.	3.3.1	3.3.1
Cumult	Obtain any mine-related air quality monitoring data to assess whether mine emissions would be great enough to affect regional air quality, or perhaps parks and other regional natural resources, through long-range transport of emissions. Monitoring data availability unknown at this time. Further investigation needed to identify and obtain any data. If not available, qualitative assessment will focus on emissions of existing mines, together with scale comparison of existing and potential new mines.	Mining air quality data from ADEC or other agencies is relevant to understanding the types of secondary impacts from mines. Given the assumed good natural air quality of the project area, it is unlikely the data would be relevant to significant air quality effects but would be helpful in understanding types and magnitude of impact.	The data are not essential to a choice among road alternatives, because all action alternatives would result in the same secondary mining activity and mining emissions, and because emissions are not likely to be significant except perhaps at the local mine area.	Not applicable because not essential. However, some comparable existing data are available, and the BLM has obtained it and included it in the EIS. Local air quality data is not available.	EIS 3.2.7, and Appendix D and Appendix H 3.3.7	EIS 3.2.7, and Appendix D and Appendix H 3.3.7
Phys	Available air quality data regarding existing mining operations in Alaska are likely quite limited, but some have been obtained in prior studies and can be obtained from ADEC. Determine availability of this kind of air quality data.	Mining air quality data from ADEC or other agencies is relevant to understanding the types of secondary impacts from mines. Given the assumed good natural air quality of the project area, it is unlikely the data would be relevant to truly significant air quality effects.	The data are not essential to a choice among road alternatives, because all action alternatives would result in the same secondary mining activity and mining emissions, and because emissions are not likely to be significant except perhaps at the local mine area.	Not applicable because not essential. However, some existing information is available, and the BLM has obtained it and included it in the EIS.	EIS 3.2.7, and Appendix H 3.3.7	EIS 3.2.7, and Appendix H 3.3.7

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Phys	Air quality data are needed to help assess baseline conditions. Obtain the most representative AQ data for rural, undeveloped locations in the region (e.g., Denali National Park monitoring data). Obtain any air quality monitoring data in close proximity to the Dalton Highway, to provide an indication of the project's potential operational AQ impacts. A recommendation was made to measure air quality along the Dalton Highway to provide baseline data and assess impacts, especially for fugitive dust. Model emissions for proposed road traffic.	Existing air quality data could be relevant to understanding patterns in the study area. However, significant AQ effects from the road project alone are highly unlikely. It is reasonable to assume good air quality in this undeveloped project area. Baseline air quality data is relevant but not necessary.	The baseline AQ data is not essential to a reasoned choice among alternatives, because it is reasonable to assume good baseline AQ in this undeveloped area. Dalton Highway air quality data could be a corollary to the proposed road but is not essential to a choice among alternatives. To the extent air quality data exists and is reasonably available, it should be obtained.	Not applicable because not essential. However, to the extent that existing data could be obtained without exorbitant cost or time, the BLM obtained it and used it in the EIS. The BLM modeled dust production for the alternatives. It was determined exorbitant in terms of time and cost to collect data specific to the Dalton Highway when it is plainly known that gravel roads cause dust and when it is possible to model without such a measurement.	3.27	3.2.7
Socio	Both harvest surveys and subsistence mapping studies can provide valuable baseline information for all 12 baseline indicators for an impact assessment.	Harvest surveys and subsistence mapping studies generally are relevant to understanding impacts to subsistence, because they define the affected environment	The information is essential to a reasoned choice between No Action and any action alternative. Impacts to subsistence are likely to be similar in nature but to affect different communities.	Existing obtainable harvest surveys and subsistence mapping studies from ADF&G and other studies have been obtained and used in the EIS and are adequate for a choice among alternatives.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	A data gap exists regarding current levels of competition that occur between local and outside hunters and an analysis of ADF&G's Wildlife Harvest Ticket Database can characterize existing levels of competition near project alternatives related to land mammal harvests.	The harvest ticket data may be relevant to understanding who is harvesting wildlife in the project area currently. It is unlikely this would directly address significant impacts to hunters from the project but would help establish the current situation/affected environment.	The harvest ticket data are not essential to a choice among alternatives because the road will not be open to the public and thus a major increase in outside hunting pressure is not anticipated. It is clear from scoping that there is concern about competition for resources and that it applies to all alternatives equally.	Not applicable because not essential. Competition data also appear in other sources, including subsistence surveys. It is possible to address competition without these data.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Socio	Household harvest surveys are most useful for documenting baseline conditions related to resource use, and availability and assessing changes to harvests over time, if the community has harvest surveys available for more than 1 year.	Household harvest surveys generally are relevant to understanding impacts to subsistence, because they define the affected environment	The information is essential to a reasoned choice, but mostly between No Action and any action alternative. Impacts to subsistence are likely to be similar in nature but to affect different communities.	The existing obtainable household harvest survey data from ADF&G have been obtained and included in the EIS, along with other studies that did not require exorbitant investment of time or cost.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7

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Bio	Data gap: locations of spawning and rearing habitat for Koyukuk River Chinook salmon (Stock of Concern) within the proposed corridors. Consider acquiring or developing EIS-level data to identify spawning and rearing areas to address ADF&G's scoping comment/issue of concern.	The data likely are relevant to understanding Chinook salmon, although the likelihood of significant adverse impacts is relatively low.	The missing information is not essential to a choice among alternatives. All alternatives would cross salmon streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. The BLM has obtained readily available existing data and included it in the EIS. BLM also held a workshop with subject matter experts from state and federal agencies to discuss the available data.	3.3.2	3.3.2
Bio	Chum data gap per ADF&G's scoping comment. The ADF&G stated that while data indicate the Koyukuk River may be the largest single contributor to the summer chum salmon run on the Yukon River and these fish regularly enter the John River, other rivers within the proposed (Dalton Highway) road corridor have not been consistently monitored.	The data likely are relevant to understanding Chum salmon, although the likelihood of significant adverse impacts is low.	The missing information is not essential to a choice among alternatives. All alternatives would cross salmon streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. Any readily obtainable existing data has been obtained and included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2
Bio	Data gap: lack of detailed salmon spawning and rearing areas for several streams along Dalton Highway corridors (per ADF&G's scoping comment). ADF&G recommends AIDEA identify spawning and rearing habitat for salmon throughout streams within the proposed corridors, with an emphasis on Koyukuk River Chinook salmon.	The data likely are relevant to understanding Chinook and other salmon, although the likelihood of significant adverse impacts is low.	The missing information is not essential to a choice among alternatives. All alternatives would cross salmon streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. Any readily obtainable existing data has been obtained and included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2

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Bio	Data gap: lack of detailed salmon spawning and rearing areas for several streams along all project alternatives (ADF&G Issue of Concern). ADF&G recommends AIDEA identify spawning and rearing habitat for salmon throughout proposed corridors.	The data likely are relevant to understanding other salmon, although the likelihood of significant adverse impacts is low.	The missing information is not essential to a choice among alternatives. All alternatives would cross salmon streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. Any readily obtainable existing data has been obtained and is included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2
Bio	In order for the NEPA analysis to address comments received during scoping, additional data that identify specific salmon spawning and rearing areas, spawning areas for sheefish and whitefish species, and suitable winter habitat may be necessary.	The data likely are relevant to understanding salmon, sheefish, and whitefish, although the likelihood of significant adverse impacts is low. xyz	The missing information is not essential to a choice among alternatives. All alternatives would cross fish streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. Any readily obtainable existing data has been obtained and is included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2
Bio	Based on the lack of data in the Alaska Freshwater Fish Inventory (AFFI) dataset, it appears that fish sampling has not been recently conducted in the streams along the Alternative C corridors. However, further coordination with ADF&G would be necessary to confirm. According to ADF&G during the 7/10/18 Cooperating Agency meeting, ADF&G conducted fieldwork this summer. Need to inquire with ADF&G about this data.	The data likely are relevant to understanding fish, although the likelihood of significant adverse impacts is low. [Note that this comment is about existing data and does NOT appear to be suggesting development of original data]	The missing information is not essential to a choice among alternatives. All alternatives would cross fish streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. However, any readily obtainable existing ADF&G data has been obtained and is included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2

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Bio	While some salmon spawning location data appear to be available, locations of salmon spawning areas do not appear to be available for streams within all project corridors.	The data likely are relevant to understanding salmon, although the likelihood of catastrophic adverse impacts is low.	The missing information is not essential to a choice among alternatives. All alternatives would cross salmon streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. Fieldwork on hundreds of streams would be exorbitant in terms of time and cost. Any readily obtainable existing data has been obtained and is included in the EIS. Additional data will be collected during permitting, which will provide the design level details necessary to adequately mitigate for potential fish impacts.	3.3.2	3.3.2
Phys	Other than the alternative routes, the proposed mining developments have the most potential for effects on air quality, and can be qualitatively assessed by comparison with any similar mines in far northern latitudes (see cumulative impacts in Section 6). Obtain air quality data from other similar mines in far northern latitude.	The data are relevant to understanding the indirect AQ impacts of mines but not relevant to the direct AQ impacts of the road, because the proposed (road) action would not result directly in mining emissions.	The missing information, or other similar information, is essential to a choice between No Action and any action alternative but is not essential to a choice among action alternatives, because all alternatives would result in the same mining development.	AQ data on similar mines at northern latitudes exists and is obtainable. Other EIS documents describing mining related impacts were collected. Enough existing data has been obtained to reasonably complete the EIS and make a reasoned choice among alternatives.	Appendix H, 3.3.7	Appendix H, 3.3.7
Bio	Data from collared caribou would be invaluable for predicting seasonal range use, relative densities, distribution, and migration routes of the Western Arctic Caribou Herd (WAH) in the absence of empirical field studies. Collar data can be used to predict movement at a finer scale than is presented in ADF&G range maps. Access to these data and correct interpretation of the data would require close coordination with ADF&G, NPS, and USGS researchers.	Collared caribou data is relevant to potentially significant impacts to caribou from the road and its traffic, because it would help define patterns of movement, at least in the year(s) studied.	The data are not essential to a choice among alternatives but are assumed to be informational. Enough is known about caribou behavior from other existing studies to predict impacts without these data.	The BLM has obtained available data about collared caribou from relevant agencies and included the information in the EIS.	EIS 3.3.4; Appendix H 3.4.4.	EIS 3.3.4; Appendix H 3.4.4.
Socio	Recreation visitor numbers within the project area are not currently contained within project files. Inquire with state and federal land management agencies (ADF&G, DNR, BLM, USFWS, and NPS) regarding visitation numbers for the project area. It is expected that the federal conservation system units will have decent coverage of visitor statistics.	Recreation visitor numbers are relevant to better understanding of the scope of use in the area and of potential significant impacts but may not be relevant to the occurrence of impacts.	The data are not essential to a choice among alternatives but would be informative, to the extent they are available. Other information is available to adequately explain and assess the potential for impacts to recreation among the alternatives. Existing user data are not essential.	Existing data were available within BLM and from NPS and have been obtained and included in the EIS.	3.4.3	3.4.3

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Bio	Data gap: data on fine-scale movement of large mammals across alternatives. Consider terrain modeling to identify probable wildlife movement and use areas. Identify specific issues of concern that cannot be adequately addressed with caribou collar data (or existing data for other species) and work with wildlife management agencies (BLM, ADF&G, NPS, USFWS) to develop approaches for use in EIS evaluation.	Terrain modeling/modeling of paths of least resistance for large mammals likely is not relevant for determining impacts of the action alternative. It is likely sufficient information is available on mammal behavior to assess impacts without understanding the nuances of the effects of terrain adjacent to these specific alternatives.	The missing information is not essential to a choice among alternatives. It is reasonable to assume that all alternatives cross wildlife movement corridors and that there will be impacts.	Not applicable because not essential. Modeling of terrain and habitat type is possible where sufficient terrain and habitat data are available. Such data may not be suitably refined for the project area. Even if it were, modeling wildlife movement over hundreds of miles of the alternatives would be exorbitant in terms of time and cost.	EIS 3.3.4; Appendix H 3.4.4.	EIS 3.3.4; Appendix H 3.4.4.
Bio	Gap: data on caribou distribution and movement. Obtain access to ADF&G and NPS collar data. If collar data from ADF&G is not available, formal interviews with key ADF&G staff could be done with the goal of being able to map general seasonal movements, key habitats and mountain passes, funneling points, etc. Work with experienced caribou researchers to accurately analyze and interpret data. Obtain summer range caribou data and other habitat sets from BLM.	Collared caribou data are relevant to potentially significant impacts to caribou from the road and its traffic, because such data would help define patterns of movement, at least in the year(s) studied.	The data are not essential to a choice among alternatives but are assumed to be informative. These data are not essential because enough is known about caribou behavior from other existing studies to predict impacts without these data.	The BLM has obtained available data about collared caribou from relevant agencies and included it in the EIS.	EIS 3.3.4; Appendix H 3.4.4.	EIS 3.3.4; Appendix H 3.4.4.
Bio	Review and evaluation of monitoring, peer-reviewed reports, and other related data pertaining to invasive species, sensitive species, and vital wildlife habitats. Literature review. Review non-native plant species data points for invasive plans can be downloaded from AKEPIC. The BLM and NPS have a NISMs database for invasive plant species that may include more than points. Action items: obtain NISM data from NPS and BLM; review the 2013 Alaska Rare Plant Guide; submit a request for rare plant occurrences data from the Alaska Natural Heritage Program (or have BLM make the request); review the 2010 BLM Alaska Special Status Plant and Animal Species List. (see: https://www.nps.gov/gaar/learn/nature/published-research.htm and https://science.nature.nps.gov/im/units/arcn/Monitoring.cfm)	Data/literature about occurrences of invasive species, sensitive species, rare species, and important habitats is relevant to understanding these species and wildlife habitat, although the likelihood of significant impacts is low. Such data/literature exist.	Data/literature about occurrences of invasive species, sensitive species, rare species, and important habitats are essential to establishing what is known about the study area vegetation and, although not expected, could be essential to a choice among alternatives (e.g., if one alternative affected multiple sensitive areas and another affected few or none).	Data/literature about occurrences of invasive species, sensitive species, rare species, and important habitats from agencies and in literature have been obtained and are included in the EIS.	Principally 3.3.1	Principally 3.3.1

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Socio	For Alternative A, a review of land records should be conducted to see if updates have occurred since their 2016 query and to further review the land status of parcels identified as needing further research.	Land records could be relevant to understanding affected land ownership and land management, which could have significant effects, although significant effects are expected to be minimal. Differences since 2016 are expected to be very minor.	Land records information could be essential to a choice among alternatives, if they pointed out substantially greater impacts of one alternative over another.	Up to date general land record information is readily obtainable without exorbitant cost or time, and the BLM has obtained it and included in in the EIS.	Principally 3.4.1.	Principally 3.4.1.
Socio	Scoping comments requested identifying land ownership of potential material sites. (AIDEA's application does not indicate ownership on the list of 41 potential material sites for Alternative A). Ensure land ownership is researched for identified potential material sites.	Land ownership at identified material sites is not relevant to significant adverse impacts but is an issue of concern especially for private parcels where a material site would preclude other desired uses.	The information could be essential to a choice among alternatives, because it could indicate likelihood for conflicts with intent for the land. However, (1) the likelihood is low (most land is public); and (2) short of interviewing every land owner, conflicts would not be known for sure anyway.	Land ownership by category (state, federal, native corporation, private) was readily obtainable without exorbitant cost or time and was acquired and used in the EIS. The information obtained is adequate for discussing land ownership impacts to public and private lands.	Principally 3.4.1.	Principally 3.4.1.
Socio	State and federal land management agencies have GIS layers from their management planning efforts. Obtain GIS resource data and layers from state and federal agencies.	Data on land management in the project area could be relevant to significant adverse impacts because it could point out conflicts between management intent and the proposed action.	The information could be essential to a choice among alternatives, because it could indicate likelihood for conflicts with intent for the land.	Land management information is readily available in land use plans and was generally available in GIS data. These sources have been obtained and used in the EIS.	Principally 3.4.1.	Principally 3.4.1.
Phys	Meteorological data are needed to describe existing conditions in the project area, as well as trends in recent decades. Search for and obtain online, any agency (state, federal) and private meteorological data sets for analysis.	Raw meteorological data could be relevant to understanding the weather and climate of the project area but are not highly relevant to identifying significant impacts. That is, significant impacts to weather and climate are highly unlikely to be caused directly by the project. The influence of weather and climate on the project and other resources is relevant information. Baseline data could be relevant to air quality modeling efforts if undertaken. Wind data could be relevant to predicting distribution of road dust and other pollutants.	Data sets (raw data for analysis) are not essential to a choice among alternatives. Existing weather and climate summaries are adequate and even then are not essential to a choice among alternatives, because the project is not expected to have any significant effect on local weather and climate.	Not applicable because not essential. However, weather and climate summaries are readily obtainable without exorbitant time or cost, and the BLM has obtained them and used them in the EIS. Raw data sets for analysis need not be acquired and are not readily available for the specific project area. Such data would be exorbitant in terms of time and cost to collect in the field. Analysis of any raw data readily available would be time- and cost-intensive and is not warranted.	3.2.7	3.2.7

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Bio	During the review of the draft data gap report, the Allakaket Tribal Council stated more data on fishing and spawning sites would be available through a Data Sharing Agreement. Obtain data from Allakaket Tribal Council.	The data likely are relevant to understanding fish, although the likelihood of catastrophic adverse impacts is relatively low.	The missing information is not essential to a choice among alternatives. All alternatives would cross fish streams, and protections for fish would be built in to any action alternative equally via stipulations in the ROD, and these are assumed to include further field data gathering for stream characteristics (including fish surveys) for the selected alternative during design.	Not applicable because not essential. However, this information is readily obtainable. Where relevant, the BLM has obtained existing information from cooperating agencies like the Allakaket Tribal Council and included the information in the EIS.	3.3.2	3.3.2
Bio	The Alaska Natural Heritage Program should be contacted to request any updated information on rare plant species, which may not be provided in the 2013 field guide.	Data about occurrences of rare species is relevant to understanding these species, although the likelihood of significant impacts is considered low.	The missing information is essential to establishing what is known about the study area vegetation and, although not expected to be significantly impacted, could be essential to a choice among alternatives (e.g., if one alternative affected multiple sensitive areas and another affected few or none).	Obtaining existing rare plant information is not exorbitant in terms of cost or time, and the information has been obtained and included in the EIS.	Principally 3.3.1	Principally 3.3.1
Cumult	Obtain information on scale (raw ore processing rates, mineral production rates) and types of minerals for likely mine developments. Compare with existing mines (and annual emissions potential) in Alaska or northern Canada to develop order-of-magnitude projections of potential emissions. Emissions data should be available in ADEC databases or annual company submittals.	The scale and types of mining operations expected are relevant to determining the secondary and cumulative impacts of the mines. Mining AQ data is also is relevant to understanding the types of secondary impacts from mines. Mine impacts in total could be significant, although air quality impacts are less likely to be significant because the baseline is assumed good air quality.	The data are not essential to a choice among road alternatives, because all action alternatives would result in the same secondary mining activity and mining emissions, and because emissions are not likely to be significant except perhaps at the local mine area. However, the data generally are essential to understanding mine operations and a suite of impacts, some of which may be significant.	Not applicable because not essential. However, information on similar mines is available and has been collected. Limited data exist about the prospects in the Ambler Mining District, but the existing information has been collected. The BLM developed a reasonably foreseeable development scenario specific to the Ambler Mining District to help supplement the data.	Appendix H 2.1; specific to mine air quality, EIS 3.2.7, and Appendix H 3.3.7.	Appendix H 2.1; specific to mine air quality, EIS 3.2.7, and Appendix H 3.3.7.

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Socio	Scoping comments included concerns on impacts to recreation. Recreation data are not currently contained within project files. Obtain BLM recreation inventory and determine if additional information is needed to assess recreation impacts. Inquire with other agencies for similar information. Review data and determine whether additional outreach is needed to determine recreation values within the study area.	This comment identified a need to collect general recreation information in order to assess impacts. Recreation visitor numbers and use patterns are relevant to better understanding of the scope of use in the area and of potential significant impacts but may not be relevant to determining whether or not impacts will occur.	The data are essential to a choice among alternatives, because different alternatives could differently affect areas used recreationally.	Existing data were obtainable within BLM and from NPS for lands under their management and for the Dalton Highway corridor, Other data about area recreational use also were found. These data were not exorbitant to obtain in terms of cost or time, and the BLM has obtained this information, found them adequate to make a choice among alternatives, and used the data in the EIS.	3.4.3	3.4.3
Socio	Scoping comments state that visitor and resident land use motivations/recreations are under-documented. Such data might include hunting (total number of commercially supported hunters; number of permitted guides; determining access by plane, boat or foot); total number of commercial operators; backcountry service locations; and number of sightseeing tour operators. Inquire with state and federal land management agencies (ADF&G, DNR, BLM, USFWS, and NPS) regarding visitation numbers for the project area.	Recreation visitor numbers and use patterns are relevant to better understanding of the scope of use in the area and of potential significant impacts but may not be relevant to determining whether or not impacts will occur.	The data regarding numbers of users such as those specifically listed are not essential to a choice among alternatives but would be informational, to the extent they are available. The general types and patterns of recreational use are essential, and information about types and patterns of use are available.	Obtaining the data regarding numbers of users such as those specifically listed is not applicable because it not essential. However, existing information is obtainable within some agencies (particularly federal agencies) and in other recreation information. These data have been obtained, found to be adequate to make a choice among alternatives, and used in the EIS.	3.4.3	3.4.3
Socio	A land records search has not been conducted for Alternatives B and C. Therefore, the previous land ownership/status search results are incomplete and are identified as a data gap. For Alternative A, updated land ownership data is needed. For all other alternatives, a full review of land ownership is needed. Research land ownership records as part of the development of the affected environment analysis effort.	Land records could be relevant to understanding affected land ownership and land management, which could have significant effects, although significant effects are not reasonably foreseen.	Land records information could be essential to a choice among alternatives, if they pointed out substantially greater impacts of one alternative over another.	General land record information is readily obtainable without exorbitant cost of time, and the BLM has obtained it and used in in the EIS.	Principally 3.4.1.	Principally 3.4.1.

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Socio	The BLM Manual 6310–Conducting Wilderness Characteristics Inventory on BLM Lands (Public) states that if the public or the BLM identifies wilderness characteristics as an issue during the NEPA process, the BLM will consider whether to update a wilderness characteristics inventory or conduct one for the first time.	A wilderness characteristics inventory exists for most or all BLM lands in the study area and for some lands not managed by the BLM. This information is relevant to understanding the affected environment and the types of impacts that may occur to people using the environment, but the land is not managed to protect its wilderness characteristics except in GAAR, so significant impacts as a land management topic are not anticipated.	The information is not essential to a choice among alternatives. As a mostly undeveloped area, much of the study area can be reasonably assumed to have wilderness characteristics.	Not applicable because not essential. However, a BLM inventory exists, and the BLM has used it in the EIS.	3.4.1 (land) and 3.4.3 (recreation)	3.4.1 (land) and 3.4.3 (recreation)
Socio	Scoping comments included concerns on impacts to wilderness and wilderness characteristics. Wilderness characteristics information is not currently contained within project files. The Central Yukon RMP wilderness characteristics inventory covers BLM lands off the Dalton Highway. The Kobuk Seward Peninsula RMP (September 2008) may or may not have conducted a wilderness inventory that would have covered the lands near the Ambler Mining District. Need to determine status and coverage of existing wilderness characteristics documentation and determine what BLM will require for analysis in the EIS.	A wilderness characteristics inventory exists for most or all BLM lands in the study area and for some lands not managed by the BLM. This information is relevant to understanding the affected environment and the types of impacts that may occur to people using the environment, but the land is not managed to protect its wilderness characteristics except in GAAR, so catastrophic impacts as a land management topic are not anticipated.	The information is not essential to a choice among alternatives. As a mostly undeveloped area, much of the study area can be reasonably assumed to have wilderness characteristics.	Not applicable because not essential. However, a BLM inventory exists, and the BLM has used it in the EIS.	3.4.1 (land) and 3.4.3 (recreation)	3.4.1 (land) and 3.4.3 (recreation)
Socio	Scoping comments included concerns about visual impacts. Some project-specific visual impacts analysis has occurred (for Gates of the Arctic), though baseline visual data do not exist for the full project area. Without these data and a means to assess changes in the regional viewscape, there is no way to assess visual impacts. Obtain BLM Visual Resource Inventory and determine if additional information is needed to assess recreation impacts. Inquire with other agencies for similar information.	The information is relevant to visual impact and recreation impact assessment, but the project is mostly about the difference between having no development and having road development. A substantial visual change is expected and formal assessment is not needed to make this determination.	The information is not essential to choice among alternatives. All alternatives would create a dramatic visual change in an almost-entirely natural visual environment. The NPS visual analysis is sufficient as a proxy for other parts of the project area.	Not applicable because not essential. Existing data, however, such as the NPS visual analysis, exists and is obtainable without unreasonable cost or expenditure of time. The BLM has acquired it and used it in the EIS. Completing new field work via helicopter throughout some 500 miles of alignments would be exorbitant in terms of time and cost without adding substantially to the knowledge base.	3.4.4	3.4.4

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Socio	Public comments identified a concern for the project impact on area viewsheds, including and beyond national parkland boundaries. This would require performing a visual resource inventory along the alignments and evaluating impacts at key observation points.	The information is relevant to visual impact and recreation impact assessment, but the project is mostly about the difference between having no development and having road development. A substantial visual change is expected and formal assessment is not needed to make this determination.	The information is not essential to choice among alternatives. All alternatives would create a dramatic visual change in an almost-entirely natural visual environment. The NPS visual analysis is sufficient as a go-by and proxy for other parts of the project area.	Not applicable because not essential. Existing data, such as the NPS visual analysis, exists and is obtainable without unreasonable cost or expenditure of time. The BLM has acquired it and used it in the EIS. Completing new field work via helicopter throughout some 500 miles of alignments would be exorbitant in terms of time and cost without adding substantially to the knowledge base.	3.4.4	3.4.4
Socio	Past or draft visual resource management maps for the eastern half of the project would be needed to consistently evaluate lands for all alternatives.	Visual Resource Inventory and Visual Resource Management mapping is relevant to understanding how the project may affect management of the visual resource but not necessarily relevant to whether there would be catastrophic visual impacts.	The VRI and VRM mapping is not essential to a choice among alternatives, but it provides good context for discussion of visual impacts and management direction.	Not applicable because not essential. VRI and VRM exist for the eastern portion of the project area, and are easy to obtain. The BLM used this information in the EIS. Where such data do not exist, management has not been determined and would require a formal planning process by BLM. This is not considered reasonable for completing an EIS.	3.4.4	3.4.4
Cumult	Ecological impacts of changes in fire suppression strategy (whether it's from better access to the area, routine use of the road as a line of defense, reduction in natural fire size, or increased fire starts due to increased human activity.) Ability to use existing data and models to simulate is unknown at this time.	Simulation of fire suppression data and models is one methodology of assessing the impact of the project on the agency and ecology related to changes in the fire regime.	Simulation of fire suppression strategy is not essential to a choice among alternatives. All alternatives would affect fire patterns and fire suppression. Qualitative discussion of fire and fire suppression has been determined adequate for the EIS.	Not applicable because not essential. Creating new data through modeling and simulation could be done, but costs and time would be exorbitant considering the extent of the project area and unknowns regarding usefulness of existing data and models.	3.3.1	3.3.1
Socio	BLM's land administrator GIS dated October 2017 may be outdated. The BLM indicated during a review of the draft data gap report they have an updated land administrator dataset and State & Native selections. BLM said they can also provide Native allotments as standalone datasets. BLM also indicated they have an AFS dataset that has additional information on allotments and whether they have been further subdivided or sold. Obtain GIS layers from BLM.	Land records could be relevant to understanding affected land ownership and land management, which could have significant effects, although significant effects are expected to be minimal.	Land records information could be essential to a choice among alternatives, if they pointed out substantially greater impacts of one alternative over another.	Current general land record information is readily obtainable without exorbitant cost of time, and the BLM has obtained it and used it in the EIS.	Principally 3.4.1.	Principally 3.4.1.

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Socio	BLM's Central Yukon RMP effort covers the eastern and southeastern portion of the Ambler Road study area. BLM has a number of resource maps on its ePlanning website that include topics such as recreation, aquatic resource value model, and wildlife species. Obtain GIS layers and resource data from BLM.	Land management data could be relevant to understanding affected environment in multiple categories, some of which could have significant effects.	GIS land management data could be essential to a choice among alternatives, if they pointed out substantially greater impacts of one alternative over another.	GIS land management data is generally available within BLM, and BLM has used it in the EIS.	Volume 4 Maps, and multiple EIS sections.	Volume 4 Maps, and multiple EIS sections.
Bio	The 2010 BLM Alaska Special Status Plant and Animal Species List provides a list of sensitive species within the state. This data would be useful to understand what sensitive plants species may occur within the vicinity of the proposed alternatives as well as to assess potential impacts to those species.	Data about occurrences of special status species is relevant to understanding these species, although the likelihood of significant impacts is considered low.	The missing information is essential to establishing what is known about the study area and its species and, although not expected, could be essential to a choice among alternatives (e.g., if one alternative affected multiple sensitive areas and another affected few or none).	Existing information on special status species is available, and the BLM has acquired and used it in the EIS.	3.3	3.3
Cumult	Data has not been collected to cover analysis of the impact to the overall landscape condition. Obtain data from the BLM.	The Analysis of the Management Situation by BLM (2016) is a valuable source of existing condition information that has information relevant to putting impact analysis in context.	The missing information is essential to establishing what is known about the study area and would be essential to a reasoned choice among alternatives.	Analysis of the Management Situation by BLM (2016) was obtained and used in the EIS.		
Cumult	There is a body of literature on landscape fragmentation, and a few data sets around, but nothing specific to this project. Some data sets compiled for the Central Yukon RMP on landscape connectivity and ecological integrity are available through BLM, but they won't cover portions of the Ambler road project. The Northwest Boreal LCC has funded more extensive work and may be able to provide relevant data.	Information on landscape fragmentation specific to the study area may be relevant to impacts to ecological integrity. As a 'first road' into the study area, impacts are likely and a certain level of fragmentation assured, but significant/ catastrophic effects to ecological integrity are not expected from a single road with relatively low traffic levels.	The information is not essential to a choice among action alternatives. Any of the action alternatives would create similar fragmentation impacts, and all would be treated the same in terms of stipulations to protect ecological integrity.	Not applicable because not essential.		

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Phys	Because "surficial deposits" are necessary for road bed materials, as well as being the preferred substrate for the routes, the majority of the alternate routes are placed along surficial deposits. This results in a large data gap from having little to no available information regarding whether or not there are significant concentrations of asbestos in the sand or gravel along the routes. Limited site-specific information on material with NOA. Understanding how far NOA has spread from their original bedrock sources into surficial deposits would be useful for minimizing route exposure and impacts from the material. A potential resolution of this data gap would be examining maps or other information that show the direction and limits of glaciers that would have distributed the material, and comparing to the DGGS map of asbestos presence (Solie and Athey 2015). Also, suggest augmenting existing maps to estimate NOA presence in surficial deposits using glacier maps (if available).	Sufficient data is available to indicate that NOA occurs along all alternatives. The missing information about what is specifically in the individual proposed material sites or in other surficial deposits could be relevant to understanding the likelihood of asbestos material being used in road construction and thus to the potential for health effects.	No, the missing information is not essential to a choice among alternatives. All alternatives are known to have NOA occurrences. AIDEA has stated it has identified approximately twice the gravel actually needed in order to be able to avoid NOA and has committed to following DOT&PF guidelines meant to avoid and minimize asbestos in road dust. All alternatives are treated the same on this topic, and material testing would occur during final design.	Not applicable because not essential. However, the work needed to create a model for transport of material from bedrock sources to existing surficial deposits would be costly and time intensive and not likely dependably accurate.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.	3.2.1, 3.2.2, 3.2.3, 3.2.7, 3.3 in general, 3.4.5, 3.4.6, and 3.4.7. Also Health Impact Assessment.
Socio	The SOA scoping letter requested continued public use of impacted RS2477 routes. Scoping comments mentioned the need to consider old trap line/mushing trails and guarantee continued public access to areas. Obtain GIS layer from DNR.	GIS trail and RS2477 and easement data in general is relevant to understanding potential impacts to public access routes and general off-road transportation in the project area. Impact have potential to be significant to those using the routes but would not result in catastrophic consequences.	The GIS data would be helpful in creating the best knowledge base about the project area and these issues. The alternatives are expected to be treated similarly regarding trails/easements in that allowances would be needed to ensure continued use across the proposed road, so the data likely is not essential to making a choice among alternatives	The information exists, is available, and has been obtained and used in the EIS.	3.4.2; vol. 4, Maps	3.4.2; Vol. 4, Maps
Phys	Given the gravel surface and the likelihood that construction techniques would be similar to those of the Dalton Highway, and given that there has been measurable warming in northern Alaska in recent decades, it will be important to assess whether permafrost changes or other climate-related changes may have caused either improvement or degradation in the Dalton Highway function and in maintenance needs over a several-decade period of measured warming in northern Alaska.	Information about the Dalton Highway is not relevant to understanding effects of climate change/permafrost thawing on the proposed road. The effects are well documented in literature without collecting the maintenance records.	The missing information is not essential to a choice among alternatives, because all alternatives in general would traverse permafrost areas. It would be the responsibility of the applicant to keep the road maintained to a useable level or close it.	Not applicable because not essential.	3.2.1	3.2.1

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Phys	For assessing the role of climate change on gravel road maintenance and sustainability, maintenance and cost trend data will be requested for the Dalton Highway to assess whether maintenance costs have been potentially affected by measured warming in northern Alaska, which has been occurring since approximately the opening of the Dalton Highway in the 1970s. The quality and consistency of any such maintenance and cost data are unknown at this time, pending further investigation.	The requested information about the Dalton Highway is not relevant to understanding effects of climate change/permafrost thawing on the proposed road. The effects are well documented in literature without collecting the maintenance records.	The missing information is not essential to a choice among alternatives, because all alternatives in general would traverse permafrost areas. Standard engineering practices are expected to enable construction of the road in the arctic environment. It would be the responsibility of the applicant to keep the road maintained to a useable level or close it.	Not applicable because not essential.	3.2.1	3.2.1
Bio	Data gap: methods associated with development of DOWL's "Assumed Anadromous Streams" GIS file (2012 April Summary Report Data). Request DOWL provide additional data relative to methods if assumptions should be extended to other alternatives analyzed for NEPA.	Assumed anadromous fish streams data are relevant to addressing impacts on fish passage and fish habitat, which could be significant if the project is not done well.	The missing data are essential to treating Alternative C the same as A and B and therefore are essential to a choice among alternatives.	The BLM required the applicant to provide a similar level of information about assumed anadromous fish streams for Alt C as provided for A and B, and this was obtained and used in the EIS.	3.3.2	3.3.2
Socio	During a review of the draft data gap report, it was identified that GIS data regarding lifetime subsistence use for interior Athabascan communities has been produced by Dr. Annette Watson. It is not clear if this is available nor has it been reviewed.	Additional subsistence use data for study area communities are relevant to determining subsistence impacts, which have potential to be significant. Impacting subsistence resource uses and access to resources could be significant culturally and in terms of food/health.	The subsistence use data would supplement other sources of data (e.g., ADF&G) and therefore are not essential to a choice among alternatives.	This information is available, and BLM obtained it and used it in the EIS.	Appendix L Subsistence Technical Report; EIS 3.4.7	Appendix L Subsistence Technical Report; EIS 3.4.7
Bio	It is possible that focused wood frog surveys could be conducted through field surveys, eDNA analysis (Spangler et al. 2017), and/or remote acoustic recordings (ABR 2015b). Consultation with nongame wildlife managers regarding wood frogs should be conducted to determine if focused surveys are warranted or feasible.	Data regarding wood frog presence is relevant primarily to assessing impacts to wood frogs. Wood frogs are considered to be widespread in the study area, and no significant impacts to wood frog populations are expected.	Data regarding wood frog presence are not essential to a choice among alternatives. All alternatives traverse wood frog habitat and would affect that habitat but none would be expected to threaten wood frog populations. Stipulations to protect aquatic life would be equally applied to all action alternatives.	Not applicable because not essential. Field work to assess wood frog presence would entail exorbitant cost and investment of time, given the broad extent of aquatic habitats across the project area. NPS GAAR wood frog information has been acquired and referenced for the EIS. Available, vegetation mapping data was collected and used to evaluate impacts in the EIS.	3.3.2	3.3.2

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Phys	Limited baseline noise data exist. Without these data and a means to assess noise propagation through the environment, baseline assumptions from data collected elsewhere would need to be accepted to assess the level of impacts from noise. Recommend consideration of a qualitative noise impact analyses using data available from Gates of the Arctic. Agencies may require individual inventories, collecting field data in both summer and winter according to protocols agreed upon by the BLM and participating agencies.	Baseline sound level data are relevant to understanding the potential for noise impacts. Given the status of the project area as almost entirely undeveloped, the main impact is likely to be presence vs. absence of road noise and to be an important impact on that basis rather than a quantified change basis.	Sound level data are not essential to a choice among alternatives, because all alternatives would create new road noise where currently there are few human-caused noises. All alternatives would operate similarly with similar traffic levels and thus similar noise levels.	Not applicable because not essential. However, NPS sound level data were obtained and used in the EIS. Gathering new baseline data in the field over some 500 miles of alternatives and an expansive project area was judged exorbitant in cost and time investment and not pursued. The NPS data works as a proxy for other undeveloped portions of the study area.	3.2.6	3.2.6
Phys	It may be sufficient to use Gates of the Arctic noise measurement data to qualitatively characterize the existing noise environment along all the alternatives.	Baseline sound level data are relevant to understanding the potential for noise impacts. Given the status of the project area as almost entirely undeveloped, the main impact is likely to be presence vs. absence of road noise and to be an important impact on that basis rather than a quantified change basis.	Sound level data are not essential to a choice among alternatives, because all alternatives would create new road noise where currently there are few human-caused noises. All alternatives would operate similarly with similar traffic levels and thus similar noise levels.	NPS sound level data were obtained and included in the EIS. Gathering new data in the field over some 500 miles of alternatives and an expansive project area was judged exorbitant in cost and time investment and not pursued. The NPS data works as a proxy for other undeveloped portions of the study area, and NPS modeling was extended the length of each alternative.	3.2.6	3.2.6
Bio	The 2009 Land Cover Mapping, Arctic Park Network (Jorgenson et al. 2009), GIS coverage with associated metadata is not available at this time and is therefore identified as a data gap. Obtain data from NPS.	Land cover mapping is relevant to understanding the mosaic of vegetation types but may not be relevant to any significant or catastrophic impacts to vegetation.	The information is not essential to a choice among alternatives. In any case, loss of vegetation is a known impact for all action alternatives. The land cover mapping would supplement other vegetation data.	Not applicable because not essential. However, the BLM obtained the NPS land cover mapping data and included it in EIS analysis.	Volume 4 Maps, and EIS 3.3.1.	Volume 4 Maps, and EIS 3.3.1.
Bio	NPS monitoring reports, from 2001 to 2017, would provide insight on avoidance, minimization, and mitigation topics important to the project, such as minimizing the spread of invasive species.	Invasive species monitoring reports are relevant to understanding invasive species and vegetation in general but may not be highly relevant to any significant or catastrophic impacts to vegetation resulting from the road project.	The information is not essential to a choice among alternatives, particularly if it is focused on particularly NPS lands. In any case, loss of native vegetation and potential spread of NNIS is a known impact for all action alternatives.	Not applicable because not essential. However, the BLM obtained the NPS data and considered it in the EIS analysis.	3.3.1	3.3.1
Socio	The visual resource inventory for Gates of the Arctic National Park and Preserve provides the necessary data to evaluate the proposed alternative and its variant through the National Park and Preserve. Obtain visual resource inventory from NPS.	The visual resource inventory may be relevant to visual impacts at the most sensitive lands in the project area (GAAR lands). Consequences of the project could include significant visual impact in an area managed for natural appearance.	NPS visual data are not essential to BLM's choice among alternatives, because the EEA process governs choices within GAAR.	Not applicable because not essential. However, the BLM obtained the NPS data and used it in the EIS.	3.4.4	3.4.4

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Socio	The SF299 application includes a brief description of impacts to the Kobuk River. No other wild and scenic rivers have been evaluated for impacts analysis. Obtain data and information on wild and scenic rivers from the USFWS and NPS to determine if other wild and scenic rivers in the project area would be impacted.	WSR information is relevant to potential impacts to WSRs other than the Kobuk. However, it has been determined that no alternative would cross other WSRs or cross streams upstream of a WSR segment. Being able to show WSRs in relation to the alternatives is important.	The missing information is essential to showing how close the alternatives are to WSRs and where the alternatives cross the Kobuk WSR. NPS data are not essential to BLM's choice among alternatives, because the EEA process governs choices within GAAR, where the alternatives would cross Kobuk WSR.	Not applicable because not essential. However, the BLM obtained the WSR data, mapped WSRs for the EIS, and considered WSRs in the EIS.	3.4.1; 3.4.3; Vol. 4 Maps	3.4.1; 3.4.3; Vol. 4, Maps
Bio	The University of Alaska Fairbanks has conducted some analysis of impacts along existing roads to permafrost alterations, hydrologic changes and dust for some amount of distance from the right-of-way; however, data is not available or sufficient to estimate the effects in the boreal forest. An analysis of data on what worked and didn't along the Dalton Highway should be conducted.	An analysis of what worked and what didn't along the Dalton Highway regarding permafrost alterations, hydrologic changes, and dust may be relevant to understanding effects on the proposed road and effects of road construction on the surroundings. However, such effects are generally well documented in literature without collecting new information about highway effects and maintenance records.	The missing information is not essential to a choice among alternatives, because all alternatives in general would traverse permafrost areas. It would be the responsibility of the applicant to keep the road maintained to a useable level or close it.	Not applicable because not essential.	3.2.1	3.2.1
Bio	Needed: NWI, Viereck Level III, HGM classification for the alternatives moving forward. If NWI and Viereck Level III data are needed: field and supplemental data supported mapping within a 2,000-foot study area surrounding the reasonable alternatives. If HGM data are needed: Field and/or office based functional assessment data within a 2,000-foot study area surrounding the reasonable alternatives. This is needed for nearly all of Alternative C; some of Alternatives A and B have some coverage.	Wetland data/mapping is relevant to understanding wetlands in the project area and relevant to wetland and waters impacts, which could be significant. Relevance is particularly high for USACE and its jurisdiction over waters.	The missing data are essential to treating Alternative C the same as A and B and therefore are essential to a choice among alternatives.	The BLM required the applicant to provide desktop wetland mapping for Alternative C and for missing portions of A and B, and it was provided as close to what is already available for A & B as possible. This information was used in the EIS.	3.3.1, and Volume 4 Maps.	3.3.1, and Volume 4 Maps.
Bio	While the 2012 wetland maps provides GIS coverage for the majority of Alternative A and B and a portion of Alternative C, this mapping does not provide complete coverage of the alternatives and only provides coarse scale information. As such, these data would be insufficient for use beyond supplementary information.	Wetland data/mapping is relevant to understanding wetlands in the project area and relevant to wetland and waters impacts, which could be significant. Relevance is particularly high for USACE and its jurisdiction over waters.	Having comparable data are essential to treating Alternative C the same as A and B and therefore are essential to a choice among alternatives.	The BLM required the applicant to supplement the 2012 wetland maps through providing the best available wetland mapping for Alternative C and for missing portions of A and B, and it was provided as close to what is already available for A & B as possible. This information provided comparable data for all alternatives and was used in the EIS.	3.3.1, and Volume 4 Maps.	3.3.1, and Volume 4 Maps.

Topic	Suggested Data Gaps	1502.22(a) Is the missing info relevant to reasonably foreseeable significant adverse impacts on the human environment? Why or why not?	1502.22(a) Is the missing info essential to a reasoned choice among alternatives? Why or why not?	1502.22(b) Is the missing info obtainable (based on cost or means)? Why or why not?	If required, discussion of existing credible scientific evidence; if not, citation to applicable EIS section	If required, BLM's evaluation of impacts based on theoretical approaches or research methods generally accepted in the scientific community; if not, citation to applicable EIS section
Bio	A wetland functional assessment completed for all alternatives in the EIS using a consistent and USACE-approved methodology is required to evaluate avoidance and minimization of high-value wetlands and impacts to wetland functions among all alternatives. These data may be needed to support compensatory mitigation planning for the selected alternative. Consider field- and/or office-based functional assessment data within a 2,000-foot study area surrounding the reasonable alternatives. A recommendation was made that wetland and vegetation mapping and reporting efforts should be supported by field work as well as available LiDAR and high-resolution imagery. (Data gap: a lack of USACE-approved wetland functional assessment for Alternative A, aside from the work completed by ABR in 2017)	Wetland functional assessment and mapping are relevant to understanding wetlands in the project area and relevant to wetland and waters impacts, which could be significant. Relevance is particularly high for USACE and its jurisdiction over waters.	The missing data are not essential to a choice among alternatives. Functional assessments have been provided for most of the Alternative A/B alignments and are broadly applicable to the study area as a whole.	Not applicable because not essential. The cost and time required to complete further functional assessment work was deemed exorbitant in light of the added value that would be provided. This decision was made in consultation with the USACE.	3.3.1, and Volume 4 Maps.	3.3.1, and Volume 4 Maps.
Cumulative	Data need: Baseline information on past and present levels of activity on key issues: public access, hunting levels, fishing activity, caribou movement, fish, socioeconomics, visual resources, and recreation covering all reasonable alternatives. Collect additional data.	Information on activity levels of people on the land would be relevant to understanding hunting/fishing pressure on wildlife and recreation and local/regional economic activity. Because use levels are low and because the road would not be open to public traffic, impacts would not be significant/catastrophic.	Actual activity levels are not essential to a choice among alternatives, but an understanding of activity types and locations may be essential, because it is possible some areas have more activity or more sensitive activity than others. Sufficient information exists to understand activity types and locations.	Collection of new data was deemed to be exorbitant in terms of cost and time. The BLM collected existing information as needed to complete impact analysis.	3.3.2 Fish; 43.3.4 Mammals; 3.4.3 Recreation; 3.4.4 Visual; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence.	3.3.2 Fish; 43.3.4 Mammals; 3.4.3 Recreation; 3.4.4 Visual; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence.
Bio	The literature review should also include reports pertaining to monitoring and minimization of invasive species, avoidance and minimization of impacts to rare plant species sensitive to disturbance, and impacts to vital wildlife habitat such as lichen vegetation communities and shallow waterbodies important to wood frogs.	Literature pertaining to Invasive species, rare plants, and wildlife habitat is relevant to understanding the biological environment and may be relevant to significant impacts.	The information could be essential to a choice among alternatives, because some alternatives could affect areas of greater importance or rarity than others.	The BLM collected existing information as needed to complete impact analyses in all sections.	multiple sections of the EIS	multiple sections of the EIS

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Cumult	Information on the status of the proposal to install fiber optic cable. Suggestion for RFI to AIDEA.	Information on a fiber optic line/communications is relevant to multiple impacts categories, some of which could entail significant impacts, including greater loss of vegetation/wetlands/habitat and effects on communication in communities.	The information is not essential to a choice among alternatives, because all alternatives would be treated the same (all would have communications systems installed/configured in the same way). However, the information was deemed essential to a full understanding of the proposed action, once it became clear it was part of the proposal.	The BLM inquired with the applicant, and the applicant amended the application to include communications systems. The information provided was included and evaluated in the EIS.	2.4.3	2.4.3
Socio	Baseline data investigation may be needed to determine background concentrations of asbestos in air and water in villages, as well as in subsistence foods along the routes.	Background concentration of asbestos in air, water, and food could be relevant to health effects related to the project adding asbestos to the system through NOA in gravel used for road construction, and then through dust in the air and in water. Asbestos occurs naturally and is in the air but is a known health risk if breathed in concentration.	The background concentrations are not essential to a choice among alternatives. Health of the populations are generally known and does not appear to be impacted by asbestos-related conditions compared to other areas, despite known NOA near communities. All alternatives would cross areas of known and likely NOA, and would be treated the same in terms of asbestos stipulations.	Not applicable because not essential. Fieldwork on hundreds of people, the subsistence foods, and for air and water in dozens of communities would be exorbitant in terms of time and cost. The BLM has contracted with asbestos experts to examine the impacts for the project using available data.	3.2.1 Geology & Soils; 3.2.3 Hazardous Waste; 3.2.5 Water Resources; 3.2.7 Air Quality; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence; and Health Impact Assessment.	3.2.1 Geology & Soils; 3.2.3 Hazardous Waste; 3.2.5 Water Resources; 3.2.7 Air Quality; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence; and Health Impact Assessment.
Phys	There are no large-scale bedrock and surficial geology maps for the selected routes. Consider desktop and field studies to compile large-scale bedrock and surficial geology maps for the selected routes.	Geology maps are relevant to understanding sources of construction materials and potential geologic hazards, including NOA and acid rock drainage risks.	Geology maps exist. A unified geology map at a single or most-desirable scale for the entire lengths of all alternatives may not exist but is not essential to choice among alternatives, because sufficient information does exist.	Not applicable because not essential. Developing original new data for some 500 miles of alternatives and a vast project area was determined to be exorbitant in terms of time and cost. The BLM collected known geologic data/mapping that was reasonably available and mapped key geologic issues based on existing data: permafrost and asbestos potential.	Vol. 4 Maps; 3.2.1 Geology; 3.2.5 Water; 3.2.7 Air Quality.	Vol. 4 Maps; 3.2.1 Geology; 3.2.5 Water; 3.2.7 Air Quality.
Bio	GIS data that include salmon spawning locations and associated habitat data collected by Lemke et al. (2013). Request GIS data and associated habitat information from Lemke et al. (2013) to avoid the need to digitize these important data.	Salmon spawning locations and habitat data are relevant to impacts related to the project. There is potential that salmon/habitat impacts could be significant. However the Lemke data were specific to earlier alignments of Alternatives A/B and did not address C at all.	The missing data are not essential to a reasoned choice among alternatives, because in general the data were nominated to the ADF&G Anadromous Waters Catalog and are presumed to be present there and because the alignments changed from the specific alignment studied.	Not applicable because not essential. However, the BLM did collect the most up to date ADF&G compilation of spawning data from the Anadromous Waters Catalog. Road and facility design near and across salmon streams are common engineering design issues in Alaska and would be addressed further in final design and permitting.	3.3.2; Vol. 4 Maps	3.3.2; Vol. 4, Maps

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Phys	Consult with geologists to develop order of magnitude likelihood of asbestos being present based on distances from source bedrock.	Consulting with asbestos experts could be relevant to health effects related to the project adding asbestos to the system through NOA in gravel used for road construction, and then through dust in the air and in water. Asbestos occurs naturally and is in the air, and it is a known health risk if breathed in concentration.	Consulting with asbestos experts is not essential to a choice among alternatives. All alternatives would cross areas of known and likely NOA, and all would be treated the same in terms of asbestos stipulations.	Not applicable because not essential. However, it is obtainable to consult with experts regarding existing knowledge on the topic. The BLM contracted with asbestos experts to examine the issue for the project using available data.	3.2.1 Geology & Soils; 3.2.3 Hazardous Waste; 3.2.5 Water Resources; 3.2.7 Air Quality; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence; and Health Impact Assessment.	3.2.1 Geology & Soils; 3.2.3 Hazardous Waste; 3.2.5 Water Resources; 3.2.7 Air Quality; 3.4.5 Socioeconomics and Communities; 3.4.7 and Appendix L Subsistence; and Health Impact Assessment.
Phys	A preliminary evaluation of Alternative C and segments of Alternatives A and B with respect to acid rock drainage (ARD) issues is needed to evaluate alternatives consistently. The evaluation would be based on general bedrock geology and chemistry and aerial photo interpretation.	Evaluation of the alternatives for ARD potential may be relevant to explaining impacts of ARD on water quality, vegetation, etc.	The missing information is not essential to a choice among alternatives, because ARD potential is known for each build alternative, and all alternatives would be treated the same in terms of stipulations to address ARD risks.	Not applicable because not essential. ARD potential would be tested during geotechnical investigations on the selected alternative and addressed by mitigation measures.	3.2.1	3.2.1
Phys	Research will be required to determine acceptable ARD potential and methods to prevent or decrease ARD from material with ARD potential.	This gap is applicable to final design but is not necessary at a NEPA level to understand and disclose impacts from ARD. With proper engineering design, significant/catastrophic impacts would be avoided.	The missing information is not essential to a choice among alternatives, because ARD potential is known for each build alternative, and all alternatives would be treated the same in terms of stipulations to address ARD risks.	Not applicable because not essential. ARD potential would be tested during geotechnical investigations on the selected alternative and addressed by mitigation measures during design.	3.2.1	3.2.1
Phys	Each alternative should be searched for the presence of existing hard rock mines, and nearby surface water bodies should be analyzed for low pH and elevated metals concentration.	It is not clear that specifically discovering the presence of hard rock mines or determining existing acidity of surface waters would be relevant to significant impacts of the proposed road project. This appears to be concerned with impacts that may have occurred from past or present mines, which could be cumulative with road-related ARD impacts.	The missing info may be helpful in understanding the affected environment but is not essential to a choice among alternatives. It is not essential because it is not closely related to impacts of the project, but rather is related to future mine development in the Ambler district.	Not applicable because not essential. Field work to assess water bodies for acidity in thousands of streams over some 500 miles of alternatives was determined to be exorbitant in terms of time and cost. Reasonably available existing data about risks of ARD were obtained and included in the EIS.	3.2.1	3.2.1
Alternatives	Operations: Develop estimate of current costs of transporting fuel, supplies, equipment, modules, mineral process chemicals, and mineral concentrate over the various route alternatives and distances, and compare among reasonable alternatives.	It is not clear that costs to the applicant or road users are relevant to determining significant/catastrophic impacts of the project. The BLM has systems in place to ensure the financial ability of the applicant to take on the project, but this is not an impact of the project.	The information is not essential to a choice among alternatives, because it is about costs incurred by the applicant and not costs (impacts) to society as a whole. However impact analysis should include calculation of economic impacts.	Not applicable because not essential. However, as part of impact assessment, the BLM has undertaken to estimate a reasonably foreseeable development scenario for mining and for road traffic and has estimated truck trips/traffic. Economic impacts associated with the alternatives were updated by AIDEA at BLM's request.	Appendix H sections 2.1.5, 2.2	Appendix H sections 2.1.5, 2.2

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Bio	If caribou movement and habitat use data are insufficient to address issues of concern, it may be necessary to conduct field studies to identify caribou (and other mammal) distribution, habitat use, movement corridors, and seasonal range use. If field studies are not conducted, a suggestion was made to rely heavily on ADF&G and NPS data.	Field studies related to caribou/mammal movement and distribution would be relevant to potentially significant impacts to caribou from the road and its traffic, because they would help define patterns of movement, at least in the year(s) studied.	The data are not essential to a choice among alternatives but are assumed to be helpful. The data are not essential because enough is known about caribou behavior and movement from other existing studies to predict impacts without project-specific field data.	Not applicable because not essential. The BLM determined that the time and cost associated with field studies of caribou movement would be exorbitant, given the large area traversed by the alternatives and the caribou herds, and because sufficient relevant caribou data already existed. Other mammals have not been identified through scoping at the same level of concern as caribou.	EIS 3.3.4; Appendix H 3.4.4.	EIS 3.3.4; Appendix H 3.4.4.
Bio	Available mapping lacks vegetation type attributes.	Mapping of vegetation types is relevant to understanding the affected environment in general and for plants and wildlife habitat more specifically. Some wildlife impacts could be significant, which in turn could be significant for subsistence.	A certain level of understanding of vegetation by type is essential to understanding the project area and likely to a choice among alternatives, although other information about wildlife movement and behavior may be sufficient.	Vegetation type data are available through the BLM's Rapid Ecoregional Assessment GIS, with 15 classifications of vegetation type. This was determined to be adequate for the project and is reasonably obtainable and was used in the EIS.	3.3.1; Vol. 4, Maps	3.3.1; Vol. 4 Maps.
Bio	Mapping of vegetation types using the Alaska Vegetation Classification system, a standard classification system developed for Alaska, is recommended for the alternatives and the missing eastern end of Alternatives A and B.	Mapping of vegetation types is relevant to understanding the affected environment in general and for plants and wildlife habitat more specifically. Having similar data for all alternatives is important to fairly assessing impacts.	A certain level of understanding of vegetation by type is essential to understanding the project area and likely to a choice among alternatives, although other information about wildlife movement and behavior may be sufficient. It is essential to have similar data for all alternatives.	Vegetation type data are available through the BLM's Rapid Ecoregional Assessment GIS, with 15 classifications of vegetation type for the entire project area. This was determined to be adequate for the project and is obtainable and was used in the EIS. It was supplemented by what can be generalized to all alternatives from more detailed mapping done by the applicant. It was determined to be exorbitant in cost and time to map all alternatives to a more detailed level and that the less detailed level was adequate.	3.3.1; Vol. 4, Maps	3.3.1; Vol. 4 Maps.

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Bio	Vegetation type mapping needed for Alternative C and the eastern 50 miles of Alternatives A and B. Field and supplemental data supported vegetation type mapping within a 2,000-foot study area surrounding the reasonable alternatives.	Mapping of vegetation types is relevant to understanding the affected environment in general and for plants and wildlife habitat more specifically. Having similar data for all alternatives is important to fairly assessing impacts.	A certain level of understanding of vegetation by type is essential to understanding the project area and to a reasoned choice among alternatives, although other information about wildlife movement and behavior may be sufficient. It is essential to have similar data for all alternatives.	Vegetation type data are available through the BLM's Rapid Ecoregional Assessment GIS, with 15 classifications of vegetation type for the entire project area. This was determined to be adequate for the project and is obtainable and was used in the EIS. It was supplemented by what can be generalized to all alternatives from more detailed mapping done by the applicant. It was determined to be exorbitant in cost and time to map all alternatives to a more detailed level and that the less detailed level was adequate.	3.3.1; Vol. 4. Maps	3.3.1; Vol. 4 Maps.
Bio	Fine-scale mapping at this level is not provided for the eastern end of Alternatives A and B and Alternative C; however, at a minimum, vegetation mapping at Viereck Level III should be used as the project baseline level of detail, and a cross-walk could be applied to the ITU mapping to generate vegetation types at this level of detail.	Mapping of vegetation types is relevant to understanding the affected environment in general and for plants and wildlife habitat more specifically. Having similar data for all alternatives is important to fairly assessing impacts.	A certain level of understanding of vegetation by type is essential to understanding the project area and likely to a choice among alternatives, although other information about wildlife movement and behavior may be sufficient. It is essential to have similar data for all alternatives.	Vegetation type data is available through the BLM's Rapid Ecoregional Assessment GIS, with 15 classifications of vegetation type for the entire project area. This was determined to be adequate for the project and is reasonably obtainable and was used, supplemented by what can be generalized to all alternatives from more detailed mapping done by the applicant. It was determined to be exorbitant in cost and time to map all alternatives to a more detailed level and that the less detailed level was adequate.	3.3.1; Vol. 4. Maps	3.3.1; Vol. 4 Maps.

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Bio	Data gap: mapped wildlife habitat. Map wildlife habitat within and surrounding all alternatives at a similar quality and resolution. Wildlife habitat can be derived from vegetation mapping.	Mapping of vegetation types is relevant to understanding the affected environment in general and for plants and wildlife habitat more specifically. Some wildlife impacts could be significant, which in turn could be significant for subsistence.	A certain level of understanding of habitat by vegetation type is essential to understanding the project area and likely to a choice among alternatives, although other information about wildlife movement and behavior may be sufficient.	Vegetation type data is available through the BLM's Rapid Ecoregional Assessment GIS, with 15 classifications of vegetation type. This was determined to be adequate for the project and is reasonably obtainable and was used in the EIS. Other measures of caribou habitat (winter range, summer range, collared movement, etc.) also were mapped and used.	3.3.4; Vol. 4. Maps	3.3.4; Vol. 4 Maps.
Phys	Water resources data, including surface water (rivers and lakes) quantity and quality, groundwater availability and quality, and the seasonal changes to these resources, are recommended for identifying and assessing impacts from development.	Surface water and ground water flows and quality are relevant to understanding the affected environment and assessing impacts to water. It is possible that impacts to water would be significant.	Detailed data on water flow in each drainage and in groundwater, and on water quality, are not essential to a choice among alternatives. Sufficient data exist to map drainages and to understand the general behavior of water, and it is reasonable to assume that virtually all water quality near the alternatives if effectively untainted by human activity, given the mostly undeveloped and unindustrialized nature of the area.	Not applicable, because not essential. The fieldwork necessary to investigate details of surface and subsurface water flows and water quality was determined to be exorbitant in terms of time and cost, considering the extent of the study area, the length of the alternatives (some 500 miles), and the hundreds or even thousands of drainages crossed.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.
Phys	Baseline data on water resources are important in determining how road construction and mine development activities may impact the existing conditions.	Surface water and ground water flows and quality are relevant to understanding the affected environment and assessing impacts to water. It is possible that impacts to water would be significant.	Detailed data on water flow in each drainage and in groundwater, and on water quality, are not essential to a choice among alternatives. Sufficient data exist to map drainages and to understand the general behavior of water, and it is reasonable to assume that virtually all water quality near the alternatives if effectively untainted by human activity, given the mostly undeveloped and unindustrialized nature of the area.	Not applicable, because not essential. The fieldwork necessary to investigate details of surface and subsurface water flows and water quality was determined to be exorbitant in terms of time and cost, considering the extent of the study area, the length of the alternatives (some 350 miles), and the hundreds or even thousands of drainages crossed.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.

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Phys	Additional data on water resources are needed to fully describe the impacts of changes to existing conditions due to infrastructure development and mine operations.	Surface water and ground water flows and quality are relevant to understanding the affected environment and assessing impacts to water. It is possible that impacts to water would be significant.	Detailed data on water flow in each drainage and in groundwater, and on water quality, are not essential to a choice among alternatives. Sufficient data exist to map drainages and to understand the general behavior of water, and it is reasonable to assume that virtually all water quality near the alternatives if effectively untainted by human activity, given the mostly undeveloped and unindustrialized nature of the area.	Not applicable, because not essential. The fieldwork necessary to investigate details of surface and subsurface water flows and water quality was determined to be exorbitant in terms of time and cost, considering the extent of the study area, the length of the alternatives (some 500 miles), and the hundreds or even thousands of drainages crossed.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.
Phys	Limited field data for studied routes and no field data for Alternative C. Consider fieldwork including geotechnical drilling and material testing to check assumptions of reconnaissance level studies.	Geotechnical drilling and material testing would be relevant to determining such risks as naturally occurring asbestos and acid rock drainage, which if ignored could present potential for significant impacts.	Specific drilling and material testing is not essential to a choice among alternatives. A reasonable understanding of the project area is available from geologic mapping and other existing information. All alternatives are expected to encounter geologic challenges, and a reasonable drilling/testing program would not eliminate all questions and would cause impacts. Drilling and testing data would be useful but is more suited to the design phase.	Specific drilling and material testing information for some 500 miles of alternatives was determined to be exorbitant in terms of cost and time. Material testing would be conducted during final design for the selected alternative.	3.2.1; 3.2.2	3.2.1; 3.2.2
Bio	Limited baseline discharge data exist for water courses in the region. Very little water quality data exist (on an area-wide basis) for lakes and rivers in the region. (Note: this data gap is also discussed in the Water Resources section previously).	Surface water and ground water flows and quality are relevant to understanding the affected environment and assessing impacts to water. It is possible that impacts to water would be significant.	Detailed data on water flow in each drainage and in groundwater, and on water quality, are not essential to a choice among alternatives. Sufficient data exist to map drainages and to understand the general behavior of water, and it is reasonable to assume that virtually all water quality near the alternatives if effectively untainted by human activity, given the mostly undeveloped and unindustrialized nature of the area.	Not applicable, because not essential. The fieldwork necessary to investigate details of surface and subsurface water flows and water quality was determined to be exorbitant in terms of time and cost, considering the extent of the study area, the length of the alternatives (some 500 miles), and the hundreds or even thousands of drainages crossed.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.	3.2.5; 3.3.2; also Appendix H 3.3.5 and 3.4.2.

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Bio	Presence/absence of wood frogs and presence/absence of chytrid fungus. Consider GIS analysis to determine potential wood frog habitat. Conduct limited wood frog surveys and test for chytrid fungus. Methodology should be developed in coordination with ADF&G, NPS, and University of Alaska-Fairbanks researchers.	The presence of wood frogs is relevant to the project's potential impacts on wood frogs. The presence of the fungus is relevant to the health of wood frogs and to general baseline/affected environment knowledge but not particularly relevant to the road's impacts to frogs. Frog habitat is expected to be widespread, and no significant impact to frog populations is anticipated.	Conducting frog surveys and tests for the fungus is not essential to a choice among alternatives. All alternatives are expected to traverse frog habitat and to impact individual frogs, but are not expected to impact frog populations. While it is possible the road could be a vector to accidently bring the fungus to the area, the existing presence of the fungus would be a separate issue.	Not applicable because not essential. Field work to assess wood frog presence would entail exorbitant cost and investment of time, given the broad extent of aquatic habitats across the project area. Based on what is known, it reasonable to assume wood frog habitat is widespread. Collecting known observations data and mapping likely wood frog distribution is reasonable and has been done using vegetation mapping.	3.3.2; Vol. 4, Maps.	3.3.2; Vol. 4, Maps.
Bio	Data need: overwintering habitat use by fish in areas potentially impacted by the project (for all alternatives) Consider acquiring or developing EIS-level data to identify overwintering habitat use by fish. Environmental analysis should address overwintering habitat use by fish in areas potentially impacted by the project. A few recent studies mentioned previously (Wuttig 2015 and Brown 2009) provide information on overwintering habitat for select species near Alternatives A and B, but overwintering use data tied to other potential alternatives may not be available.	Overwintering data for fish are relevant to potential impacts to fish, which could be significant if water drainage patterns were ignored.	Overwintering data for fish are not essential to a choice among alternatives. All alternatives are expected to affect fish habitat year round, and stipulations for all alternatives related to protection of fish and fish habitat would be the same for all alternatives. It was determined that sufficient information is known to reasonably discuss fish habitat and seasons of fish movements	Not applicable because not essential. However, existing studies regarding fish overwintering habitats have been acquired and used in the EIS.	3.3.2	3.3.2
Alternatives	Design/construction consideration: Data are required on the applicability of mitigation measures to avoid or minimize impacts from infrastructure development. The roadways would likely be constructed in methods similar to existing Arctic roads, with design elements and mitigation measures that are suited to the climate in which they are located.	Best practices and common mitigation measures for arctic road construction are relevant to minimizing impacts of multiple kinds.	Types of reasonable and effective mitigation measures available are essential to a choice between No Action and the action alternatives, and for understanding whether impacts can be reasonably mitigated. However, all action alternatives are expected to be treated the same regarding most mitigation measures, so mitigation measures are not essential to a choice among action alternatives.	Information about best practices and effective mitigation measures have been collected from BLM, CAs, public comments, and incorporated into the EIS.	Appendix N; also EIS 2.4.4.	Appendix N; also EIS 2.4.4.

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Phys	Soundscape inventories and project descriptions may be required for all other alternatives to develop comparable analyses and apply environmental sound models to assess impacts.	Baseline sound level data are relevant to understanding the potential for noise impacts. Given the status of the project area as almost entirely undeveloped, the main impact is likely to be presence vs. absence of road noise and to be an important impact on that basis rather than a quantified change basis.	Sound level data are not essential to a choice among alternatives, because all alternatives would create new road noise where currently there are few human-caused noises. All alternatives would operate similarly with similar traffic levels and thus similar noise levels.	Not applicable because not essential. NPS sound level data were obtained, and incorporated into the EIS. Gathering new data in the field over some 500 miles of alternatives and an expansive project area was judged exorbitant in cost and time investment and not pursued. The NPS data works as a proxy for other undeveloped portions of the study area, and NPS noise modeling was extended the length of each alternative.	3.2.6	3.2.6
Phys	Preliminary evaluations, including drilling and material testing regarding ARD, should be completed for routes considered for construction and associated potential material source.	Geotechnical drilling and material testing would be relevant to determining such risks as naturally occurring asbestos and acid rock drainage, which if ignored could present potential for significant impacts.	Specific drilling and material testing are not essential to a choice among alternatives. A reasonable understanding of the project area is available from geologic mapping and other existing information. All alternatives are expected to encounter geologic challenges, and a reasonable drilling/testing program would not eliminate all questions and would cause impacts. Drilling and testing data would be useful but is more suited to the design phase.	Not applicable because not essential. Specific drilling and material testing information for some 500 miles of alternatives was determined to be exorbitant in terms of cost and time. Material testing would be conducted during final design for the selected alternative.	3.2.1; 3.2.2	3.2.1; 3.2.2
Cumult	Baseline traffic noise data along existing highway corridors are not available. Qualitative assessment of traffic noise increases within a set distance from road corridors associated with increased truck or rail traffic.	This suggestion does not appear to directly request baseline traffic noise data. Baseline sound level data are relevant to understanding the potential for noise impacts. Given the status of the project area as almost entirely undeveloped, the main impact is likely to be presence vs. absence of road noise and to be an important impact on that basis rather than a quantified change basis. Along the Dalton Hwy, the sound change would be an incremental small increase.	Sound level data are not essential to a choice among alternatives, because all alternatives would create new road noise where currently there are few human-caused noises. All alternatives would operate similarly with similar traffic levels and thus similar noise levels.	Not applicable because not essential. However, NPS sound level data were obtained, and NPS was asked to extend its modeling to the road corridors. Gathering new data in the field along 100 miles of Dalton Hwy was judged exorbitant in cost and time investment and not pursued, especially given the expected small incremental increase in road noise in that area compared to areas that currently have no traffic noise.	3.2.6	3.2.6

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Phys	Physical environment-related fieldwork has been requested, which would include collecting temperature, ice-content, and soils data and identifying permafrost distribution along alternative alignments for EIS analysis impact and comparative analyses. A request was made for this data to be collected along alternative alignments using a geotechnical drilling field effort.	The missing information likely is relevant to better understanding of the project area environment but does is not relevant to significant adverse impacts on the environment. It is known that all alternatives are underlain by permafrost. Consequences for a road project of thawing permafrost are principally damage to the road, which is a risk to the applicant but probably not significant to the broader environment.	Drilling information would be informative but is not essential to a choice among alternatives. All alternatives cross permafrost, and all have risks. Most risks are standard for construction in the arctic and would be dealt with equally among the alternatives in design.	Not applicable because not essential. The cost and time required to complete field drilling over some 500 miles of alignments in an area without road access would entail exorbitant cost and time. When an alternative is selected, drilling is expected to occur for one alternative to inform design.	3.2.1	3.2.1
Cultural	Comprehensive cultural resources investigations involving aerial and pedestrian field survey, with sub-surface testing and site evaluation (i.e., determining eligibility to the National Register of Historic Places) will need to be conducted throughout the proposed Project area. The extent, timing, and survey methods can be prescribed in a PA for the preferred alternative [36 CFR 800.4(a)(2)].	Site investigations are relevant to determining presence and importance of cultural resources, because sites often are forgotten, only partially known, or hidden/buried.	The results of fieldwork are not essential to a choice among alternatives, because there is a known regional history that affects all alternatives, because there are some data available, and because there is a formal PA procedure in place to address the topic for the selected alternative.	Not applicable because not essential. The cost and time required to perform ground surveys and shovel testing would entail exorbitant cost and time for some 500 miles of alignments.	3.4.8	3.4.8
Cultural	Archival material through Alaska's Digital Archives and the National Archives should be reviewed, including historical photographs, albums, oral histories, moving images, maps, documentaries, and physical objects associated with the Project area, to identify places or individuals that may be significant[36 CFR 800.4(4)(b)(1)]. Resources include Alaska's Digital Archives, the National Archives, museum and library collections, Project Jukebox at the University of Alaska, Fairbanks, and Gates of the Arctic Research Portal.	Archival material may be relevant to determining presence and importance of cultural resources, because sites often are forgotten or only partially known.	The results of archival research are not essential to a choice among alternatives, because there is a known regional history that affects all alternatives, because there is some data available, and because there is a formal PA procedure in place to address the topic for the selected alternative.	Not applicable because not essential. The cost and time required to perform archival research would entail exorbitant cost and time for some 500 miles of alignments.	3.4.8	3.4.8
Cultural	The RS 2477 files should be reviewed to identify any historic roads and trails that may exist within the study area.	RS 2477 information is relevant to understanding historic context and potential current public rights-of-way that could be blocked or altered by a road. There is likely no catastrophic impact, but it would be helpful to know whether historic trails or current easements are present and possibly impacted.	RS 2477 information is not essential to a choice among alternatives. First, different routes likely affect all alternatives. Second, the impacts are unlikely to be significant and can be dealt with in the right-of-way grant.	Not applicable because not essential. However, the DNR's RS 2477 data is readily available. BLM obtained and used this data.	3.4.2, 3.4.8; Vol. 4. Maps	3.4.2, 3.4.8; Vol. 4. Maps

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Cultural	Conduct geoarchaeological research to better understand prehistoric site distributions and to assist with probability modeling of buried archaeological sites.	Research necessary for probability modeling of archaeological sites is relevant to predicting the likelihood of archeological sites and could help identify areas for future ground surveys. It is unlikely to be directly relevant to identifying significant impacts to actual sites.	Research necessary for probability modeling of archaeological sites is not essential to a choice among alternatives. Probability modeling would help to identify risk of impact associated with the various alternatives but would be unlikely to change the process being developed in a Programmatic Agreement.	Not applicable because not essential. However, sufficient information exists to undertake probability modeling. BLM completed probability modeling.	3.4.8	3.4.8
Cultural	Conduct paleontological research in the Project study area, including review of NPS reports and database, and other paleontological databases or studies.	Such research is relevant to understanding the paleontology of the study area and likelihood of encountering paleontology resources. It is unlikely that significant impacts would occur; it is more likely that the information would help determine the need to seek out and preserve any such resources as part of the project.	Such research is not essential to a choice among alternatives but would help to identify risks to paleontology resources and would help distinguish those risks among alternatives. Because the impact is unlikely to be significant/because impacts likely could be avoided, the research is not essential.	Not applicable because not essential. BLM undertook such modeling based on available information, and incorporated the analysis into the EIS.	3.2.4	3.2.4
Cultural	A CRMP, with clear research questions and survey and testing strategy, should be developed to guide the field investigations including developing a predictive model and survey strategy for archaeological resource identification. This should begin early in the planning process.	It is relevant to the cultural resources impacts	The CRMP would be the same for all alternatives so is not essential to a choice among alternatives.	The CRMP has been completed as part of the Section 106 process.	3.4.8	3.4.8
Cultural	National Register of Historic Places (NRHP) evaluations must be conducted on both newly discovered and previously recorded resources to determine if they are eligible to the NRHP. If they are eligible, effects and mitigation measures must be determined for those properties (36 CFR 800.5).	This is related to a legal requirement and not specifically a data gap. Related regulations allow for a Programmatic Agreement that details how resources will be discovered and documented. This is relevant to protecting historic and cultural resources.	Information about specific resources in the proposed alternative corridors is not essential to a choice among alternatives because all alternatives have risk of encountering such resources and because there is a process in place (the PA process) to identify and protect to the extent possible any sites discovered under any alternative.	Not applicable because not essential. However, a Programmatic Agreement and CRMP have been developed.	3.4.8	3.4.8
Cultural	Scoping comments received to date identified the need for consultation with Tribes to identify and evaluate potential cultural landscapes, places of Traditional Cultural Importance, or other knowledge that Tribes may have as cultural resource subject matter experts.	Information from Tribes about cultural resources is relevant to understanding the project area and identifying impacts. Significant impacts to culturally important places are possible but may not be likely.	The information could be essential to a choice among alternatives, if it was determined that areas of significant cultural importance were impacted by one alternative but not another	The BLM has undertaken such consultation and government-to-government consultation on this and other topics, and incorporated any data into the Section 106 process and PA.	3.4.8	3.4.8

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Cultural	Interviews with traditional knowledge holders need to be conducted to determine where ethnographic resources, or places of traditional religious or cultural importance may exist within the Project area. These interviews should also inform field survey [36 CFR 800.4(4)].	Information from Tribes about cultural resources is relevant to understanding the project area and identifying impacts. Significant impacts to culturally important places are possible but may not be likely.	The information could be essential to a choice among alternatives, if it was determined that areas of significant cultural importance were impacted by one alternative but not another	The BLM has undertaken such consultation and government-to-government consultation on this and other topics, and incorporated any data into the Section 106 process and PA.	3.4.8	3.4.8
Cultural	Compile previously documented place names for the cultural resource study area to help identify ethnographic resources. Following the compilation of place name information, include place name research for areas lacking previous documentation.	Place name research could be relevant to understanding the cultural importance of places, but no impact to place names per se is anticipated.	The information about place names is not essential to a choice among alternatives, because cultural importance can be determined in other ways.	No applicable because not essential.	3.4.8	3.4.8
Cultural	More information is needed regarding historic sites in the region. AHRS database shows a predominance of prehistoric site types. Need to confirm if this is an accurate reflection or if the data is skewed with researchers focusing more on prehistoric resources in the Project area.	Information about historic sites could be relevant to understanding and assessing impacts to historic sites. Significant impacts are possible but not considered likely because of ability to adjust road alignment and because of mitigation measures in a PA.	Information about specific resources in the proposed alternative corridors is not essential to a choice among alternatives because all alternatives have risk of encountering such resources and because there is a process in place (the PA process) to identify and protect to the extent possible any sites discovered under any alternative.	Not applicable because not essential. However, the BLM has collected available data about historic sites, and incorporated it into the EIS.	3.4.8	3.4.8
Cultural	Review mining records to identify historic mining sites. Evaluation and inventory of modern mining locations would likely lead to further knowledge of historic resources within the region. Useful archival resources include historic USGS topographic and other historic maps; land status records; mining claim documents and other mining-related documentation.	Original research regarding historic mining sites is relevant to understanding the historic background of the area and to potentially to identifying specific historic properties.	Information about specific resources in the proposed alternative corridors is not essential to a choice among alternatives because all alternatives have risk of encountering such resources and because there is a process in place (the PA process) to identify and protect to the extent possible any sites discovered under any alternative.	Not applicable because not essential. However, the BLM has collected available data about historic sites, and incorporated it into the EIS, as appropriate (i.e. considering the protected nature of the resources)	3.4.8	3.4.8

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Cumult	No specific indirect and cumulative effects analysis has been done. The cumulative impacts methodology has not yet been determined. The spatial/ geographic temporal extent for indirect and cumulative impacts analysis by resource is not currently defined. A technical workshop could be conducted to determine impacts/analysis. Additionally, a cooperating agency suggested during the review of the draft data gap report that it may be helpful to look at mining projects elsewhere in Alaska, including but not limited to Red Dog mine. Nearby communities such as Kotzebue and Kivalina could provide input on the effects of job creation, subsistence and pollution.	Information about the extent and methods for indirect and cumulative impacts analysis is not really a data gap but an administrative need for completion of an EIS. Therefore this item is not addressed further.			Appendix H as a whole; reasonably foreseeable development scenario in Appendix H, Section 2, and most specifically in Section 2.5.1. Impacts discussion of mines in Appendix H, Section 3.	Appendix H as a whole; reasonably foreseeable development scenario in Appendix H, Section 2, and most specifically in Section 2.5.1. Impacts discussion of mines in Appendix H, Section 3.
Cumult	A past, present, and future actions list has not been prepared. Could be prepared as part of a cumulative impacts technical workshop.	Information about past, present, and foreseeable actions is not really a data gap but an administrative need for completion of an EIS. Therefore this item is not addressed further.		.	Appendix H, Section 2.3	Appendix H, Section 2.3
Alternatives	Operations: Additional data are needed to evaluate resources and issues of concern along the reasonable alternatives, including descriptions of construction equipment, material site operations, aircraft usage, and seasonal actions.	The information is generally relevant to reasonable foreseeable impact that could be significant, because the types of road operations affect the surrounding environment.	All action alternatives would operate similarly, but the information noted could be helpful in understanding the differences between No Action and any action alternative. BLM obtained sufficient information to understand these differences and analyze impacts from all alternatives.	The BLM obtained further information from the applicant on many points of construction and operation and incorporated the information in the description of the alternatives and in impact analyses.	Ch. 2, 2.4.3 to the end; Ch. 3	Ch. 2, 2.4.3 to the end; Ch. 3
Cumult	Fuel use projections for construction of the project. VMT and vehicle type/mix operation of the project. Obtain fuel use and VMT projections from other team members and/or AIDEA.	Fuel use projections would be relevant to describing use of fuel (a resource) and to understanding air emissions. Significant impacts regarding air quality are not likely.	The missing information is not essential to a choice among alternatives, because traffic and operating procedures would be the same. Criteria air pollutant emissions are anticipated to be relative to the length of the road.	Not applicable because not essential. However, the BLM contracted with a mining expert to develop traffic estimates and vehicle mix, from which fuel use and air emissions were derived. BLM calculated criteria air pollutant emissions for the transportation on the road for the Final EIS.	3.2.7 Air Quality; 3.4.2 Transportation; Appendix H, 2.1.5 (transportation and traffic)	3.2.7 Air Quality; 3.4.2 Transportation; Appendix H, 2.1.5 (transportation and traffic)

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Phys	Project-related GHG emissions should be quantified. Need construction fuel use estimate, and estimated vehicle miles traveled (VMT) and vehicle mix data for operational phase to allow quantification of GHG emissions.	Fuel use projections would be relevant to understanding air emissions. Significant/catastrophic impacts associated with the project regarding GHG emissions and climate change are not likely, although clearly the project would contribute to a global impact.	The missing information is not essential to a choice among alternatives, because VMT/fuel use/GHGs would be expected to be relative to the length of the road and otherwise the alternatives would operate the same and would carry the same traffic related to mining.	Not applicable because not essential. However, the BLM contracted with a mining expert to develop traffic estimates and vehicle mix, from which fuel use and air emissions were derived. BLM estimated GHG emissions calculations for road construction and road operations.	3.2.7 Air Quality; 3.4.2 Transportation; Appendix H, 2.1.5 (transportation and traffic)	3.2.7 Air Quality; 3.4.2 Transportation; Appendix H, 2.1.5 (transportation and traffic)
Phys	A qualitative evaluation of the potential for contaminant releases is needed during construction as well as operations at proposed maintenance, storage, or refueling facilities along each alternative. The analysis would identify best practices designed to prevent and minimize impacts of spills.	This comment is addressing impact assessment needs and not a data gap per se.	NA	The BLM obtained further information from the applicant and addressed spill risk qualitatively.	3.2.3 Hazardous Waste; 3.2.5 Water Quality; 3.3.2, Fish	3.2.3 Hazardous Waste; 3.2.5 Water Quality; 3.3.2, Fish
Phys	Evaluate potential for contaminant releases. GIS evaluation to identify sensitive resources (e.g. amphibian habitat) to avoid during facility siting along each alternative. Desktop qualitative assessment of potential spills and effects on existing communities, people and wildlife.	This comment is addressing impact assessment needs and not a data gap per se.	NA	The BLM obtained some additional information from the applicant and incorporated it into the EIS. Spill risk was addressed qualitatively with respect to similar projects.	3.2.3 Hazardous Waste; 3.2.5 Water Quality; 3.3.2, Fish; and other sections.	3.2.3 Hazardous Waste; 3.2.5 Water Quality; 3.3.2, Fish; and other sections.
Alternatives	Operations: Safety plan for communications; public safety; provision of gas/fuel and other vehicle services; and provision of police and/or emergency services. Develop an assessment of risk to human life and property, and an estimate of cost and feasibility of protecting them; compare among reasonable alternatives.	Information about road operations, including safety plan, communications, fuel, and emergency services, is important to understanding the project and could have implications for potentially significant impacts.	Information about road operations, including safety plan, communications, fuel, and emergency services, is not essential to a choice among alternatives, because all alternatives would operate the same. However, this information pertains to the choice between No Action and any action alternative.	The BLM obtained clarification and additional detail about road operations from the applicant and used them for impact assessment in the EIS.	Ch. 2, section 2.4.5 to the end, and Ch. 3 in general.	Ch. 2, section 2.4.5 to the end, and Ch. 3 in general.
Cumult	Size of the mines, operating scenarios of the mines, transportation assumptions on how, where, and at what levels shipments would occur. Could be prepared as part of a cumulative impacts technical workshop.	Detail about the mines and traffic associated with the mines is relevant to understanding how mines could impact the environment. Some impacts could be significant.	The information is not essential to a choice among action alternatives, because the mines would be the same under any alternative, but could be essential to a choice between No Action and any action alternative.	The BLM obtained from the applicant further information about mining assumptions and traffic assumption and developed a reasonably foreseeable development scenario that included mine details, and incorporated this information into the EIS.	Appendix H as a whole; reasonably foreseeable development scenario in Appendix H, Section 2, and most specifically in Section 2.5.1. Impacts discussion of mines in Appendix H, Section 3.	Appendix H as a whole; reasonably foreseeable development scenario in Appendix H, Section 2, and most specifically in Section 2.5.1. Impacts discussion of mines in Appendix H, Section 3.

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Alternatives	More design has occurred with AIDEA's preferred alternative and alternative corridor Alternatives A and B). Consistent level of design across all alternatives is needed. Conduct additional conceptual design so a commensurate level of impacts analysis can occur across reasonable alternatives. A reconnaissance-level analysis for Alternative C is needed to adequately compare the considered alternatives.	The missing information is relevant to evaluation of Alternative C for all impact, some of which could be significant, and to fairly comparing it to Alternatives A and B.	The missing information is essential to a choice among alternatives; there must be analysis of Alternative C to create a choice.	The BLM obtained the best available data both about Alternative C (engineering refinement of the alignment) and about resources along the alignment from the applicant and other contractors. In most cases it was the same as what was available for Alternatives A and B. The data used for A and B in some cases was determined best if it matched what was available for Alternative C. Information was incorporated into the EIS	Chapter 2 and 3, in general.	Chapter 2 and 3, in general.
Bio	Locations and details (e.g., type, size) of stream crossing conveyances (culverts and bridges) do not appear to be available for Alternative C. These data will be necessary in order to compare potential impacts to fish and fish habitat across all alternatives analyzed in the NEPA document.	The missing information is relevant to evaluation of Alternative C for water and fish impacts, some of which could be significant, and to fairly comparing it to Alternatives A and B.	The missing information is essential to a choice among alternatives.	The BLM obtained data for Alternative C stream crossings from the applicant and other consultants, and incorporated it into the EIS.	Vol. 4 , Maps.; 3.2.5 Water; 3.3.2 Fish; Ch. 2 general alternative description	Vol. 4 , Maps.; 3.2.5 Water; 3.3.2 Fish; Ch. 2 general alternative description
Phys	No identification of potential material sites for Alternative C. Consider desktop analysis to identify potential material sites for this alternative.	The missing information is relevant to evaluation of Alternative C for general footprint impacts and geology-related impacts, some of which could be significant, and to fairly comparing it to Alternatives A and B.	The missing information is essential to a choice among alternatives.	The BLM obtained data for Alternative C material sites from the applicant, and incorporated it into the EIS.	Ch. 2 general alternative description	Ch. 2 general alternative description
Bio	Locations and types of stream crossings for Alternative C. Identify locations and types (bridge or culvert size) of stream crossings for all alternatives for NEPA analysis.	The missing information is relevant to evaluation of Alternative C for water and fish impacts, some of which could be significant, and to fairly comparing it to Alternatives A and B.	The missing information is essential to a choice among alternatives.	The BLM obtained data for Alternative C stream crossings from the applicant and other consultants, and incorporated it into the EIS.	Vol. 4 , Maps.; 3.2.5 Water; 3.3.2 Fish; Ch. 2 general alternative description	Vol. 4 , Maps.; 3.2.5 Water; 3.3.2 Fish; Ch. 2 general alternative description
Alternatives	Develop updated estimate of current costs of construction, maintenance, and operation among alternatives.	The costs of construction and operations are primarily a risk to the applicant and not an impact issue. The exception would be if public funds were proposed to be used.	The information is not essential to a choice among alternatives, particularly because the applicant proposes no use of public funds.	The BLM obtained updated cost and economic information from the applicant for all three alternatives, plus clarification of funding mechanisms proposed, and incorporated the information into the EIS.	Section 2.4.3; Section 3.4.5 Socioeconomics.	Section 2.4.3; Section 3.4.5 Socioeconomics.

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Alternatives	O&M: Costs of addressing impacts of natural forces (permafrost, river overflow, fire, and flooding) on road maintenance and operations. Develop estimate of current costs of maintaining and repairing roads; and compare among reasonable alternatives.	The costs of operations are primarily a risk to the applicant and not an impact issue. The exception would be if public funds were proposed to be used.	The information is not essential to a choice among alternatives, particularly because the applicant proposes no use of public funds.	Not applicable because not essential. However, the BLM obtained operating and maintenance cost information from the applicant for all action alternatives, and incorporated the information into the EIS. There is no breakout of special costs related to permafrost, NOA, overflow, fire, etc.).	Section 3.4.5 Socioeconomics.	Section 3.4.5 Socioeconomics.
Alternatives	Costs and tolls: Estimate contribution toward road maintenance and operational costs from anticipated tolls for the alternatives. Develop an estimate of traffic levels for each alternative, estimate how much money would be generated by a toll that would allow for a comparison among reasonable alternatives.	Cost and toll information is relevant to understanding use of the road if it were a public road; it would address impacts of cost to the public. However, none of the action alternatives includes a public road.	The missing information is not essential to a choice among alternatives because all alternatives would operate similarly regarding costs and tolls.	The BLM obtained additional information on costs and fees to mining companies and clarified multiple details regarding who would be allowed to use the industrial road, and incorporated it into the EIS. Traditional per-vehicle tolls are not proposed.	Section 2.4.3	Section 2.4.3
Phys	What are the cost impacts of NOA on annual maintenance? Develop order of magnitude cost estimates.	Information about use of asbestos-containing construction and maintenance materials is relevant to understanding the impact of asbestos of road users and others in the area. Breathing asbestos is a known health risk.	Information about the use of asbestos-containing construction and maintenance materials is not essential to a choice among action alternatives, because all would traverse areas of known NOA concentration. The information may be essential in a choice between No Action and any action alternative.	The BLM obtained further information from the applicant about its plans regarding the use, developed mitigation measures to address NOA, and incorporated them into the EIS.	3.2.1 Geology; 3.2.2 Sand and Gravel; 3.2.3 Hazardous Waste; 3.2.5 Water; 3.2.7 Air Quality; 3.3 Biological Resources; 3.4.5 Communities/Public Health; 3.4.7 Subsistence. Health Impact Assessment (on BLM ePlanning project website)	3.2.1 Geology; 3.2.2 Sand and Gravel; 3.2.3 Hazardous Waste; 3.2.5 Water; 3.2.7 Air Quality; 3.3 Biological Resources; 3.4.5 Communities/Public Health; 3.4.7 Subsistence. Health Impact Assessment (on BLM ePlanning project website)
Alternatives	"Order of magnitude" cost differences for building and maintaining roads in areas with natural occurrences of asbestos (NOA), as well as those without.	Information about use of asbestos-containing construction and maintenance materials is relevant to understanding the impact of asbestos of road users and others in the area. Breathing asbestos is known health risk.	Information about the use of asbestos-containing construction and maintenance materials is not essential to a choice among action alternatives, because all would traverse areas of known NOA concentration. The information may be essential in a choice between No Action and any action alternative.	The BLM obtained further information from the applicant about use of asbestos-containing materials and mitigation measures designed to prevent exposure to asbestos in road dust and washing off the road. Because cost is a risk borne by the applicant, the cost differences of construction with NOA vs. non-NOA are not essential for the EIS.	3.2.1 Geology; 3.2.2 Sand and Gravel; 3.2.3 Hazardous Waste; 3.2.5 Water; 3.2.7 Air Quality; 3.3 Biological Resources; 3.4.5 Communities/Public Health; 3.4.7 Subsistence. Health Impact Assessment (on BLM ePlanning project website)	3.2.1 Geology; 3.2.2 Sand and Gravel; 3.2.3 Hazardous Waste; 3.2.5 Water; 3.2.7 Air Quality; 3.3 Biological Resources; 3.4.5 Communities/Public Health; 3.4.7 Subsistence. Health Impact Assessment (on BLM ePlanning project website)

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Socio	How will emergencies be handled? Who will pay for these services? How much will these services cost? Conduct additional stakeholder outreach/ interviews (e.g., clarifying with Alaska State Troopers on per-trooper cost).	Emergency services are relevant to public health and safety issues on the road and in nearby communities, although significant impacts are not likely.	Specific information about emergency services is not essential to a choice among alternatives, because all alternatives would be treated the same.	Not applicable because not essential. The BLM requested and received further information and clarification from the applicant regarding proposed security and safety issues and incorporated it into the EIS.	2.4.3; 3.4.5	2.4.3; 3.4.5
Cumult	Assessment of existing transportation infrastructure and whether it can accommodate foreseeable increases in traffic. Conduct analysis of transportation infrastructure and foreseeable increases.	Information about the capacity and impacts on existing transportation infrastructure is relevant to understanding cumulative impacts.	The information is not essential to a choice among action alternatives, because the changes to capacity would be very similar for all action alternatives, but could be essential to a choice between No Action and any action alternative.	The BLM estimated road and rail traffic over time based on mining development scenario, in lieu of a specific mining development proposal, and used it in the EIS.	Appendix H, 3.4.	Appendix H, 3.4.
Phys	Preliminary terrain unit maps are needed to evaluate preliminary alignments.	Geological and geotechnical data is relevant to the specific road alignment and design footprint.	Terrain unit mapping is not essential for determining impacts of the road or to a choice among alternatives. Information about the underlying geology could help determine construction needs and costs to construct. Because cost is a risk borne by the applicant, the cost differences of construction are not essential.	Not applicable because not essential. However, the BLM collected existing terrain mapping to the extent it was available, and it used it in the EIS. Permafrost and naturally occurring asbestos were the primary 'geologic' topics addressed in the EIS for impact and are not directly related to terrain unit mapping.	EIS 3.2.1	EIS 3.2.1
Socio	An economic analysis model is suggested for the current set of alternatives with newer data. The analysis of economic linkages is based on old data.	Economic information about the project is relevant to economic benefits and adverse impacts.	Information about the economics of the mines may be essential to a choice between No Action and any action alternative, because indirect economic benefits are the primary driver of the project. Information about the economics of the road are not essential to a choice among alternatives, because (1) the financial risks fall to the applicant, and (2) all alternatives would be treated the same. Still the information is important to distinguishing the costs of the alternatives	The BLM requested and obtained an updated economic report from the applicant (through the UA Center for Economic Development) and used it in the EIS.	EIS 3.4.5; Appendix H 3,5,5	EIS 3.4.5; Appendix H 3,5,5

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Socio	Numerous scoping comments asked about the costs vs. benefits of the project. Conduct a cost-benefit analysis.	A cost-benefit analysis is most relevant if public funds were being used; otherwise, the costs accrue to the applicant and investors.	The missing information is not essential to a choice among alternatives, because it is more about whether the project 'pencils out' for the applicant than it is about impacts to the human environment.	Not applicable because not essential. The BLM determined that sufficient socioeconomic information was available to evaluate the project and that a cost-benefit analysis was not needed given the financing structure of the proposed project.	EIS 3.4.5; Appendix H 3.5.5	EIS 3.4.5; Appendix H 3.5.5
Socio	Numerous scoping comments called for the need to assess the economic feasibility and a full analysis of project costs in all phases. Request project cost information from AIDEA.	Economic feasibility information is mostly relevant to the applicant and not to impacts. It would be relevant to significant impacts if public funds were proposed to be used.	Economic feasibility information and project costs are basic background information but are not essential to a choice among alternatives, given that the economic risk is not to the public.	Not applicable because not essential. However, the BLM requested and obtained from AIDEA greater information on project costs and project funding mechanisms, and equal information for all three alternatives, and incorporated it into the Final EIS.	2.4.3; 2.4.7	2.4.3; 2.4.7
Socio	Scoping comments included inquiries about how the project would be paid for. How would bonds for the road be paid off if the tolls are not enough? Would bonds be backed by the State? Would tolls be affordable enough for truckers? Where would AIDEA get its money for investment? Inquire with AIDEA about project financing.	Economic feasibility information is mostly relevant to the applicant and not to impacts. It would be relevant to significant impacts if public funds were proposed to be used.	Economic feasibility information and project costs are basic background information but are not essential to a choice among alternatives, given that the economic risk is not to the public.	Not applicable because not essential. However, the BLM requested and obtained from AIDEA greater information on project costs and project funding mechanisms, and equal information for all three alternatives, and incorporated it into the Final EIS	2.4.3; 2.4.7	2.4.3; 2.4.7
Socio	Scoping comments included questions about the direct and indirect economic impacts of the project. Running an economic model, such as IMPLAN, could provide a snapshot to estimate jobs and income effects of construction and other socioeconomic factors.	IMPLAN models could be relevant to determining economic effects of the project and of the indirect mining that may be induced by the project. Some of these impacts could be significant.	The results of an IMPLAN modeling exercise could be essential to a choice among alternatives if it showed substantial differences in economic effects.	The BLM required the applicant to provide further economic information, and this included IMPLAN modeling of the road and mines. The internal EIS team also used similar techniques to compare alternatives. The information is included in the EIS.	EIS 3.4.5; Appendix H 3.5.5	EIS 3.4.5; Appendix H 3.5.5
Socio	Scoping comments included questions about job creation, such as the types and numbers of jobs during construction and supporting the road. Consideration of local hire was commonly asked about during scoping. Inquire with AIDEA and others about the types and numbers of jobs anticipated.	Jobs are a relevant socioeconomic effect of a project.	The number of jobs could be essential to a choice among alternatives if they showed substantial differences in economic effects among alternatives.	The BLM requested and obtained an updated economic report from the applicant (through the UA Center for Economic Development) and used it in the EIS.	EIS 3.4.5; Appendix H 3.5.5	EIS 3.4.5; Appendix H 3.5.5

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Bio	The NWI classification system is the USACE standard for analyzing impacts to wetlands, and the lack of NWI attributes represents a data gap.	Wetland data/mapping is relevant to understanding wetlands in the project area and relevant to wetland and waters impacts, which could be significant. Relevance is particularly high for USACE and its jurisdiction over waters.	Comparable data are essential to treating Alternative C the same as A and B and therefore are essential to a choice among alternatives.	The BLM required the applicant to provide the best available wetland mapping for Alternative C and for missing segments of A and B, and incorporated it into the EIS	3.3.1, and Volume 4 Maps.	3.3.1, and Volume 4 Maps.
Phys	Limited baseline data exist for discharge of the water courses in the region. Some USGS data exist for Koyukuk at Hughes, Jim River at Bettles, Dahl Creek near Kobuk, and Kobuk River at Ambler. It is assumed that there were some estimates of baseline flow in the applications for the Wild and Scenic designations of several rivers in the area, though records could not be found. USGS regression equations exist for several regions of Alaska and have been published in 2003 and 2016 versions. Existing baseline data can be compared to regression equations to determine the suitability of their use for estimating flow volumes. Stages or rating curves would need to be developed for individual crossing locations, with attention paid to development of aufeis, ice jams, and seasonal flooding (annual breakup). A recommendation was made that the field assessment of aufeis extent to be performed prior to breakup.	Baseline stream flow data may be relevant to understanding stream dynamics and potential for flooding, and related to culvert sizing, bridge pier spacing, and other design issues. Flooding and aufeis development are relevant to potential significant adverse impacts but would be addressed using standard engineering practices during design.	Stream flow data and ice formation data are not essential to a choice among alternatives. Flooding and aufeis issues are present for every action alternative, although the extent and cost impacts may differ by alternative length and number of waterbody crossings. Standard hydraulic and hydrologic engineering design practices exist to avoid and minimize impacts and would be addressed in the same fashion for each alternative.	Not applicable because not essential. Collecting reasonable data regarding flow and discharge of study area streams and rivers would require at least one year and more likely multiple years. Considering the cumulative length of the alternatives (some 500 miles) and numbers of streams in the hundreds, the time and cost was determined exorbitant. The BLM collected existing data.	3.2.5	3.2.5
Phys	Very little data exist (on an area-wide basis) on water quality of lakes and rivers in the region. There are limited USGS data collected on a variety of parameters for the locations listed above under Water Resources Quantity. Identification of additional data sources of water quality such as Alaska Department of Natural Resources' Alaska Groundwater Database, Streams Data, Water Reservations, other scientific journal data from past studies, National Park Baseline assessments, and past studies by the USFWS. A recommendation was made to collect necessary water quality data in a field investigation. The recommendation included baseline sampling, focusing on metals, be performed at water bodies along each alternative.	Baseline water quality data would relevant to understanding changes to water quality, including naturally high levels of metals/acidity that may occur. However, it was determined to be reasonable to assume that baseline water quality is natural and good in this principally undeveloped study area.	Water quality data are not essential to a choice among alternatives. Standard hydraulic and hydrologic engineering design practices exist to avoid and minimize impacts related to construction and erosion-related water quality, and these would be addressed in the same fashion for each alternative. The risks to water quality from operations (e.g., potential spills) would be of the same type for all alternatives.	Not applicable because not essential. Collecting field data regarding water quality on study area streams and rivers was determined exorbitant. The BLM collected existing data to the extent possible. It was determined reasonable to assume water quality in the study area's mostly-undeveloped watersheds is good, and baseline data can be collected during design and construction.	3.2.5	3.2.5

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Cumulative	Determine whether costs of subsistence may increase if subsistence hunters have to go further out due to disturbance. Determine what data might be available to address this topic	Subsistence hunting patterns and costs may be relevant to determining impacts to subsistence, which could be significant.	Subsistence hunting patterns and costs could be essential to a choice among alternatives if they showed substantial differences among alternatives. However, the general types of impacts to subsistence are expected to be very similar across alternatives.	The BLM contracted with subsistence experts to research and document subsistence patterns and costs. The efforts was based on existing data and costs were dealt with qualitatively, but the best available data was used.	Appendix L; EIS 3.4.7; Appendix H 3.5.7	Appendix L; EIS 3.4.7; Appendix H 3.5.7
Socio	Additional research and Traditional Knowledge (TK) compilation/documentation would be required to identify TK relevant to the project. The data gap related to the identification or documentation of project-specific TK could be addressed through review of existing TK sources and conducting TK workshops in selected communities. Holding TK workshops in communities with knowledge of the project area (i.e., communities that are in proximity to or have use areas overlapping the project area) would address the TK data gap.	Traditional knowledge is relevant to multiple resource impact categories, particularly wildlife and subsistence topics. Wildlife and subsistence effects have potential to be significant.	Traditional knowledge is not essential to a choice among alternatives but is important information for consideration and understanding of impacts and during development of mitigation plans.	The BLM conducted multiple government-to-government and cultural resources meetings at communities in the area and collected TK through these means, through formal subsistence study, and through scoping and public comment on the Draft EIS.	3.4.5; 3.4.7;	3.4.5; 3.4.7;