

**PEBBLE PROJECT**  
**FINAL ENVIRONMENTAL IMPACT STATEMENT**  
**VOLUME 2: CHAPTER 3**  
**JULY 2020**

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## 3.0 AFFECTED ENVIRONMENT

### 3.1 INTRODUCTION TO AFFECTED ENVIRONMENT

Chapter 3, Affected Environment, describes the existing environment that would be affected by the proposed project and alternatives under consideration in this Environmental Impact Statement (EIS). This chapter is intended to help readers and agency decision-makers find the information they need to evaluate the affected environment and to understand the impacts and consequences discussed in Chapter 4, Environmental Consequences. Each Chapter 3 section (Section 3.2 through Section 3.26) has a corresponding section in Chapter 4 (Section 4.2 through Section 4.26).

Each resource section in Chapter 3 (Section 3.2 through Section 3.26)<sup>1</sup> discusses:

- The area of analysis (see “Scope of Analysis” below)
- The overall existing condition of the resource, including the natural and physical environment
- The types of potential impacts typically associated with the project, and the alternatives for that resource

The project is discussed in Chapter 3 and Chapter 4 by its four major components. See Chapter 2, Alternatives, for detailed descriptions of differences between alternatives. Note that the action alternatives in Chapter 3 and Chapter 4 are referred to by name without including the word “action” in front. Project components include:

- **Mine Site**—Includes the footprint at the mine site (minus milepost 24-29 of the mine access road, which is included in the transportation corridor).
- **Transportation Corridor**—Includes the footprint of access roads (including milepost 24-29, which overlaps with the mine site footprint), spur roads, ferry terminals, ferry route, and all associated infrastructure. The transportation corridor footprint varies between the action alternatives.
- **Port**—Includes the footprint of the port, dock, all associated infrastructure, navigation aids, and lightering locations. There are two port locations. Alternative 1a and Alternative 1 include the Amakdedori port site. Alternative 2 and Alternative 3 include the Diamond Point port site.
- **Natural Gas Pipeline Corridor**—Includes the pipeline route and all associated infrastructure from the Kenai Peninsula across Cook Inlet to the mine site. The natural gas pipeline corridor footprint varies between the action alternatives.

#### 3.1.1 Other Resources

The National Environmental Policy Act (NEPA) provides the lead agency with discretion to determine which categories of resources merit detailed analysis and which categories do not, based on the scoping process. This determination and impacts to resources that did not warrant detailed analysis are briefly addressed in Section 4.1, Introduction to Environmental Consequences. In addition, although a resource category may not have warranted detailed

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<sup>1</sup> Note that in Chapter 3 and Chapter 4, waters of the US (WOUS) as defined under the Clean Water Act and determined to be jurisdictional under US Army Corps of Engineers (USACE) authority (see Appendix J for the Preliminary Jurisdictional Determination from USACE) are discussed collectively with wetlands and other waters; all WOUS, wetlands, or other waters are together termed “wetlands and other waters.” The term WOUS may appear in Chapter 3 and Chapter 4 under specific regulatory context.

discussion in a separate section of the EIS, the EIS may still discuss impacts to or aspects of the resource in connection with other resources. This is particularly the case where the resource has relevance to US Army Corps of Engineers (USACE) public interest review. Table 3.1-1 identifies these resource categories and where their environmental consequences are addressed elsewhere in this EIS. Note that affected environment for resources not specifically discussed in Section 3.2 through Section 3.26 is discussed along with environmental consequences in Section 4.1, Introduction to Environmental Consequences.

Chapter 4 also includes Section 4.27, Spill Risk. There is no corresponding section in Chapter 3, because spill risk would be considered an environmental consequence to the resources discussed in Section 3.2 through Section 3.26. Although many environmental protections and precautions would be built into the mine design and operations, including mitigation measures and spill and emergency response plans, concern was expressed about spills during scoping. Detailed analysis on fate and behavior, historical data, existing response capacity, mitigation, and scenarios on diesel spills, natural gas releases from the natural gas pipeline, copper-gold ore concentrate spills, chemical reagent spills, bulk and pyritic tailings release, and untreated contact water release, are analyzed in Section 4.27, Spill Risk.

**Table 3.1-1: Chapter 3 and Chapter 4 Section Resource Discussion Location**

<b>USACE Public Interest Review Factor</b>	<b>Location</b>
Conservation	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Economics	Section 3.3 and Section 4.3, Needs and Welfare of the People—Socioeconomics
Aesthetics	Section 3.11 and Section 4.11, Aesthetics
General environmental concerns	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Wetlands	Section 3.22 and Section 4.22, Wetlands and Other Waters/Special Aquatic Sites
Historic properties	Section 3.7 and Section 4.7, Cultural Resources*
Fish	Section 3.24 and Section 4.24, Fish Values
Wildlife values	Section 3.23 and Section 4.23, Wildlife Values
Soils	Section 3.14 and Section 4.14, Soils
Flood hazards	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Floodplain values	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Land use inclusive of subsistence subset	Section 3.2 and Section 4.2, Land Ownership, Management, and Use, and Sections 3.9 and 4.9, Subsistence
Navigation	Section 3.12 and Section 4.12, Transportation and Navigation
Shore erosion and accretion	Subsection in Section 3.16 and Section 4.16, Surface Water Hydrology
Recreation	Section 3.5 and Section 4.5, Recreation
Water supply and conservation	Subsection in Section 3.17 and Section 4.17, Groundwater Hydrology
Water quality	Section 3.18 and Section 4.18, Water and Sediment Quality

**Table 3.1-1: Chapter 3 and Chapter 4 Section Resource Discussion Location**

<b>USACE Public Interest Review Factor</b>	<b>Location</b>
Energy needs	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Safety	Section 3.10 and Section 4.10, Health and Safety
Food and fiber production	Section 3.21 and Section 4.21, Food and Fiber Production
Mineral needs	Both affected environment and environmental consequences are discussed in Section 4.1, Introduction to Environmental Consequences
Considerations of property ownership	Section 3.2 and Section 4.2, Land Ownership, Management, and Use
Needs and welfare of the people	Section 3.3 and Section 4.3, Needs and Welfare of the People—Socioeconomics
Noise	Section 3.19 and Section 4.19, Noise

Note: This table does not list every resource discussed in Chapter 3 and Chapter 4. Additional sections include: Section 3.4 and Section 4.4, Environmental Justice; Section 3.6 and Section 4.6, Commercial and Recreational Fisheries; Section 3.13 and Section 4.13, Geology; Section 3.15 and Section 4.15, Geohazards; Section 3.20 and Section 4.20, Air Quality; Section 3.25 and Section 4.25, Threatened and Endangered Species; and Section 3.26 and Section 4.26, Vegetation.

\*Section 3.8 and Section 4.8 were separate sections in the DEIS titled Historic Properties. Content in Section 3.8 has been combined with Section 3.7 in the Final EIS (FEIS) and titled Cultural Resources. Content in Section 4.8 has been combined with Section 4.7 and titled Cultural Resources.

Source: USACE 2017

## 3.1.2 Scope of Analysis

### 3.1.2.1 EIS Analysis Area

The EIS analysis area refers to the entire area of resource analysis, which is specific to each resource discussed in Section 3.2 through Section 3.26. Although the EIS analysis area can be delineated based on the physical footprint of the action alternatives, potential resource impacts are considered in a spatial context appropriate to each resource. The EIS analysis area is defined in each Chapter 3 and Chapter 4 section.

The EIS analysis area is provided to assist USACE in evaluating reasonably foreseeable adverse effects on the human environment per Council on Environmental Quality (CEQ) guidance. The EIS analysis area considers the scope of analysis in the USACE review of all standard public interest review factors in context to determine significance (USACE 2017, Memorandum for Record, Subject: Determination to conduct an environmental impact statement level of analysis for Department of the Army Permit Application POA-2017-271, lead agency determination, and scope of analysis).

In addition, for certain resources, Chapter 3 summarizes supplemental affected environment information downstream of EIS analysis areas to allow impact assessment of spill scenarios in Section 4.27, Spill Risk.

The project area refers to the exact project footprint for each action alternative.

### 3.1.2.2 Project Location and Watersheds

This section provides a general overview of the proposed project location and the US Geological Survey (USGS) watersheds in the Bristol Bay drainage and the Cook Inlet drainage. Detailed information on the project physical setting is provided in various Chapter 3 resource sections. Hydrology is discussed in Section 3.16, Surface Water Hydrology, and Section 3.24, Fish Values. Detailed information on climate and meteorology is provided in Section 3.20, Air Quality. Detailed



information on land cover is discussed in Section 3.22, Wetlands and Other Waters/Special Aquatic Sites, and Section 3.26, Vegetation.

The proposed mine site is approximately 200 miles southwest of Anchorage. The communities of Iliamna, Newhalen, and Nondalton are each approximately 17 miles from the proposed mine site. The proposed project is in two major watersheds: the Bristol Bay watershed, and the Cook Inlet watershed.

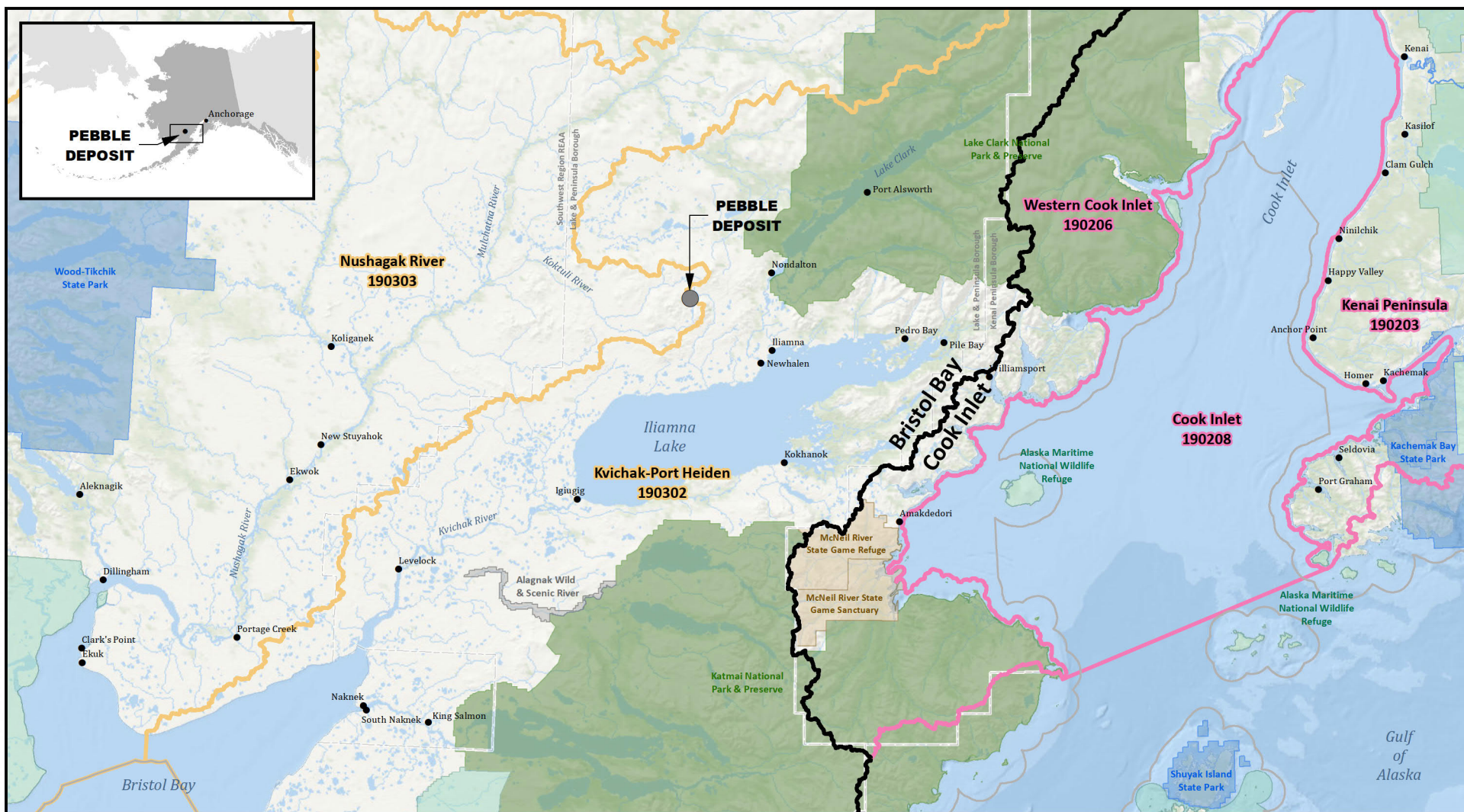
A watershed is defined as the area of land drained by a river and its tributaries. The US is divided and sub-divided by watershed into successively smaller hydrologic unit codes (HUCs) that are arranged or nested in one another. Each hydrologic unit is identified by a unique HUC consisting of two to eight digits, based on the four levels of classification in the hydrologic unit system (USGS 1999). The proposed project is in southwest Alaska in Alaska Region watershed HUC 19 (first-level classification, or HUC 2) in HUC 1903 (Southwest Alaska) and HUC 1902 (Southcentral Alaska) (second-level classification, or HUC 4) (USGS 2018e). The Southwest and Southcentral Alaska HUC 4 level watersheds are further broken down into HUC 6 level watersheds (third-level classifications).

The Bristol Bay watershed and the Cook Inlet watershed are discussed and referred to in Chapter 3. The area of analysis is defined in each resource section in Section 3.2 through Section 3.26 as the EIS analysis area (see definition above). The EIS analysis area may vary from USGS mapping of HUC 6 level watersheds. Figure 3.1-1 depicts the HUC level 6 watersheds that occur in either the Bristol Bay watershed or the Cook Inlet watershed that the proposed project would occur in, for reference.

The Bristol Bay watershed (including the Kvichak and Nushagak rivers) occurs in a portion of HUC 1903. The Bristol Bay watershed includes the proposed mine site and the western portions of the transportation corridor and natural gas pipeline up to where these components cross into HUC 1902. The mine site would be primarily in HUC 190303 (Nushagak River) (third-level classification, or HUC 6). A small portion of the mine site and the HUC 1903 portions of the transportation corridor and natural gas pipeline components (including overland, buried, ferry routes, or subsea routes) would be in HUC 190203 (Kvichak-Port Heiden) (third-level classification, or HUC 6) (USGS 2018e).

The Cook Inlet watershed (including the Cook Inlet) occurs in a portion of HUC 1902. The Cook Inlet watershed includes the proposed port location (for Alternative 1, Amakdedori port site; for Alternative 2 and Alternative 3, Diamond Point port site) and the eastern portions of the transportation corridor and natural gas pipeline corridor that would occur in HUC 1902. The port sites (both Amakdedori port site and Diamond Point port site) would occur in HUC 190206 (Western Cook Inlet) (third-level classification, or HUC 6). The transportation corridor and natural gas pipeline corridor components (including overland routes, undersea routes, and navigation aids) would occur in HUC 190208 (Cook Inlet) (third-level classification, or HUC 6). A portion of the natural gas pipeline component would occur on the Kenai Peninsula at the start of the natural gas pipeline in HUC 190203 (Kenai Peninsula) (third-level classification, or HUC 6).

Figure 3.1-1 depicts the Bristol Bay watershed and the Cook Inlet watershed, delineated by HUC 6 watersheds (USGS 2018e).



Sources: PLP 2018d; ADNRR; USGS 2018e



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10 0 10 20  
Miles

- Pebble Deposit
- ~ Bristol Bay/Cook Inlet Drainage Basin Divide
- Borough Boundary
- Three Nautical Mile Line
- Bristol Bay Watershed
- Cook Inlet Watershed
- Alaska State Park
- Wild and Scenic River
- National Park
- State Game Refuge/Sanctuary
- National Wildlife Refuge

PEBBLE PROJECT EIS

BRISTOL BAY AND COOK INLET WATERSHEDS

FIGURE 3.1-1

### 3.1.3 Resource Interrelationships

Although resources are discussed in Chapter 3, and the impacts on those resources are analyzed in Chapter 4 in discrete sections; these resources are dynamic and interrelated. A change to one resource can have cascading or synergistic impacts to other resources.

The site of the proposed project and the nature of open-pit mining activity would lead to a complex interaction between groundwater, surface water, and a number of water-related resources. The proposed project would also lead to a complex interaction between the above-mentioned water-related resources and fish and aquatic resources. Impacts to water, fish, and wildlife resources could in turn have impacts on subsistence or commercial fishing resources; for example, water quality may affect fish populations, which in turn may influence subsistence or commercial fishing harvests, and can have implications for other human outcomes such as health and socioeconomics. Impacts described in one section may depend on the analysis from another section. During the writing process, preparers collaborated by sharing data and discussing interrelated aspects of the analyses to better capture the interrelated nature of environmental resources in both Chapter 3 and Chapter 4.

### 3.1.4 Traditional Ecological Knowledge

The people of the region have lived there for centuries and have developed a unique culture that evolved from the environment. Their knowledge base has evolved through a system of learned experience, through direct observations, and through trial and error. In recent decades, Alaska Natives have been promoting their complex bodies of knowledge and understanding to be recognized by state and federal agencies regarding climate change, flooding and erosion, surface/groundwater hydrology, landscapes, fish and wildlife life histories and migratory patterns, and seasonal distributions/use of subsistence resources. This traditional ecological knowledge (TEK) is just as important as modern means of transportation and hunting technology in supporting safe and efficient subsistence harvest activities. TEK is a culturally significant accumulation of data acquired over thousands of years, with a vast depth and breadth of knowledge.

USACE has taken the following approach to incorporating TEK into this EIS:

- Reviewing scoping comments for relevant TEK.
- Reviewing comments on the Draft EIS (DEIS) for relevant TEK.
- Reviewing pertinent sections of the Environmental Protection Agency (EPA) Watershed Assessment (An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska, EPA 2014).
- Reviewing pertinent sections of the Pebble Environmental Baseline Document (EBD) Chapter 23, Subsistence (SRB&A 2011b) to identify any relevant material that can be considered TEK and attributed to an individual or a tribal organization.
- Reviewing Alaska Department of Fish and Game (ADF&G) technical papers that incorporate traditional knowledge into the methodology.
- Reviewing meeting notes from government-to-government meetings for relevant TEK, as appropriate.
- Reviewing meeting notes from National Historic Preservation Act Section 106 consultations.



Specific topics that USACE considered for inclusion as TEK include:

- Information on surface/groundwater hydrology and water quality in the project area (including areas with a high water table and variations in stream flow and underlying causes, timing of breakup, and freeze-up, and areas where water quality might be affected by natural and human-made causes).
- Information on location, frequency, and trends with regard to natural hazards such as flooding, erosion, river and lake ice, avalanches, and rockslides.
- Observations of trends, patterns, or changes in weather and climate, including storms, rainfall, and snowpack.
- Information on fish, wildlife, birds, and marine mammals in the EIS analysis area, including distribution and seasonal presence, population trends, migration patterns, habitat areas, behavior, and changes over time.
- Information on the vegetation in the EIS analysis area, including species used for subsistence, areas of occurrence, and changes over time.
- Important areas, access routes, and seasons of subsistence activity, use and sharing of subsistence resources, and changes over time.
- Culturally important areas in the project area from a historic and contemporary perspective.
- Areas being used by local guides and commercial operators for sport fishing, hunting, and wildlife viewing that could be directly or indirectly impacted by the project, and changes to those areas over time.
- Information important to navigation in the project area.
- Information on where residents are collecting surface water for residential use.

TEK has been incorporated into relevant resource sections. Collected TEK information can be found in Appendix K3.1.

### 3.1.5 Climate Change

Climate change has the potential to result in environmental impacts relevant to the proposed project and its alternatives in three primary ways (AECOM 2018p):

1. Effects of the project on climate change. This category addresses the effect of the proposed action on climate change as indicated by greenhouse gas (GHG) emissions, per the CEQ 2014 Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and Climate Change in NEPA Reviews (CEQ 2014), per rescission of the 2016 Final Guidance on Greenhouse Gases and Climate Change.
2. Effects of climate change on the project area. This category addresses the implications of climate change for the environmental effects of the proposed action; or in other words, examines the impacts of climate change on a proposed action that could affect sensitive populations or environmental resources (CEQ 2014). Climate change as a cumulative effect is considered under this category, per CEQ 1997 Considering Cumulative Effects under the NEPA (CEQ 1997b) and CEQ 2014.
3. Effects of climate change on proposed project infrastructure. This category addresses the effects on the proposed project infrastructure from climate change, and considers accounting for potential climate change effects on a proposed action over the course of its anticipated useful life, especially in areas that may be vulnerable to specific effects of climate change, per CEQ 2014.

This EIS addresses these three ways in the following locations:

1. Project-caused GHG emissions are discussed and analyzed in Section 4.20, Air Quality.
2. Climate change trends are integrated into discussion if appropriate to the resource in Section 3.2 through Section 3.26 (Affected Environment). Climate change as a cumulative effect is discussed in a subsection if appropriate to the resource in Section 4.2 through Section 4.27 (Environmental Consequences).
3. Climate change effects on proposed project infrastructure are addressed if appropriate to the resource in Section 4.2 through Section 4.27 (Environmental Consequences).

### **3.1.6 Incomplete and Unavailable Information**

The process of data gap analysis for the DEIS was detailed in a technical memorandum (AECOM 2018q, Pebble Project—Final Data Gap Analysis). For each data gap, the process of applying CEQ guidance questions to determine if data were required for analysis was described. The CEQ regulations in 40 Code of Federal Regulations (CFR) Part 1502.22 provide direction on how to address incomplete information, which are referred to as “data gaps” in the memo. These specific regulations need to be viewed in concert with other CEQ NEPA regulations; including, for example, 40 CFR Part 1502.24, which covers methodology and scientific accuracy.

The CEQ regulations make it clear that when there is incomplete or unavailable information for the evaluation of reasonably foreseeable significant adverse effects, the federal agencies “shall always make clear that such information is lacking.”

The CEQ regulations at 40 CFR Part 1502.22(a) instruct that if incomplete information: 1) is relevant to reasonably foreseeable significant adverse impacts; 2) is essential to a reasoned choice among alternatives; and 3) the overall costs of obtaining it are not exorbitant, the agency shall include the information in the EIS. This documentation complies with 40 CFR Part 1502.22(b)(1-4) requirements that the agency shall include in the EIS:

- (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 that is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment.
- (4) USACE’s evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

Comments received during scoping and during the public comment period for the DEIS raised concerns that some data are not current because of the age of data or studies, or because significant Pebble Limited Partnership (PLP) data collection efforts were conducted several years ago. Data gap screening information for the Final EIS (FEIS) is provided in Table 3.1-2. The FEIS data gap analysis considers the age of the data, the sufficiency of the data in terms of quality and quantity, and whether these factors meaningfully affect the evaluation of impacts.

**Table 3.1-2: Data Gaps Screening**

Missing Information Screening Questions (40 CFR Part 1502.22)	Data Gap and Responses
<b>Missing Information Screening Questions (40 CFR Part 1502.22)</b>	<p><b>Data Gap: Subsistence</b></p> <p>Comprehensive subsistence data collected from 2004 through 2011 by SRB&amp;A and the ADF&amp;G Division of Subsistence are available in the EBDs and as part of the ADF&amp;G Division of Subsistence Technical Paper Series. Data collected by ADF&amp;G Division of Subsistence for two Kenai Peninsula communities for 1998 and 2014 are also included in the EIS. However, more recent comprehensive subsistence data for these communities have not been collected and made available. Although subsistence data coverage is extensive for the Bristol Bay drainage, unavailable, older, or limited data sets for project area communities are acknowledged in the “Affected Environment” section (Chapter 3) and Appendix K (Technical Appendices) as known data gaps.</p>
Essential to a reasoned choice among the alternatives?	<p>It is common that current and site-specific information on subsistence use activities and areas is not available for a proposed project during NEPA compliance. However, data available in the Pebble Project EBDs and from the ADF&amp;G provide fairly comprehensive coverage of the proposed mine site locations and transportation routes. Changes may occur in the area and intensity of subsistence activity as the location of resources changes and as needs change, but such change typically occurs in a larger area historically used by a community, and is documented in available information. In addition, there is anecdotal information from scoping comments regarding use of some areas, such as in the vicinity of the Amakdedori port site. Through relying on the existing data sets, considering the anecdotal information from scoping comments, and allowing for some evolution of use areas and intensity, the available information is adequate for assessing the potential impacts of the proposed action alternatives and variants.</p>
How could missing information be acquired?	<p>PLP would need to hire a contractor that specializes in subsistence study, and state or federal agencies would need to allocate funding and staff members for study. Funds would need to cover travel, lodging, and other expenses for travel to approximately 19 communities.</p>
What would it take to acquire the missing information?	<p>The team, consisting of PLP’s contractor and state or federal staff, would need to travel to approximately 19 communities multiple times to hold scoping meetings; conduct systematic household surveys and mapping interviews with as many year-round households as possible; and hold follow-up meetings to review and discuss the results. The data would then need to be mapped, synthesized, and analyzed. In total, it could take 2 to 6 years to complete.</p>
Relevance to reasonably foreseeable significant adverse impacts	<p>Updated information would provide a more current picture of subsistence use in the immediate vicinity of the mine site, transportation corridor, port, and natural gas pipeline facilities. However, based on the existing information, the analysis of potential impacts assumes that subsistence harvest activities are occurring in these areas, and takes into account the previously documented areas of highest overlapping use, and the historical areas of subsistence harvest and access.</p>

**Table 3.1-2: Data Gaps Screening**

Missing Information Screening Questions (40 CFR Part 1502.22)	Data Gap and Responses
Existing credible scientific evidence	Data collected from 2004 through 2011 by SRB&A and the ADF&G Division of Subsistence for the Applicant are available in the EBDs and as part of the ADF&G Division of Subsistence Technical Paper Series. Data collection coverage includes 17 Bristol Bay drainage communities. Data collected by ADF&G Division of Subsistence for two Kenai Peninsula communities for 1998 and 2014 are also included in the EIS. Although the SRB&A and ADF&G data set for the Bristol Bay drainage communities is now 10 to 15 years old, that is not atypical for available data in much of the state. In addition, the methodology used to identify areas of overlapping subsistence use and document the areas historically used for subsistence harvest by resource for individual communities allows making conservative assumptions for potential impacts that could occur over time.
USACE evaluation of impacts based on selected approach	The EIS acknowledges this data gap for subsistence harvest use areas and rates of harvest/sharing. Although harvest areas and rates change over time, the EIS assumes that they would still follow historical trends, or may be similar enough to adequately address possible impacts.

Notes:

ADF&G = Alaska Department of Fish and Game

EBD = Environmental Baseline Document

EIS = Environmental Impact Statement

NEPA = National Environmental Policy Act

SRB&A = Stephen R. Braund and Associates

Source: AECOM 2018q; Comment Analysis Report, (Appendix D)

## 3.2 LAND OWNERSHIP, MANAGEMENT, AND USE

This section describes the regulatory setting, along with the baseline conditions of land ownership, land management, and existing land use patterns in the Environmental Impact Statement (EIS) analysis area, which is the project footprint for land ownership and management, and adjacent lands for land use. Relevant land use plans are discussed, and land status maps display land ownership for the EIS analysis area (Figure 3.2-1A through Figure 3.2-1E) (see Section 3.5, Recreation; Section 3.7, Cultural Resources; and Section 3.9, Subsistence, for additional details on recreational, cultural, and subsistence uses, respectively).

### 3.2.1 Land Ownership

Land ownership was determined using general land status data, which are accurate to the scale of 1 square mile (i.e., one section), and data of the project footprint (BLM 2019a).

The entire footprint of project alternatives being evaluated in the EIS would be on lands owned by the State of Alaska, or privately owned by individuals or by Alaska Native Claims Settlement Act (ANCSA) Native regional (typically subsurface estate), village corporations (surface estate), or Native Allotments. Land ownership is shown in Table 3.2-1. The acres include temporary impacts. The transportation corridor includes spur roads to communities.

Neither Alternative 1a nor Alternative 1 would bisect any Native Allotments. The Alternative 2 components would bisect five Native Allotments, and Alternative 3 would bisect four. The Diamond Point port and facilities would be on Native Allotments AKAA 4592A and AKAA 4225B under Alternative 2, and Native Allotments AKAA 4225B and AKAA 051014 under Alternative 3. There would be no unconveyed Native Allotments in the EIS analysis area.

Land where the transportation corridor would cross the Newhalen River (all alternatives) is owned by the Iliamna Natives Limited village corporation. Land where the transportation corridor would cross the Gibraltar River (Alternative 1a and Alternative 1) is owned by the Alaska Peninsula Corporation village corporation.

**Table 3.2-1: Land Ownership in Acres**

Owner <sup>1</sup>	Alternative 1a	Alternative 1	Alternative 2	Alternative 3
<b>Mine Site</b>				
State of Alaska	8,390	8,390	N/A	8,390
<i>Downstream Variant</i>				
State of Alaska	N/A	N/A	8,497	N/A
<i>Concentrate Pipeline Variant</i>				
State of Alaska	N/A	N/A	N/A	8,390
<i>Summer Ferry Only Variant</i>				
State of Alaska	N/A	8,425	8,532	N/A
<b>Transportation Corridor</b>				
Cook Inlet Region, Inc.	--	--	7	8
Alaska Peninsula Corporation	295	537	--	121
Iliamna Natives Limited	368	71	368	473
Pedro Bay Corporation	--	51	212	905
Salmatof Native Association, Inc.	--	--	3	3
Seldovia Native Association, Inc.	--	--	51	51



**Table 3.2-1: Land Ownership in Acres**

Owner <sup>1</sup>	Alternative 1a	Alternative 1	Alternative 2	Alternative 3
Tyonek Native Corporation	--	--	119	121
Native Allotment AKA 63274A <sup>2</sup>	--	--	--	>1
Native Allotment AKAA 4592A	--	--	3	--
Native Allotment AKAA 6025B	--	--	6	--
Native Allotment AKAA 51014	--	--	16	13
State of Alaska	1,130	1,139	532	748
Water	--	--	32	24
<i>Kokhanok East Ferry Terminal Variant</i>				
Alaska Peninsula Corporation	N/A	511	N/A	N/A
Iliamna Natives Limited	N/A	71	N/A	N/A
Pedro Bay Corporation	N/A	30	N/A	N/A
State of Alaska	N/A	1,153	N/A	N/A
<i>Summer-Only Ferry Operations Variant</i>				
Cook Inlet Region, Inc.	N/A	--	7	N/A
Alaska Peninsula Corporation	N/A	537	--	N/A
Iliamna Natives Limited	N/A	71	368	N/A
Salamatof Native Association, Inc.	N/A	--	3	N/A
Seldovia Native Association, Inc.	N/A	--	52	N/A
Tyonek Native Corporation	N/A	--	125	N/A
Pedro Bay Corporation	N/A	30	151	N/A
Native Allotment AKAA 4592A	N/A	--	3	N/A
Native Allotment AKAA 6025B	N/A	--	6	N/A
Native Allotment AKAA 51014	N/A	--	25	N/A
State of Alaska	N/A	1,139	532	N/A
Water	N/A	--	41	N/A
<i>Newhalen River North Crossing Variant</i>				
Cook Inlet Region, Inc.	N/A	N/A	7	N/A
Iliamna Natives Limited	N/A	N/A	259	N/A
Salamatof Native Association, Inc.	N/A	N/A	3	N/A
Seldovia Native Association, Inc.	N/A	N/A	51	N/A
Tyonek Native Corporation	N/A	N/A	119	N/A
Pedro Bay Corporation	N/A	N/A	212	N/A
Native Allotment AKAA 4592A	N/A	N/A	3	N/A
Native Allotment AKAA 6025B	N/A	N/A	6	N/A
Native Allotment AKAA 51014	N/A	N/A	16	N/A
State of Alaska	N/A	N/A	532	N/A
Water	N/A	N/A	32	N/A
<b>Amakdedori Port</b>				
State of Alaska	29	29	N/A	N/A
Water	7	13	N/A	N/A

**Table 3.2-1: Land Ownership in Acres**

Owner <sup>1</sup>	Alternative 1a	Alternative 1	Alternative 2	Alternative 3
<i>Pile-Supported Dock Variant</i>				
State of Alaska	N/A	29	N/A	N/A
Water	N/A	6	N/A	N/A
<i>Summer-Only Ferry Operations</i>				
State of Alaska	N/A	57	N/A	N/A
Water	N/A	13	N/A	N/A
<b>Natural Gas Pipeline</b>				
Cook Inlet Region, Inc.	--	--	78	78
Alaska Peninsula Corporation	15	37	--	--
Iliamna Natives Limited	190	--	90	--
Pedro Bay Corporation	--	--	765	--
Salmatof Native Association, Inc.			29	29
Native Allotment AKA 63274A <sup>2</sup>	--	--	5	--
Native Allotment AKAA 4592A	--	--	<1	<1
Private	1	1	1	1
State of Alaska	39	40	138	29
Water	761	738	644	638
<i>Kokhanok East Ferry Terminal Variant</i>				
Alaska Peninsula Corporation	N/A	59	N/A	N/A
Private	N/A	1	N/A	N/A
State of Alaska	N/A	40	N/A	N/A
Water	N/A	751	N/A	N/A
<b>Kenai Compressor Station</b>				
State of Alaska	2	2	2	2
Private	1	1	1	1
<b>Diamond Point Port</b>				
Native Allotment AKAA 4225B	N/A	N/A	51	--
Native Allotment AKAA 051014	N/A	N/A	--	15
Seldovia Native Association, Inc	N/A	N/A	--	18
Tyonek Native Corporation	N/A	N/A	--	3
Water	N/A	N/A	83	92
<i>Pile-Supported Dock Variant</i>				
Native Allotment AKAA 4225B	N/A	N/A	51	N/A
Water	N/A	N/A	79	N/A
<i>Concentrate Pipeline Variant</i>				
Seldovia Native Association, Inc	N/A	N/A	--	18
Tyonek Native Corporation	N/A	N/A	--	3
Native Allotment AKAA 051014	N/A	N/A	--	15
Water	N/A	N/A	N/A	92
<b>Ferry Terminals</b>				

**Table 3.2-1: Land Ownership in Acres**

Owner <sup>1</sup>	Alternative 1a	Alternative 1	Alternative 2	Alternative 3
Alaska Peninsula Corporation	28	35	--	N/A
Iliamna Natives Limited	9	--	9	N/A
Pedro Bay Corporation	--	--	21	N/A
<i>Kokhanok East Ferry Terminal Variant</i>				
Alaska Peninsula Corporation	N/A	18	N/A	N/A
<b>Material Sites</b>				
Alaska Peninsula Corporation	39	72	--	--
Seldovia Native Association, Inc.	--	--	13	13
Tyonek Native Corporation	--	--	29	29
Iliamna Natives Limited	101	9	101	122
Pedro Bay Corporation	--	9	40	266
State of Alaska	239	160	138	175
<i>Kokhanok East Ferry Terminal Variant</i>				
Alaska Peninsula Corporation	N/A	112	N/A	N/A
Iliamna Natives Limited	N/A	9	N/A	N/A
Pedro Bay Corporation	N/A	9	N/A	N/A
State of Alaska	N/A	228	N/A	N/A
<i>Summer-Only Ferry Operations Variant</i>				
Seldovia Native Association, Inc.	N/A	N/A	13	N/A
Tyonek Native Corporation	N/A	N/A	29	N/A
Iliamna Natives Limited	N/A	N/A	101	N/A
Pedro Bay Corporation	N/A	N/A	40	N/A
State of Alaska	N/A	N/A	138	N/A
<i>Newhalen River North Crossing Variant</i>				
Seldovia Native Association, Inc.	N/A	N/A	13	N/A
Tyonek Native Corporation	N/A	N/A	29	N/A
Iliamna Natives Limited	N/A	N/A	119	N/A
Pedro Bay Corporation	N/A	N/A	40	N/A
State of Alaska	N/A	N/A	138	N/A

Notes:

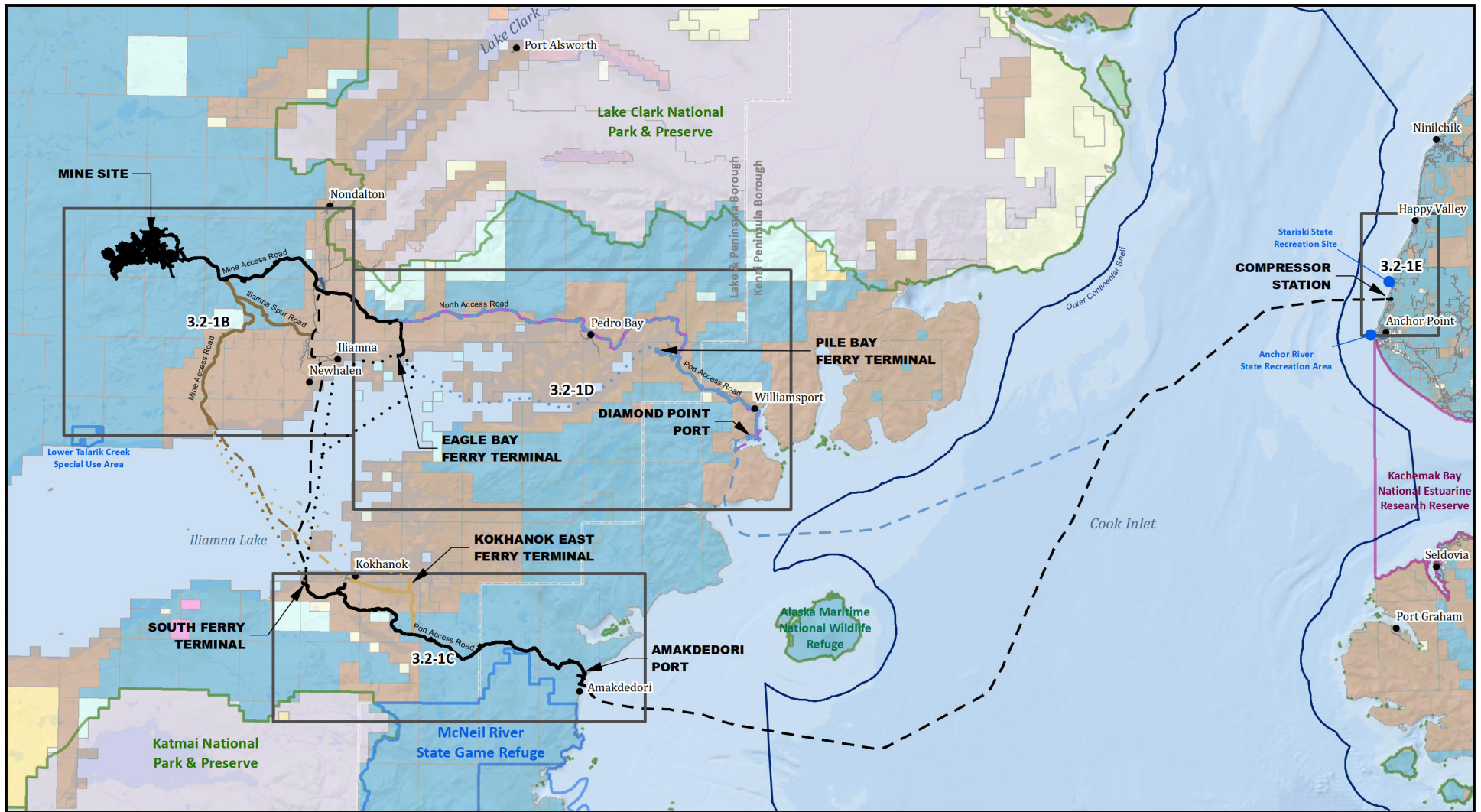
<sup>1</sup>Lands shown as being owned by the State of Alaska include University of Alaska lands

<sup>2</sup>Ownership of Native Allotment AKA 63274A is the Bristol Bay Native Corporation

-- = No lands owned by that entity

N/A = Not applicable

Source: BLM 2019a



Sources: PLP 2020-RF1168; PLP 2019-RF1153; ADNR 2012, 2015, 2017, 2019; BLM 2017, 2019; NERRS 2000; NOAA 2011; USFWS 2017



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5 0 5 10 15  
Miles

Page Index

Administrative Boundaries

Outer Continental Shelf

Borough Boundary

Native Patent, Interim

Conveyed, or Other

Conveyance

State Patent or Tentatively

Approved

Private

Miscellaneous Title

Miscellaneous Withdrawals

Native Selected

State Selected

National Park Service

Military

Fish and Wildlife Service

Bureau of Land Management

Alaska Special Use Lands

Designation

Federal Conservation System

Unit

Kachemak Bay National

Estuarine Research Reserve

Action Alternatives

Ferry Routes

Natural Gas Pipelines

Alternative 1a

Alternative 1

Alternative 1 Kokhanok East

Ferry Terminal Variant

Alternative 2

Alternative 2 Newhalen River

North Crossing Variant

Alternative 3

Other Features

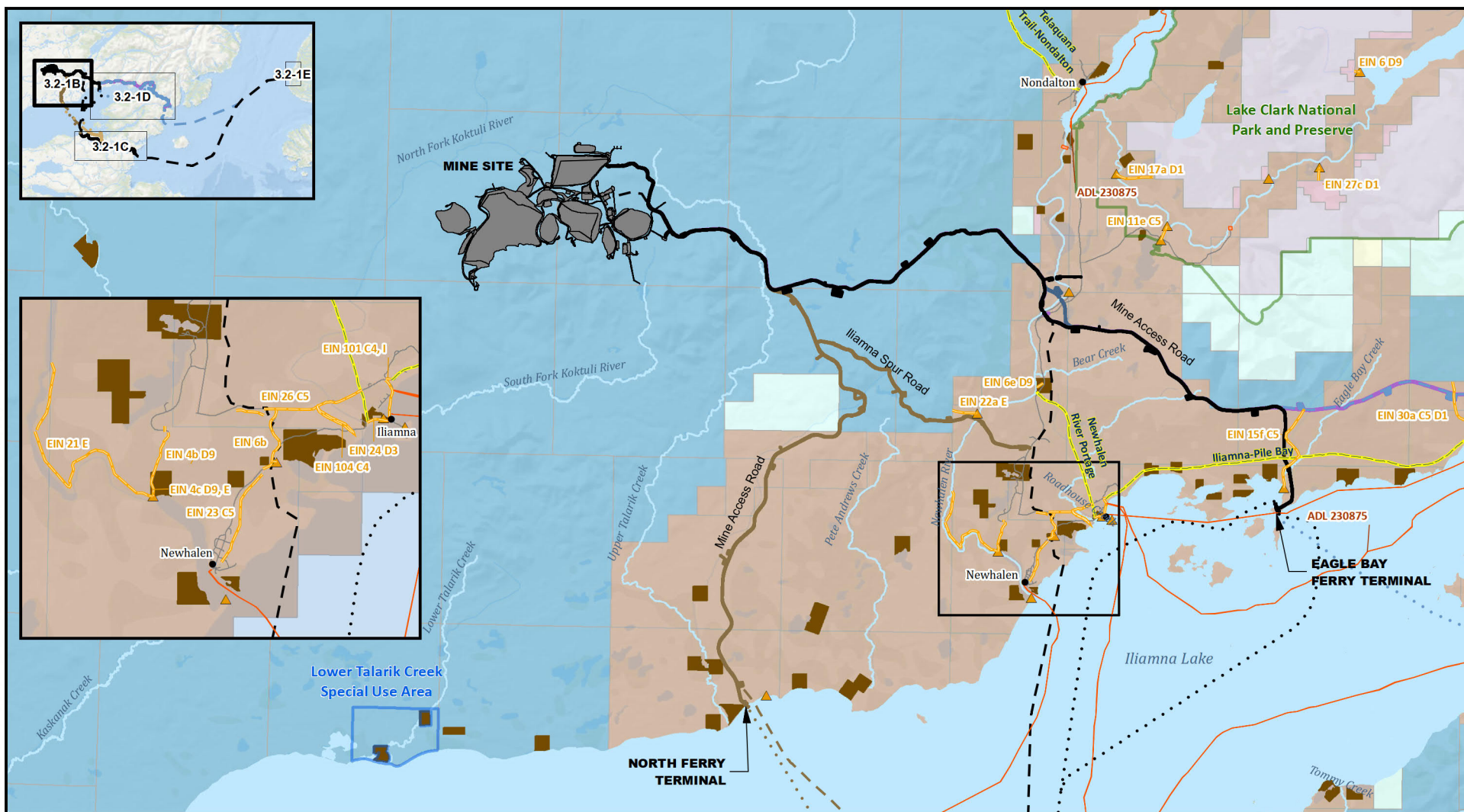
Roads

PEBBLE PROJECT EIS

GENERALIZED  
LAND STATUS  
OVERVIEW MAP

FIGURE 3.2-1A





Sources: PLP 2020-RF1168; PLP 2019-RF1153; ADNR 2012, 2015, 2017, 2019; BLM 2017, 2019; NERRS 2000; NOAA 2011; USFWS 2017



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Miles

#### Administrative Boundaries

- ▲ 17(b) Easement Site
- 17(b) Easement Trail
- RS 2477
- State Easement
- Native Allotment

Native Patent, Interim Conveyed, or Other Conveyance

State Patent or Tentatively Approved

Private

Miscellaneous Title Transfers

Miscellaneous Withdrawals

Native Selected

State Selected

National Park Service

Bureau of Land Management

State Special Use Lands Designation

Federal Conservation System Unit

#### Action Alternatives

--- Ferry Routes

— Natural Gas Pipelines

■ Alternative 1a

■ Alternative 1

■ Alternative 2

■ Alternative 2 Newhalen River

■ North Crossing Variant

■ Alternative 3

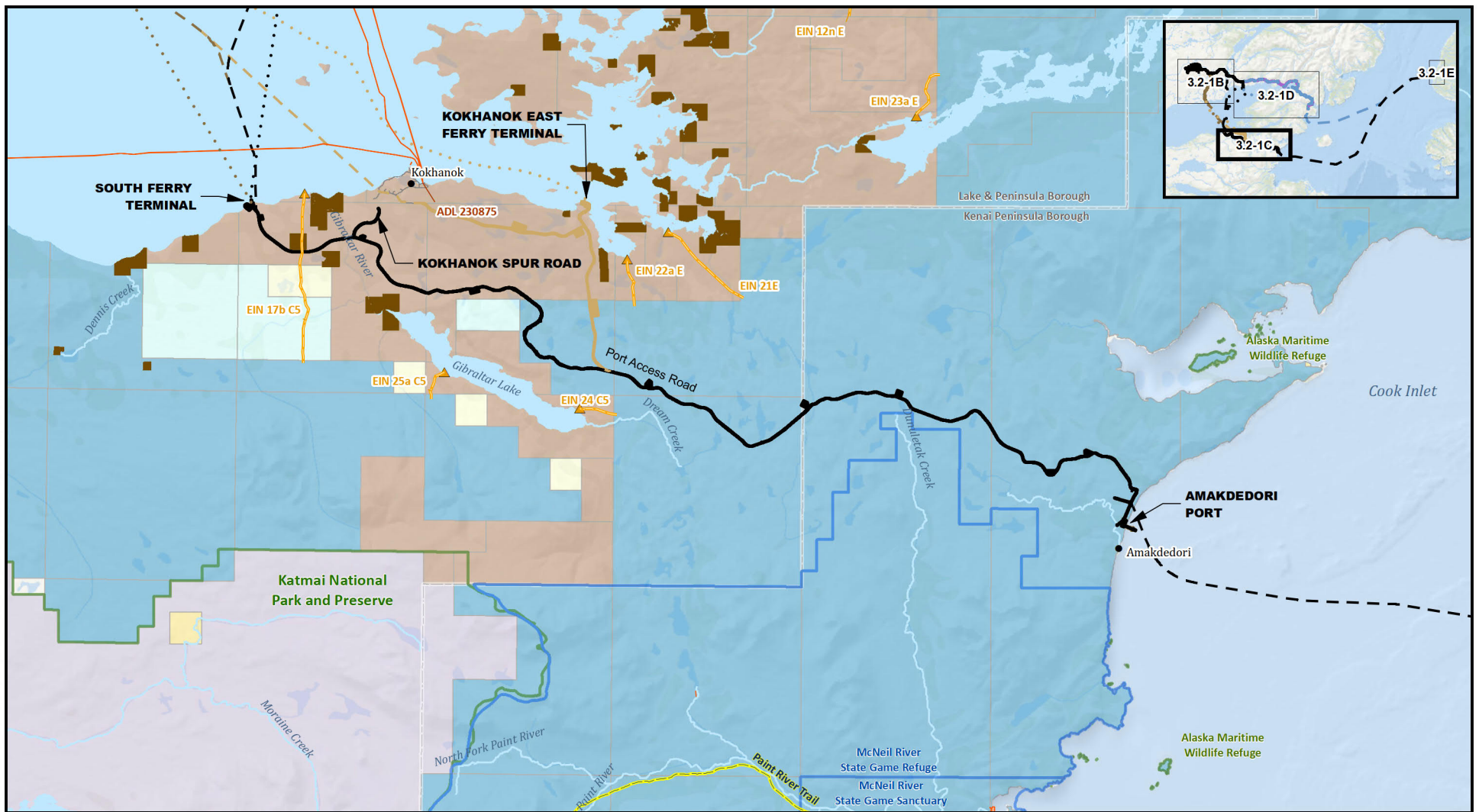
#### Other Features

— Roads

**GENERALIZED LAND STATUS  
MINE SITE TO NORTH FERRY TERMINAL**

**FIGURE 3.2-1B**

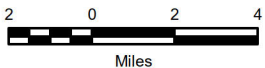
**PEBBLE PROJECT EIS**



Sources: PLP 2019-RF1153; ADN 2012, 2015, 2017, 2019; BLM 2017, 2019; NERRS 2000; NOAA 2011; USFWS 2017



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**Administrative Boundaries**

- ▲ 17(b) Easement Site
- 17(b) Easement Trail
- RS 2477
- State Easement
- Borough Boundary
- Native Allotment

Native Patent, Interim Conveyed, or Other Conveyance

- State Patent or Tentatively Approved
- Private
- Native Selected
- State Selected

National Park Service

- Bureau of Land Management
- State Special Use Lands Designation
- Federal Conservation System Unit

**Action Alternatives**

- ... Ferry Routes

Natural Gas Pipelines

- Alternative 1a
- Alternative 1
- Alternative 1 Kokhanok East Ferry Terminal Variant

**Other Features**

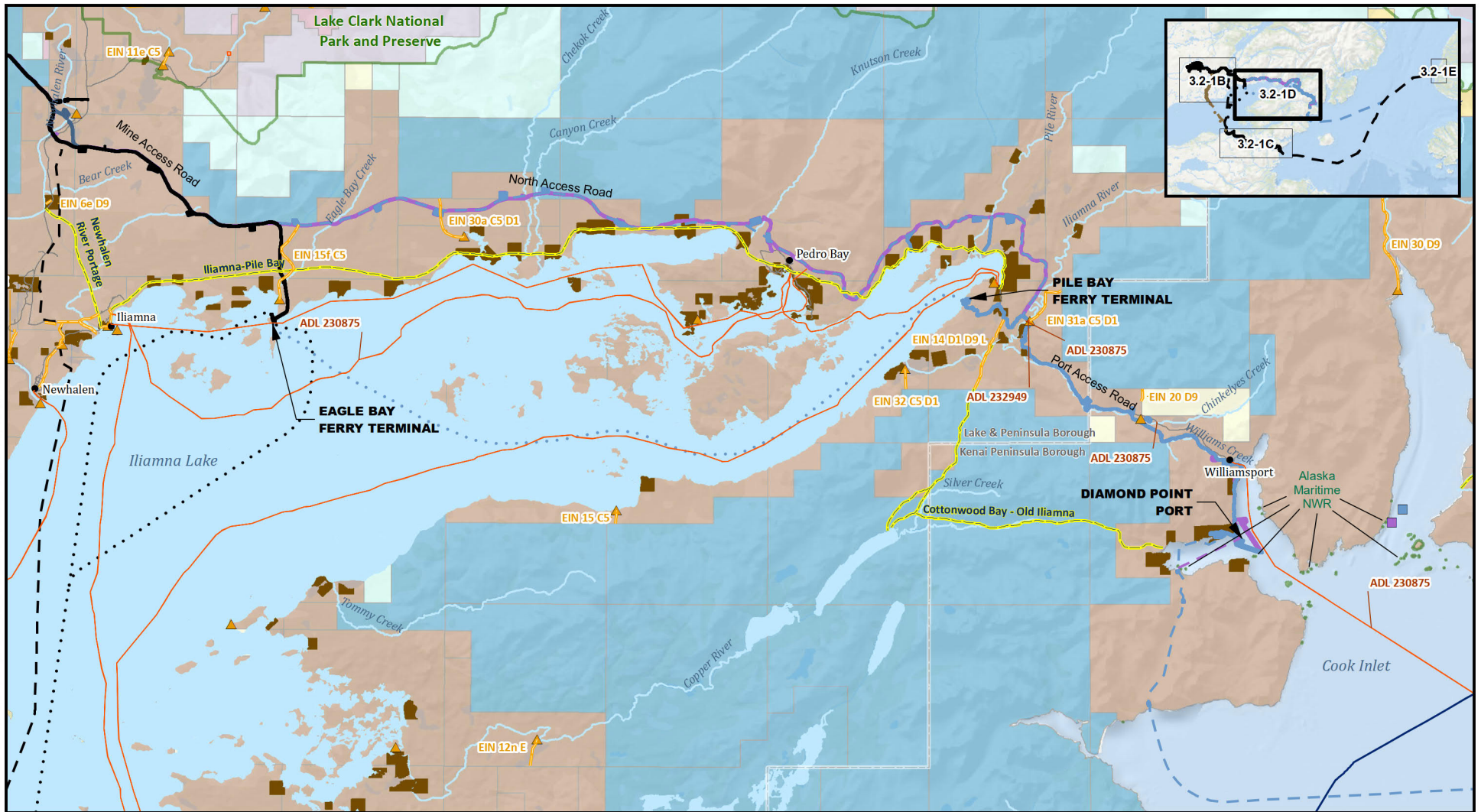
- Roads

**PEBBLE PROJECT EIS**

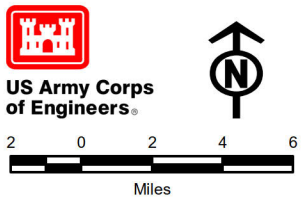
**GENERALIZED LAND STATUS  
SOUTH FERRY TERMINAL TO AMAKDEDORI PORT**

**FIGURE 3.2-1C**





Sources: PLP 2020-RFI168; PLP 2019-RFI153; ADNR 2012, 2015, 2017, 2019; BLM 2017, 2019; NERRS 2000; NOAA 2011; USFWS 2017



#### Administrative Boundaries

- ▲ 17(b) Easement Site
- 17(b) Easement Trail
- RS 2477
- State Easement
- Borough Boundary
- Outer Continental Shelf
- Native
- Native Patent, Interim Conveyed, or Other Conveyance
- State Patent or Tentatively Approved
- Private
- Miscellaneous Title Transfers
- Miscellaneous Withdrawals
- Native Selected
- State Selected
- National Park Service
- Bureau of Land Management
- Federal Conservation System Unit

#### PEBBLE PROJECT EIS

#### Action Alternatives

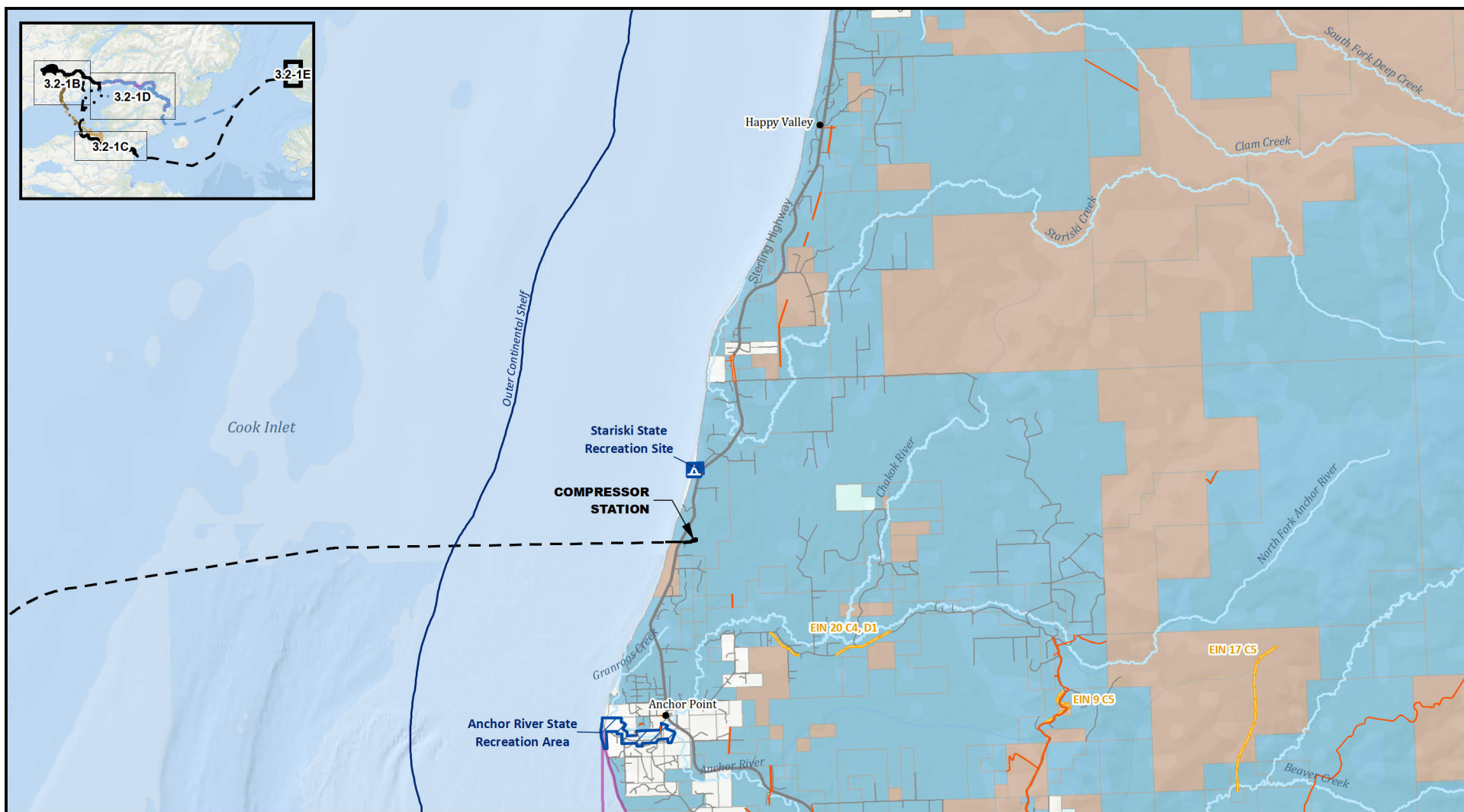
- Lightering Locations
- ... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

- Roads

#### GENERALIZED LAND STATUS EAGLE BAY TO DIAMOND POINT PORT

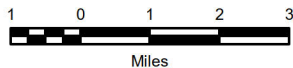
FIGURE 3.2-1D



Sources: PLP 2019-RF1153; ADN 2012, 2015, 2017, 2019; BLM 2017, 2019; NERRS 2000; NOAA 2011; USFWS 2017



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 Stariski State Recreational Site



**Administrative Boundaries**

-  17(b) Easement Trail
-  State Easement
-  Outer Continental Shelf
-  Native Patent, Interim Conveyed, or Other Conveyance

-  State Patent or Tentatively Approved
-  Private
-  Miscellaneous Title Transfers
-  Miscellaneous Withdrawals
-  Native Selected
-  State Selected
-  State Recreation Area

 Kachemak Bay National Estuarine Research Reserve

**Action Alternatives**

-  Natural Gas Pipelines
-  Alternative 1a

**Other Features**

-  Roads

**GENERALIZED LAND STATUS  
ANCHOR POINT TO HAPPY VALLEY**

**FIGURE 3.2-1E**



### 3.2.1.1 Legal Access

In the EIS analysis area, there are mechanisms to ensure consistent surface access to public lands, and in some instances, private parcels or traditional access areas. These mechanisms for access include Revised Statute (R.S.) 2477 Rights-of-Way (ROWs), ANCSA Section 17(b) Easements, Alaska National Interest Lands Conservation Act (ANILCA) Sections 811 and 1110, State Section Line Easements, and State Public Access Easements.

#### **Revised Statute 2477 Rights-of-Way**

Section 8 of the 1866 Mining Act states that “the right-of-way for the construction of highways over public lands, not reserved for public uses, is hereby granted.” In 1873, the provision was separated from the Mining Act and re-enacted as R.S. 2477. In 1938, it was recodified as 43 United States Code (USC) Section 932. In 1976, the Federal Land Policy and Management Act repealed both the 1866 Mining Act and R.S. 2477, but all ROWs that existed on the date of repeal (October 21, 1976) were preserved under 43 USC Section 1769 through a savings provision for prior established rights.

Through statute or administrative action, the State of Alaska recognizes approximately 6,750 R.S. 2477 routes throughout the state (Alaska Statute [AS] 19.30.400). However, the validity of the grant is not dependent on those State recognitions.

There are no State-recognized R.S. 2477 easements in the footprint of Alternative 1. Alternative 1a, Alternative 2, and Alternative 3 would cross the Iliamna-Pile Bay R.S. 2477 ROW. Alternative 1a would also cross the Newhalen River Portage R.S. 2477 ROW, as listed in Table 3.2-2 and shown in Figure 3.2-1D.

**Table 3.2-2: Revised Statute 2477 Rights-of-Way in the Project Footprint**

ID	Name	Alternative	Project Component(s)
RST 396	Iliamna-Pile Bay	1a, 2	Mine Access Road
RST 396	Iliamna-Pile Bay	2	Natural Gas Pipeline (crosses in two locations), Material Sites
RST 396	Iliamna-Pile Bay	2	Transportation Corridor (Pipeline Construction Access)
RST 396	Iliamna-Pile Bay	3	Transportation Corridor / Natural Gas Pipeline (crosses in two locations), Material Sites
RST 1641	Newhalen River Portage	1a	Natural Gas Pipeline

Note:  
Project components cross the ROW in one location, unless otherwise noted  
Source: ADNR 2019a

#### **Section Line Easements**

Section line easements are State-recognized easements for highway purposes that run along a surveyed section line of the rectangular survey system (11 Alaska Administrative Code [AAC] 51.025). Lands acquired by the State after March 26, 1951, including some lands in the project area, are subject to a section line easement that remains in existence unless vacated by proper authority. Easements are public ROWs that are 33, 50, 66, 83, or 100 feet wide. The State asserts that all 33- and 66-foot-wide section line easements were acquired under R.S. 2477, regardless

of whether trails have ever been developed along them. Section line easements are authorized by law and may be established when the rectangular survey of a section line occurs. Prior to survey, the State asserts the easements exist centered on the protracted section line; however, the easement must be surveyed before it can be used. Section line easements are used primarily for transportation. The project area would encompass several section line easements.

### **Alaska Native Claims Settlement Act Section 17(b) Easements**

Under Section 17(b) of ANCSA, the US reserves linear access easements to public land and water on lands that have been or will be conveyed to Alaska Native Village and Regional corporations (ADNR 2013b). Easements can take the form of 60-foot-wide roads, 25- and 50-foot trails, or 1-acre site easements for vehicle parking, temporary camping, or loading/unloading. These easements are reserved to allow for public access through ANCSA lands to reach public lands and waterways. They do not authorize public access to the private land that the easement crosses (BLM 2009). The Bureau of Land Management (BLM) has management authority for the US for these easements unless that authority has been otherwise delegated.

ANCSA Section 17(b) easements have specific allowable uses that are stated in the conveyance document. They cannot be reserved or retained for recreational purposes, but can provide access to recreational opportunities on publicly owned land or for change in mode of transportation. Uses beyond those expressly granted should be approved by the property owner to avoid trespass issues between the user and the property owner.

Alternative 1a would cross three Section 17(b) easements (two would also be crossed by Alternative 1 or Alternative 3, and one is off the Iliamna-Newhalen Road). Alternative 1 would intersect one Section 17(b) easement on the southern shore of Iliamna Lake. Alternative 2 and Alternative 3 would intersect two Section 17(b) easements; both begin at the northern shore of Iliamna Lake and continue north (Table 3.2-3).

**Table 3.2-3: ANCSA Section 17(b) Easements in the Project Area**

ID	Description	Alternative(s)	Project Component
EIN 17b C5	Access trail east of the mouth of Gibraltar Creek on the southern shore of Iliamna Lake, south to public land (25-foot trail).	Alternative 1, Alternative 1a	Transportation Corridor, Natural Gas Pipeline
EIN 15f C5	Proposed access trail from EIN 15c on Eagle Bay on Iliamna Lake northerly to public lands (25-foot trail).	Alternative 2	Transportation Corridor, Natural Gas Pipeline
		Alternative 3, Alternative 1a	Transportation Corridor
EIN 30a C5 D1	Proposed access trail from EIN 30 on the western shore of an unnamed lagoon of Iliamna Lake (25-foot trail).	Alternative 2	Natural Gas Pipeline
		Alternative 3	Transportation Corridor, Natural Gas Pipeline
EIN 6b	Proposed access trail from Schoolhouse Lake west to the Iliamna-Newhalen Road (25-foot trail).	Alternative 1a	Natural Gas Pipeline

Notes:

Project components cross the easement in one location, unless otherwise noted.

ANCSA = Alaska Native Claims Settlement Act

Source: ADNR 1990; BLM 2019a

## State Public Access Easements

Two 100- to 400-foot-wide State public access easements exist on State land along the project components. Under these easements, the State of Alaska reserved public access for current and future needs along the corridors, as well as authorization for trail improvements, trail maintenance, and safety cabins. The State public access easements in the project area are listed in Table 3.2-4. Alternative 1a, Alternative 2, and Alternative 3 cross ADL 230875 in one location, and two locations under Alternative 1. Under the Kokhanok East Ferry Terminal Variant, the pipeline would cross this easement in two locations, and the ferry route would cross it in three locations. Alternative 1a would cross at three locations, and the Alternative 2 ferry route would cross at seven to nine locations (depending on the route).

In Iliamna Lake, the pipeline would cross three times under Alternative 1a, and in two locations under Alternative 1 and the Kokhanok East Ferry Terminal Variant. The Alternative 2 and Alternative 3 pipeline would cross one time in Cook Inlet.

**Table 3.2-4: State Public Access Easements in the Project Footprint**

ID	Description	Alternative	Project Component(s)
ADL 230875	United Utilities, Inc. exclusive ROW for hybrid fiber-optic cable and microwave broadband communications network. In the project area, it would bisect in Iliamna Lake and Cook Inlet.	Alternative 1a Alternative 1 Alternative 2	Transportation Corridor (ferry route) <sup>1</sup>
		Alternative 1a Alternative 1 Alternative 2 Alternative 3	Natural Gas Pipeline (Cook Inlet and Iliamna Lake) <sup>2</sup>
ADL 232949	Alaska Department of Transportation and Public Facilities design and construction ROW, central region.	Alternative 2, Alternative 3	Transportation Corridor, Natural Gas Pipeline

**Notes:**

ADL = Alaska Division of Lands

ROW = right-of-way

Project components cross the easement in one location, unless otherwise noted.

<sup>1</sup> Crosses in two locations under Alternative 1. Under the Kokhanok East Ferry Terminal Variant, the ferry route would cross in three locations. Alternative 2 ferry route would cross seven to nine times (depending on the route), and Alternative 1a would cross three times.

<sup>2</sup> In Iliamna Lake, the pipeline would cross in three locations under Alternative 1a, and in two locations under Alternative 1 and the Kokhanok East Ferry Terminal Variant. The Alternative 2 pipeline and Alternative 3 pipeline would cross one time in Cook Inlet.

Source: LM 2010; ADNR 2019a

## 3.2.2 Land Management

### 3.2.2.1 State Management

The Alaska Department of Natural Resources (ADNR), under AS 38.04.065 Land Use Planning and Classification and 11 AAC 55.010-.030, “shall, with local governmental and public involvement under AS 38.05.945, adopt, maintain, and, when appropriate, revise regional land use plans that provide for the use and management of State of Alaska-owned lands.” Plans applicable to the EIS analysis area include the Bristol Bay Area Plan (ADNR 2013a), the Nushagak and Mulchatna Rivers Recreation Management Plan (ADNR 2005), and the Kenai Area Plan (ADNR 2001).

All resource and land uses, including mining, fish and wildlife habitat, and recreation, are considered and evaluated under State management. Unless closed by the legislature, or a tract under 640 acres closed by administrative order, all State land is open for multiple uses. The State

of Alaska's Generally Allowed Uses on State Land provides a general explanation of the state's use management framework.

The transportation corridor (port access road) and natural gas pipeline under Alternative 1a and Alternative 1 would be within 1 mile (approximately 630 feet at its closest) of the boundary of (but would not occupy) the McNeil River State Game Refuge and Sanctuary, which is managed by the Alaska Department of Fish and Game (ADF&G) in accordance with the McNeil River State Game Refuge and Sanctuary Management Plan (ADF&G 2008a). Amakdedori port under Alternative 1a and Alternative 1 would be within 2 miles of the boundary of the McNeil River State Game Refuge and Sanctuary (see Section 3.5, Recreation, for more information about management in the refuge and sanctuary).

### **Bristol Bay Area Plan**

The Bristol Bay Area Plan was the outgrowth of a cooperative federal-state land use planning process mandated by ANILCA. It was developed during the early 1980s, and was revised in 2005 to address the outstanding municipal entitlements of the three boroughs in the planning area (i.e., Bristol Bay, Lake and Peninsula, and Aleutians East); revise the tideland designations; address regional economic changes and changing land use patterns; and allow ADNR to lease portions of the area for oil and gas development.

The plan was substantially revised again in 2013 after litigation that focused on the concern of loss of protection to important habitat and recreation areas when much of the plan area was redesignated for general use. This revision was in response to an agreement with the plaintiffs in Nondalton Tribal Council et al. versus the State of Alaska, which dismissed the litigation in exchange for ADNR's agreement to address the issues raised in the lawsuit through the existing administrative process for amending area land use plans and reclassifying land.

The Bristol Bay Area Plan divides the Bristol Bay area into 20 regions with management units. The mine site would be in Region 6. The transportation corridor would be in regions 6, 8, and 10 under Alternative 1a; regions 6, 9, and 10 under Alternative 1; and regions 6, 8, and 9 under Alternative 2 and Alternative 3. At the mine site, Region 6 is designated for mineral development, among other uses; and managed to ensure that impacts to the anadromous and high-value resident fish streams are avoided, reduced, or mitigated as appropriate in the permitting processes. Additionally, impacts to moose wintering habitat will be taken into consideration during mine permit review, and the upper Koktuli River is also managed for recreation. Regions 8, 9, and 10 are managed for a variety of uses, including mineral exploration and development, public recreation and tourism, and protection of anadromous fish and wildlife resources and habitat. Region 8 is also managed for settlement. State-owned lands in these regions are identified to be retained in public ownership and managed for multiple use. The State selected much of the land in the planning area because of its mineral potential. Most of the area of the mine itself is designated with a primary use of mineral development. An additional goal for this region is for the State to provide support for mining by aiding in the development of infrastructure, such as ports and roads (ADNR 2013a). The plan retains all of the mineral closing orders (MCO), including MCO 393, which closes certain streams to mineral entry and development, and designates them habitat.

Iliamna Lake is managed under Region 9, co-designated under Public Recreation and Tourism-Dispersed and Habitat land designations. The navigable waters of this lake are to be managed so that its public recreation and habitat values are maintained. Development authorizations in these waters may be appropriate insofar as essential habitat and public recreation values are maintained. Authorizations in these waterbodies should not interfere with navigability, important habitat values, or recreational uses (ADNR 2013a).

### **Nushagak and Mulchatna Rivers Recreation Management Plan**

The Nushagak and Mulchatna Rivers Recreation Management Plan is a component of the 2005 Bristol Bay Area Plan. This plan is continued as an element of the 2013 Bristol Bay Area Plan in the navigable waters of the Nushagak-Mulchatna drainage basin. In response to previous plans and to public concern about subsistence use and increased recreational use in the region, the ADNR, ADF&G, and the Bristol Bay Coastal Resource Service Area entered into a cooperative agreement to manage these rivers. No project components would be covered by the plan, but the mine site is approximately 20 miles upriver of units 16, 17, 18, and 19 of the plan. Units 16, 17, 18, and 19 are managed as primitive or semi-primitive, and some permanent and temporary facilities may be prohibited (ADNR 2005).

The Bristol Bay Area Plan includes goals that identify the need to manage land; protect fish, wildlife, and water; and provide a diversity of commercial and non-commercial public use opportunities. To meet goals in the Bristol Bay Area Plan, State land in the Nushagak and Mulchatna planning area is to be managed to provide a mix of commercial and non-commercial public use opportunities; ensure availability of public use sites to meet the needs of all users; protect habitat and other natural resources; and maintain options for future recreation management. Major streams in the Nushagak and Mulchatna drainage basin are in MCO 393.

### **Kenai Area Plan**

The Kenai Area Plan divides the Cook Inlet area into 12 regions with management units. Amakdedori port and Diamond Point port would be in Region 12, and parts of the natural gas pipeline component for all alternatives would be in Region 7 and Region 12. State-owned lands in these regions are identified to be retained in public ownership and managed for multiple uses. The area around Amakdedori port is managed as habitat for bear spring feeding, moose, Dolly Varden, Arctic char, ducks, and geese. Cook Inlet waters at Amakdedori are managed for recreation. At Diamond Point, the project facilities would be on lands that are private or owned by Native corporations, but State lands and waters are designated in the plan for habitat and recreation. The plan has management guidelines for the development of transportation and utilities, which include cultural surveys, and protection of hydrologic systems and roads near wetlands. The plan also provides guidelines for waterfront development for soil erosion and fuel storage (ADNR 2001).

### **3.2.2.2 Borough Management**

#### **Lake and Peninsula Borough**

The mine site, a portion of the natural gas pipeline, and much of the transportation corridor would be within the boundaries of the Lake and Peninsula Borough (LPB). The LPB, as a non-unified home-rule borough, is required to provide for planning, platting, and land use regulations on an area-wide basis (both inside and outside of cities) in the borough.

The LPB's planning commission was established to perform the area-wide functions of planning, platting, and zoning; their recommendations are then transmitted to the LPB assembly, which sets policy and exercises legislative power in the borough (LPB no date). The commission prepares and revises the LPB Comprehensive Plan (LPB 2012). The LPB Comprehensive Plan provides general goals and policy recommendations to address pressing issues in the region.

The plan includes the following strategies for planning for wise land use and environmental protection: periodically review (and if appropriate improve) enforceable development standards (e.g., stream setbacks), and periodically review (and if appropriate, improve) the LPB's large-project review process. Unlike some comprehensive plans, it does not make land use



regulations, but is linked to community action plans for each of the LPB's communities, including those in the EIS analysis area. In addition to the LPB Comprehensive Plan, the LPB has prepared Village Strategic Plans for the following communities: Port Alsworth, Nondalton, Newhalen, Pedro Bay, Kokhanok, and Levelock. These brief plans outline core values, an envisioned future, and strategic direction for the period from 2017 to 2022.

LPB permits include Chapter 9.07, Development Permit, and Chapter 9.08, Large Project Permits of the LPB code, and have requirements that apply to local approval of the Pebble Project. Chapter 9.08 requires that the project comply with socioeconomic and fiscal impact criteria that are outlined in the ordinance. These include activities within 100 feet of an anadromous stream; reclamation plans; and socioeconomic and fiscal impact reports.

### **Kenai Peninsula Borough**

A portion of the natural gas pipeline under all alternatives would be in the Kenai Peninsula Borough (KPB). The Amakdedori and Diamond Point ports and the port access roads or the north access road would also be in KPB boundaries. As a second-class borough, the KPB is required to provide for planning, platting, and land use regulations on an area-wide basis (both inside and outside of cities) in the borough in accordance with AS 29.40. Land use in the KPB is guided by the KPB Comprehensive Plan (KPB 2005, 2017). The Code of Ordinances dictates the KPB's powers and operations.

Zoning in the KPB is unrestricted outside of the KPB's cities and Local Option Zone Districts, none of which are in the EIS analysis area. However, the KPB does regulate floodplain development, and development near certain anadromous fish streams throughout the borough, including Amakdedori Creek, near the port site. Such activities may require a permit from the KPB.

The KPB Comprehensive Plan recognizes the borough's proximity to the project, and acknowledges that project infrastructure would be located in the borough, although the plan does not contain goals, objectives, or implementation actions specific to project development on lands in the KPB.

### **3.2.2.3 Alaska Native Regional and Village Corporations**

In 1971, ANCSA was signed into law. Under ANCSA, aboriginal land claims were settled in exchange for \$962.5 million in compensation, as well as approximately 40 million acres of land (Norris 2002). ANCSA established 12 for-profit Alaska Native regional corporations and 225 Alaska Native village corporations to administer the settlement lands and compensation funds. A 13th regional corporation was later added for Alaska Natives living outside the state. Alaska Natives enrolled as shareholders in the village and regional corporations where they lived at the time of enactment. The regional and village corporations land entitlement was generally proportionate to the population of these corporations at the time of enrollment. In most cases, the surface estate is owned by the village corporations, with the subsurface estate owned by the associated regional corporations.

Alaska Native corporation land is often held in large tracts and used for subsistence purposes, or developed/sold to generate revenue. Alaska Native corporation-owned lands in the transportation corridors and natural gas pipeline corridors consist of parcels with surface and subsurface rights owned by the Bristol Bay Native Corporation and Cook Inlet Region, Inc. (CIRI), and surface rights owned by various village corporations. Complete ownership for all alternatives is listed above in Table 3.2-1.

As private land, uses on land owned by Alaska Native village and regional corporations are subject to approvals of the surface and subsurface landowners. In the past, there have been

conflicts over what is defined as surface and subsurface rights and the need for landowner approval; these are primarily resolved on a case-by-case basis, either through negotiations or in the court system. The Bristol Bay Native Corporation (BBNC) manages their lands to uphold three primary values (i.e., fiscal, environmental, and social) in order to protect the fish that have sustained the culture of the people throughout history (BBNC 2018). Some of the project components under Alternative 2 and Alternative 3 would be on CIRI property. CIRI manages their lands to strike a balance between sustainably developing resources to improve opportunities for shareholders, and protecting the land for future generations (CIRI 2018). Parts of the port access road under Alternative 1a and Alternative 1 would be on Alaska Peninsula Corporation property, including where the transportation corridor would cross the Gibraltar River. The Alaska Peninsula Corporation's mission is "to preserve and enhance the quality of life of Alaska Peninsula Corporation shareholders and to protect our culture while managing our assets in a manner which enhances their value" (APC 2018). Village corporation missions often include protection for the natural and cultural environment, and allowance of some development. Parts of the mine access road and pipeline corridor under Alternative 2 and Alternative 3 would be on lands owned by Pedro Bay Village Corporation, who manages its land for balancing economic purposes with subsistence use, archaeological research, and historic preservation. The corporation allows some permitted use. Parts of the mine access road under Alternative 1a, Alternative 2, and Alternative 3 would be on Iliamna Natives Limited property, including where the transportation corridor would cross the Newhalen River. The transportation corridor for Alternative 2 and Alternative 3 would cross lands owned by Salmatof Native Association, Inc., Seldovia Native Association, Inc., and Tyonek Native Corporation.

There is a conservation easement, made in agreement with Pedro Bay Village Corporation and Iliamna Village Corporation, and held and enforced by the Bristol Bay Heritage Land Trust, encompassing a majority of the islands at the northern end of Iliamna Lake, with the intent to protect freshwater seals (BBHLT 2012). The easement would prevent development on those islands, but would not prevent the passage of vessels in the vicinity.

Any private landowners have rights associated with the title to the real estate, including the exclusion of others from entering property.

#### **3.2.2.4 Native Allotments**

Native Allotments issued under the 1906 Native Allotment Act are parcels of land up to 160 acres, which are owned by an individual. The lands are held in trust by the federal government and generally require the Bureau of Indian Affairs (BIA) oversight for sales, gift deeds, leases, permits, partitions, ROWs, and sand and gravel leases. Alternative 2 and Alternative 3 would bisect Native Allotments, two of which are under BIA oversight.

#### **3.2.2.5 Federal Management**

The project footprint for any of the alternatives would not intersect with federal land. Under Alternative 1, the mine access road and natural gas pipeline corridor would be within 3 miles of Lake Clark National Park and Preserve. Under Alternative 1a and Alternative 1, the port access road would be within 8 miles of Katmai National Park and Preserve, and more than 20 miles from Alagnak Wild River. The natural gas pipeline corridor would pass near a portion of the Alaska Maritime National Wildlife Refuge and the Kachemak Bay National Estuarine Research Reserve (NERR). The mine and port access roads would be within 1 mile of lands selected by the State and managed by BLM.

Under Alternative 1a, Alternative 2, and Alternative 3, the transportation corridor and natural gas pipeline would be within 3 miles of the Lake Clark park unit, and within about 1 mile of lands

selected by the State or Native corporations and managed by BLM. The natural gas pipeline corridor would pass approximately 7 miles from a portion of the Alaska Maritime National Wildlife Refuge (all alternatives), and within 4 miles of the boundary of the Kachemak Bay NERR.

### **Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement**

The Submerged Lands Act grants individual states rights to the natural resources of submerged lands from the coastline of Alaska to 3 nautical miles offshore. The act also reaffirmed the federal claim to the lands of the Outer Continental Shelf (OCS), which consists of those submerged lands seaward of State jurisdiction. The act led to the passage of the Outer Continental Shelf Lands Act, which outlines the federal responsibility over the submerged lands of the OCS. The Bureau of Ocean Energy Management in Alaska has management authority over the development of oil, natural gas, renewable energy, and mineral resources on Alaska's OCS. The Bureau of Safety and Environmental Enforcement (BSEE) oversees safety, environmental protection, and conservation of resources related to the exploration for and development of offshore resources on the OCS. The agency ensures that offshore energy operations comply with applicable environmental regulations; develops and enforces standards and regulations to enhance operational safety and environmental protection; and refines regulations while maintaining safety. BSEE authorization is required for the ROW encompassing the natural gas pipeline between the Kenai Peninsula and the port facility for all alternatives for the portion of the ROW that would be on the OCS of Cook Inlet.

### **National Park Service**

The National Park Service (NPS) manages the Lake Clark and Katmai park units, and as well as the Alagnak Wild River. The transportation corridor and the mine site components would occur in the vicinity of (but not on) these lands. The boundary of Lake Clark Preserve would be approximately 15 miles northeast of the mine site, and 3 miles from Alternative 1a and Alternative 2 and Alternative 3 mine access road at the closest point. These project components would therefore not be subject to the NPS's land management jurisdiction. However, as a stakeholder in the immediate vicinity, NPS is concerned about impacts to its managed resources (see Section 3.5, Recreation, for more information about management in each NPS unit).

### **US Fish and Wildlife Service**

The US Fish and Wildlife Service (USFWS) manages the Alaska Maritime National Wildlife Refuge, which encompasses several small islands on the west coast of Cook Inlet, including Kamishak Bay, Cottonwood Bay, Iliamna Bay, and Iniskin Bay. Some islands in the refuge would be within 10 miles of the natural gas pipeline corridor for all alternatives. There would be refuge islands within 20 miles of the Amakdedori port site and within 3,200 feet of Diamond Point (900 feet from the nearest dredge area). Augustine Island, which is part of the refuge, would be 2.25 miles from the alternative lightering station for all alternatives, and the lightering station under Alternative 2 and Alternative 3 would be 2,800 feet from the nearest refuge island. The pipeline crossing in Cottonwood Bay under Alternative 2 and Alternative 3 would be 250 feet from the nearest refuge island. These project components would not be subject to USFWS's land management jurisdiction, because the project components would be near (but not on) USFWS land (see Section 3.5, Recreation, for more information about management in the refuge).



## **Bureau of Land Management**

All alternatives would have a facility within 1 mile of (but not on) BLM-managed lands. The project would therefore not be subject to BLM's land management jurisdiction. The project alternatives would cross one or more ANCSA Section 17(b) easement(s), discussed above.

## **National Oceanic and Atmospheric Administration**

The Kachemak Bay NERR is a state/federal partnership with the University of Alaska and the National Oceanic and Atmospheric Administration (NOAA); it was designated to promote informed management of the nation's estuaries and coastal habitats (KBNERR 2011, 2016). The pipeline compressor station would be approximately 4 miles from the reserve, and would therefore not be subject to the NOAA land management jurisdiction.

### **3.2.2.6 Local Management**

Some communities in the project area have developed community plans, including comprehensive, capital improvement, land use, strategic, transportation, vision, and other planning documents. Such planning exercises determine community goals, objectives, and management strategies for enacting public policy on transportation, utilities, land use, recreation, housing, and other topics of importance to the community. In the case of all potentially affected communities, local management plans provide guidance, but planning and permitting decision making is exercised at the borough level. No physical, project-related infrastructure would be developed on lands that are in local jurisdiction, but indirect effects could occur from management of some resources (such as water quality or air quality) on adjacent lands.

### **3.2.3 Land Use**

The prevalent land uses around the EIS analysis area are fish and wildlife habitat, subsistence, and low-intensity recreational activities, which do not require developed facilities. Land development in the Bristol Bay area is generally limited to the areas in and around geographically isolated communities, fish processing facilities, and small fishing and hunting lodges. Developments include roads, airstrips, and docks. Temporary use associated with mineral exploration activities has occurred in specific portions of the project area.

Residential and commercial land use in the vicinity of the mine site is limited, and includes the communities of Newhalen (population 214), Nondalton (population 129), and Iliamna (population 102), each approximately 17 miles from the mine site. Use around the transportation corridor, including crossings of the Newhalen and Gibraltar rivers, is also limited and includes the community of Kokhanok (population 168), approximately 2 miles from the Alternative 1a and Alternative 1 port access road; the community of Iguigig (population 52), approximately 35 miles from the Alternative 1a and Alternative 1 port access road; or the community of Pedro Bay (population 33), within 1 mile of the Alternative 3 transportation corridor. Many residents practice a lifestyle reliant on subsistence activities, and sport and commercial hunting, fishing, wildlife viewing, and boating also occurs in the area (ADCCED 2018b) (see Section 3.5, Recreation; Section 3.6, Commercial and Recreational Fisheries; and Section 3.9, Subsistence, for additional details). There are additional mining claims near the project area filed by Northern Dynasty Minerals and other mining exploration firms. Some claims have been relinquished, while others remain active for the purposes of exploration.

Iliamna Lake is used for recreational activities, sport fishing, and subsistence activities, including fishing and seal hunting. The lake is also heavily used for transportation via boat in open water, or via snowmachine when there is sufficient ice cover.

The Amakdedori port site is used for some subsistence activity, and cultural education for nearby communities. The Diamond Point port site is used for resource extraction. The transportation corridor under Alternative 2 and Alternative 3 includes the Williamsport-Pile Bay Road, which is used for the portage of fishing boats and some cargo from Cook Inlet to the region's communities and the Bristol Bay fishery.

On the Kenai Peninsula, there is a higher use of the land for recreation, as well as scattered residential and commercial development along the Sterling Highway, where the natural gas pipeline component would cross. The highway is traveled in all seasons, but sees particularly high use in the summer, when recreational and tourism activities increase. Where the natural gas pipeline corridor would cross Cook Inlet, the water is used for transportation, barging, boating, commercial fishing, recreational and subsistence fishing, and sightseeing, and provides habitat for fish and wildlife.

### 3.3 NEEDS AND WELFARE OF THE PEOPLE—SOCIOECONOMICS

This section addresses the monetized economy of the state, regions, and communities most likely to be affected by the project. In addition to jobs involving labor for wages, subsistence activities are an indispensable component of the socioeconomic system of rural Alaska communities. Although subsistence rarely involves monetary exchange, the addition of food procured by hunting and fishing can be a significant contributor to household and community welfare. In addition, employment can provide income necessary to support subsistence harvest activities. Subsistence activity and the importance of subsistence as it relates to income and its support in stabilizing communities are discussed in Section 4.9, Subsistence. Similarly, cultural ties to the area can impact the socioeconomic welfare of a community. These sociocultural dimensions are discussed in Section 3.9, Subsistence.

The Environmental Impact Statement (EIS) analysis area for this section includes the state of Alaska, regions, and communities where aspects of the monetized economy, including population, employment, income, housing, and education, could be impacted by the construction, operation, and closure of all components of each project alternative. Specific communities are listed in Table 3.3-1.

**Table 3.3-1: Population Characteristics of Potentially Affected Communities**

Area	Population <sup>1</sup>			Age <sup>2</sup>				Gender <sup>2</sup>	
	2010	2018	Change 2010-2018	Under 18	18 to 64	65 and Over	Median Age	Male	Female
Lake and Peninsula Borough	1,631	1,663	2.0%	28%	64%	8%	32.3	51%	49%
Igiugig	50	52	4.0%	37%	54%	9%	29.0	39%	61%
Iliamna	109	102	-6.4%	29%	63%	8%	34.8	48%	52%
Kokhanok	170	168	-1.2%	28%	64%	8%	28.1	50%	50%
Levelock	69	81	17.4%	38%	52%	10%	24.5	44%	56%
Newhalen	190	214	12.6%	39%	58%	3%	25.3	54%	46%
Nondalton	164	129	-21.3%	26%	68%	6%	31.8	48%	52%
Pedro Bay	42	33	-21.4%	0%	83%	17%	57.3	56%	44%
Port Alsworth	159	227	42.8%	46%	49%	5%	18.9	44%	56%
Dillingham Census Area	4,847	5,021	3.6%	31%	61%	8%	30.1	52%	48%
Dillingham	2,329	2,382	2.3%	30%	60%	10%	31.6	49%	51%
Ekwok	115	106	-7.8%	25%	61%	14%	28.3	48%	52%
Koliganek	209	205	-1.9%	34%	57%	9%	26.6	52%	48%
New Stuyahok	510	496	-2.7%	39%	53%	8%	24.8	58%	42%
Kenai Peninsula Borough	55,400	58,471	5.5%	23%	62%	15%	40.6	52%	48%
Bristol Bay Borough	997	879	-11.8%	23%	67%	10%	41.8	58%	42%
Anchorage	291,826	295,365	1.2%	25%	66%	9%	33.1	51%	49%
Alaska	710,231	736,239	3.7%	25%	65%	10%	33.9	52%	48%

Sources:

<sup>1</sup>ADOL 2019

<sup>2</sup>USCB 2018

### **3.3.1 Regional Setting**

#### **3.3.1.1 Overview of State and Regional Economy**

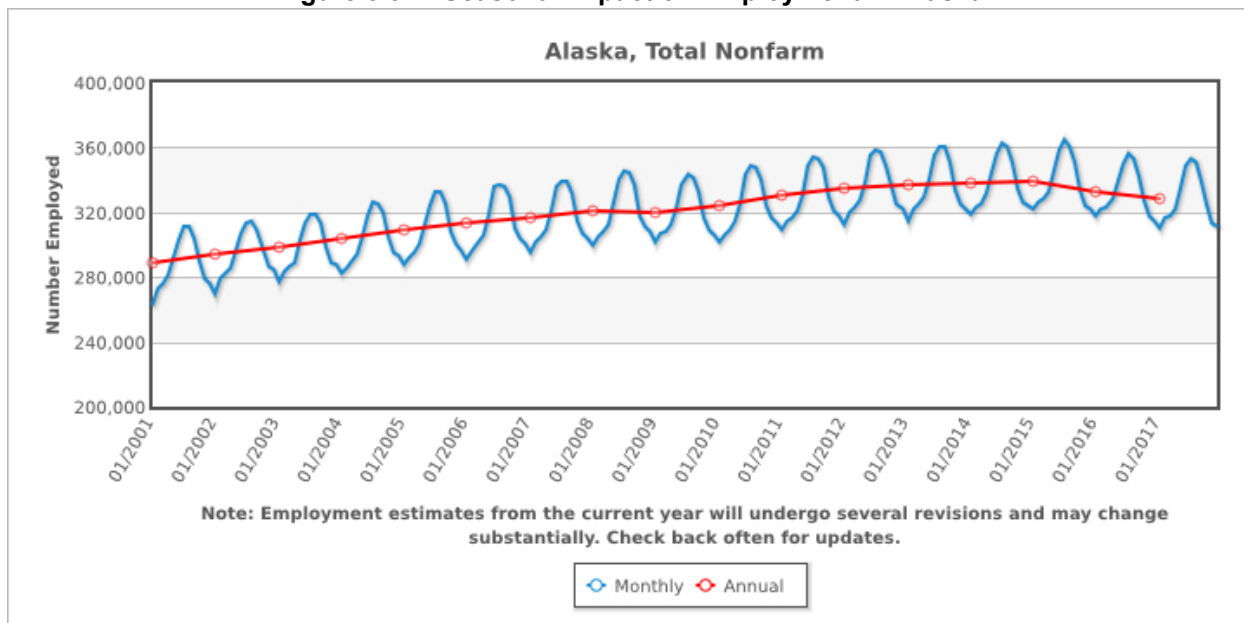
The State of Alaska relies on revenue from natural resource extraction as a primary source of income, making up 67 percent of revenue collected in fiscal year 2018, totalling \$966.5 million (ADR 2020). Alaska collects oil and gas production taxes and royalties based on the assessed value of the gross product. The State also receives production royalty payments from production of minerals on a State mining claim or State lands, and receives annual revenue from mining licenses. State and local governments also collect and share property tax on facilities built to support resource development, and some have also used severance taxes and payments in lieu of taxes with regard to mineral development.

Alaska has a long history of boom-bust cycles associated with resource extraction (e.g., oil and gold) that have impacted this tax revenue and the state economy. To help smooth revenue and investments, the State of Alaska established the Alaska Permanent Fund (APF), which was incorporated into the Alaska constitution in 1977. The APF is a permanent natural resource trust fund used to pay citizen dividends, manage inflation, and support the general fund. To support the fund, a percentage of the state's income from mineral extraction is placed in the APF. As of August 2017, the APF had a market value of \$60 billion (USDOL 2018).

Local communities and regions can also experience boom-bust cycles related to projects that occur in their area. These cycles can occur from the influx of workers and income during the construction cycle, to the more moderate employment during operations, to the loss of a major employer in the area after closure. In Alaska as a whole, recent recessions have more typically been triggered by a drop in oil prices, resulting in slowdown of spending in the oil industry and a drop in state revenues. With regard to the mining industry, cyclical metal prices can affect mining industry investment. However, most of the large operating mines in Alaska have been successful in finding additional reserves adjacent to their mine, extending their operating life and postponing a potential "bust" for a community and the state from the loss of a major employer.

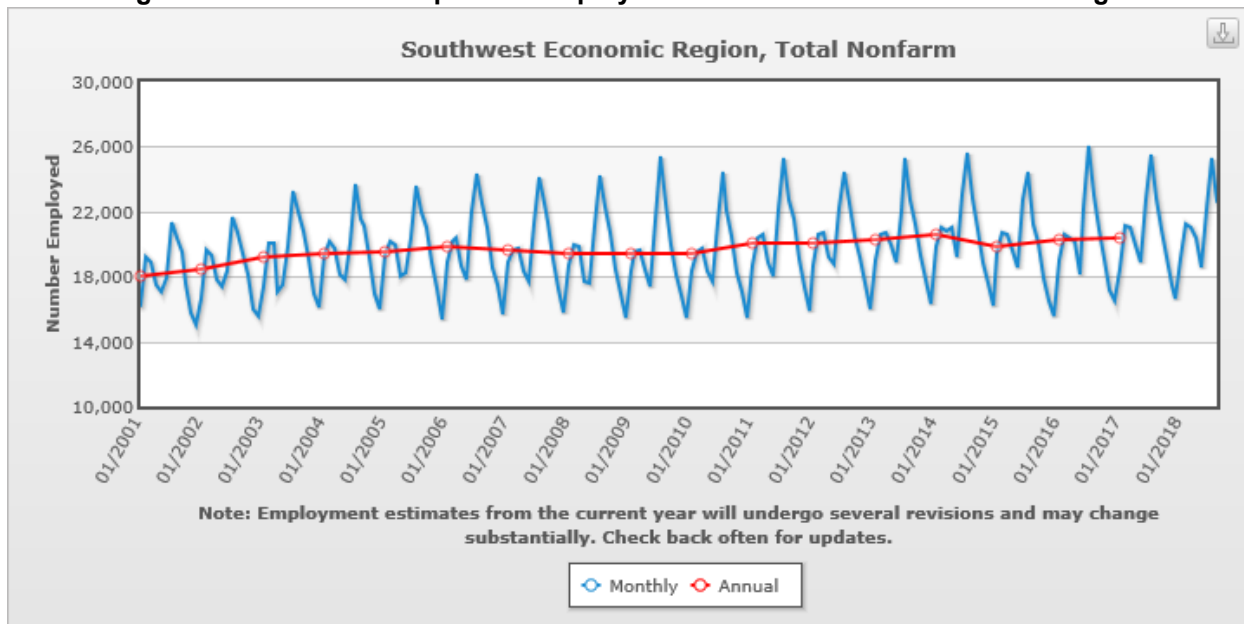
Regardless of any boom-bust cycles, employment in Alaska varies greatly throughout the year. Many of the jobs in Alaska are seasonal, leading to large fluctuation in employment between the summertime peaks and the wintertime lows. Figure 3.3-1 and Figure 3.3-2 show the cyclical characteristic of seasonal employment in Alaska and the Southwest Economic Region, respectively. Much of the seasonal employment is related to the commercial fishing and tourism industries. Some workers with year-round employment also participate in seasonal work activities. Subsistence activities can help stabilize and co-exist with the effects of seasonal employment.

**Figure 3.3-1: Seasonal Impact on Employment in Alaska**



Source: ADOL 2018

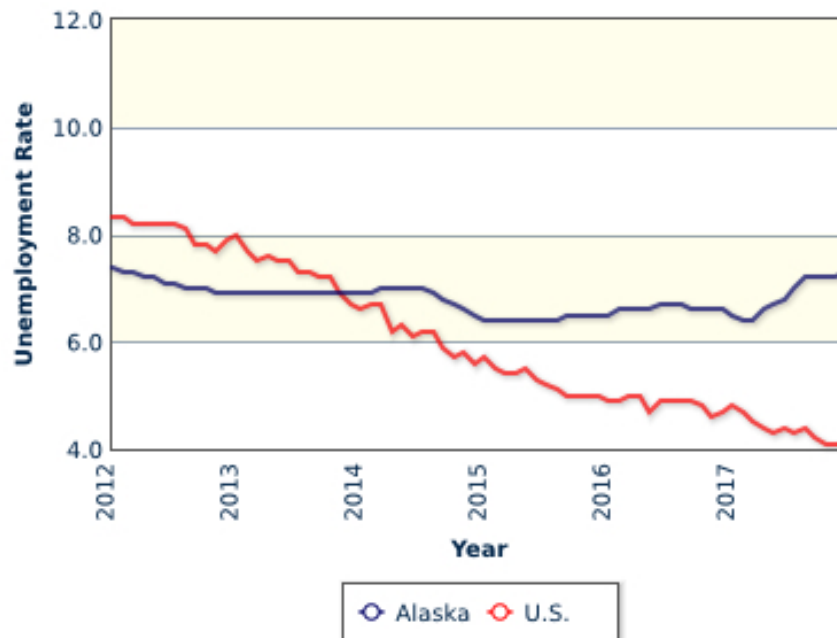
**Figure 3.3-2: Seasonal Impact on Employment in the Southwest Economic Region**



Source: ADOL 2018

Although the unemployment rate for the United States (US) as a whole has been decreasing for a number of years, the unemployment rate in Alaska has remained relatively steady at about 7 percent (Figure 3.3-3). However, rural communities have limited employment opportunities and unemployment rates that are generally higher than the statewide average.

**Figure 3.3-3: Recent Trends in Unemployment Rate**



Source: ADOL 2018

With regard to the economies of the portions of Alaska potentially affected by development of the project, there are three distinct profiles. The area on the eastern side of Cook Inlet, Anchorage and the Kenai Peninsula Borough (KPB), generally have a more diverse economy, although there is still some seasonality in employment. The lower area of the Dillingham Census Area and coastal portions of the Lake and Peninsula Borough (LPB) are dominated by the commercial salmon fishery and the economic activity it generates. Communities around Iliamna Lake and upriver in the Dillingham Census Area have less participation in commercial salmon fishing; they are more typical of small roadless rural Alaskan communities, with economic activities limited to local government, Alaska Native organizations, and some support of commercial recreation and tourism. The economies of the KPB, the LPB, and the Dillingham Census Area are summarized below.

### **Southern Kenai Peninsula Borough**

In relation to more rural Alaskan communities, the KPB's economy is more diverse, with a mix of emerging and established industries. The top five performing industries by total employment are health care and social services, local government, retail trade, accommodations and food services, and commercial fishing; while the top two industry categories by employee wages are utilities and oil, gas, and mining. In 2016, Kenai Peninsula workers earned over \$3 billion in wages (KPB 2017).

Although the oil and gas sector provides significant employment and revenue to the borough, non-oil and gas mining only represents a small portion of the economic activity, accounting for less than 0.2 percent of the Kenai Peninsula's total private employment and wages (KPB 2017). Seasonal fluctuations in employment affect many of the other industry sectors, including tourism and hospitality, commercial fishing, and construction.

## **Lake and Peninsula Borough**

As noted in the LPB Comprehensive Plan Update (LPB 2012), there are three primary components of the economy:

1. **Commercial Fishing**—The LPB is part of the world-renown Bristol Bay fishery. Residents living in the region participate in the fishery to a varying degree through commercial fishing, as well as through support of commercial and sport fishing. Commercial fishery permit holders residing in the LPB have steadily decreased over the last 30 years as permits have transferred out of region, although the value of permits and fish caught has held steady. Commercial fishing continues to be a major way of life for some residents in the region and constitutes over half of all self-employed workers. See Section 3.6, Commercial and Recreation Fisheries, for more information. Communities around the proposed mine site rely less on commercial fishing as an industry than those closer to Bristol Bay.
2. **Local Government**—A large percentage of employment in the LPB is in local government, with the majority employed by school districts and tribal governments. These jobs are important to the community because they tend to have higher pay and offer year-round employment.
3. **Other Industries and Small Businesses**—After accounting for the primary economic sectors (commercial fishing and local government), residents of the region are engaged in a range of business activities, including transportation and utilities, state government, health services, tourism, and other small businesses, however the employment opportunities in smaller communities are limited. Although the region supports a multi-million-dollar sport fishing and hunting industry, a large majority of the earnings do not go to local residents. In addition, most tourism is seasonal, and the opportunities conflict with other economic sectors and activities, such as commercial fishing, construction, and subsistence.

Many communities have been exploring small business opportunities for residents to increase local employment. However, most communities in the region have too small of a population to support a single service provider. As a result, new businesses will often have to plan for a regional market to be successful. As indicated previously, the region also engages heavily in subsistence activities.

The primary source of revenue of the LPB are raw fish taxes (56 percent) at \$2.8 million. Payment in lieu of taxes or development fees made up 11 percent, at \$540,000 (LPB 2018e).

## **Dillingham Census Area**

The Dillingham Census Area's economic base is highly seasonal and predominantly driven by the harvest and processing of Bristol Bay sockeye salmon, which has been a dominant influence on the local culture and economy for over 130 years (City of Dillingham 2010). The region has three onshore salmon processing facilities and several floating facilities/processors (SWAMC 2018). For more information on commercial fishing employment and income, see Section 3.6, Commercial and Recreational Fisheries. In general, wild resources continue to be the economic engine of the area, whether for commercial, subsistence, or recreational purposes. Many communities in the region are heavily involved in subsistence activities (City of Dillingham 2010).

Local government provides employment in regional communities such as Dillingham, King Salmon, Naknek, and smaller communities. The city of Dillingham is the largest community in the Dillingham Census Area and is the center of economic, transportation, government, and public services. King Salmon also benefits from federal employment associated with the National



Park Service (NPS), US Fish and Wildlife Service (USFWS), and other agencies. Commercial fishing, fish processing, cold storage, and support of the fishing industry are the primary sectors that sustain the economy of the area (SWAMC 2018).

### **3.3.1.2 Overview of the Cost of Living**

In general, the cost of living in Alaska is higher than most areas of the US. In 2017, Alaska was ranked as the third most expensive state based on the cost of living in the four largest Alaskan cities (i.e., Anchorage, Juneau, Fairbanks, and Kodiak), which were all well above the national average. Although fuel costs have been decreasing in recent years, health care premiums increased 29 percent from 2016 to 2017. Alaska has the highest health care premiums (purchased on the open market) of any state (ADOL 2017a).

Although taxes tend to be lower in Alaska, the cost of transportation, food, energy, and fuel is higher. Transportation is one of the main reasons the cost of living is higher in Alaska (ADOL 2017a, 2008), which is compounded in rural areas. Getting food, fuel, and other goods to Alaska is a little more expensive than other parts of the US, and then the items need to be transported over a large geographic area to small population clusters. In some communities, staple goods such as food and fuel cost over twice as much as they do in Anchorage because the items need to be transported by barge or air. Costs were found to be highest in communities served by air and seasonally by barge. In the LPB, the cost of fuel has been historically higher in Iliamna Lake communities, and population decline is partly driven by an increasingly high cost of living in remote communities (LPB 2012). In Igiugig, for example, the 2018 fuel price per gallon was \$6.75 for home heating oil, \$7.76 for gasoline, and \$10.17 for propane (McDowell Group 2018a).

Although the cost of living can be high in rural communities, subsistence hunting and fishing helps provide for the needs of families and communities. However, supporting subsistence hunting and fishing activities can be expensive in rural communities because of the higher cost of supplies, such as fuel, ammunition, and vehicles.

### **3.3.1.3 Overview of Regional Infrastructure**

#### **Education**

Alaska is composed of 54 school districts (ADEED 2018) that serve about 143,000 students. For fiscal year 2015, the National Center of Education Statistics reported that Alaska has one of the highest expenditures per pupil (NCES 2018). Alaska spent \$2.9 billion on education, with a per-pupil expenditure of \$20,191, which is 76 percent higher than the national average of \$11,454.

School closures are a serious challenge faced by rural Alaska communities around the state. Alaska State law (Alaska Statute [AS] 14.17.450) cuts off State funds for schools with nine or fewer students. Falling population can create a challenging cycle where declines in the number of residents lead to school closures, declining services, and fewer economic opportunities; these trends can then lead to further population declines. Because schools are often the largest electricity customer, the closing of a school leaves fewer customers to support the electricity network, and can lead to higher energy prices (LPB 2012).

Opportunities for higher education exist through a number of colleges and universities throughout the state, including five 2-year community colleges, three primary branches of the University of Alaska, and four private institutions. In addition, through the Western Undergraduate Exchange, residents of Alaska can attend colleges and universities at participating schools in 16 states and US territories and pay no more than 150 percent of the in-state tuition.



**Lake and Peninsula Borough**—The LPB School District has 13 public schools, from Port Alsworth in the north to Perryville in the south. However, a number of LPB communities are facing population loss and potential school closings; the Dena'ina school in Pedro Bay closed in November 2010 (LPB 2012). Although communities have local road systems, only Iliamna and Newhalen (and Nondalton seasonally) are connected by road, which allows them to have a combined school. The lack of connecting roads makes it impossible to combine schools in other communities facing population decline.

**Bristol Bay Borough**—The Bristol Bay Borough School District is composed of the elementary and middle/high school in Naknek (total enrollment 118). King Salmon and Naknek are connected by road and have a combined school.

**Dillingham Census Area**—The Southwest Region School District has seven public schools with a total enrollment of 705 students (SRSD 2009), and spans from Manokotak in the south to Koliganek in the north. The Dillingham City School District had a total enrollment of 473 in 2016/2017. Although communities have local road systems, only Aleknagik and Dillingham are connected by road; both communities have their own schools.

## **Transportation**

Most Alaskan communities have local roads, but approximately 82 percent of these communities have no connection to the contiguous road system or interregional roads (ADOT&PF 2018a). With small populations in remote, scattered locations, the per-capita costs of building and maintaining transportation infrastructure is high, and building new roads to connect the communities is unlikely. Alaska will continue to rely on a combination of air, road, and marine transportation to serve the population. Brief descriptions of these modes of transportation are provided below. See Section 3.12, Transportation and Navigation, for more information on the existing transportation systems.

### ***Air***

Large portions of Alaska are only accessible by air or water. These communities depend on aviation for access to non-subsistence foods, mail, and health care. The people of Alaska are eight times more likely to use aviation as transportation than people in the rest of the US (ADOT&PF 2018a). Aviation in Alaska is a substantial economic engine, contributing approximately \$3.5 billion annually to the state's economy.

Most communities in the region rely on air transportation for movement of people and goods into and around the region. Iliamna Airport is the primary air transportation hub for the region near the mine site, and Dillingham is a hub for the lower river communities; Port Alsworth and King Salmon are also important hubs for the region. Scheduled air service provides transportation of passengers to the regional hubs, while air taxis and charter service transport passengers from the hubs to local communities. For most of the year, air cargo is the only means of transporting goods to many of the communities in the area, including heating fuel (McDowell Group et al. 2011a). In addition to serving local communities, small aircraft provide primary transportation associated with recreation and tourism activities, including sport hunting and fishing, wildlife viewing, and visitation to federal and state parks and reserves.

### ***Road***

The Alaska Department of Transportation and Public Facilities (ADOT&PF) maintains 5,609 centerline miles of highways, 3,737 miles of which are paved. The highway system provides connectivity for freight and travel from the lower 48 states through Canada into Alaska; and from Alaska's economic hub, Anchorage, to communities that are connected to the road system, which

includes the southern Kenai Peninsula portion of the area that would be affected by the project. These hub towns and cities are the main population centers spread across the state, where goods are typically shipped to reach more remote communities by road, marine, and air transportation (ASCE 2018). However, the Bristol Bay region and the project area on the western side of Cook Inlet are not connected to the southcentral Alaska road system.

Surface transportation between villages is primarily done on trails on snowmachines or all-terrain vehicles, and most villages have local road systems. Village and rural roadways consist mainly of unpaved roads, walkways, trails, and boardwalks in areas outside of Alaska's hub towns. Local roadways in rural areas are typically maintained by local village governments, regional native corporations, the state, and the Bureau of Indian Affairs. The roads, walkways, trails, and boardwalks are of importance to community members because they serve as routes to health care facilities, schools, airports, and in some cases, subsistence hunting and fishing locations (ASCE 2018).

Near the proposed project infrastructure, the Iliamna/Newhalen area has the most extensive local road system. King Salmon/Naknek and Dillingham have a relatively extensive road network for the lower river communities. Elsewhere, road systems and vehicle use are limited (McDowell Group et al. 2011a).

In addition to community-based road systems, the Williamsport-Pile Bay Road provides seasonal access between Cook Inlet and Bristol Bay via a 15-mile road to Iliamna Lake and down the Kvichak River. This road allows summer season transportation of fishing vessels bound for Bristol Bay commercial fisheries, as well as some goods and supply transport to lake and river communities. The road is owned and maintained by the State of Alaska. Section 3.12, Transportation and Navigation, provides more information on local road systems.

## **Marine**

Ports and harbors across Alaska provide services that support critical economic activities. These facilities play a vital role in the communities they serve by delivering bulk goods and services, providing employment opportunities, promoting economic diversification, transshipping Alaska products such as seafood, and supporting cultural and subsistence lifestyles. In 2015, 40.8 million tons of goods were moved out of the state and 3.4 million tons of goods into the state via marine transport. Ports and harbors are also critical to the Alaska commercial fishing industry, which supports six of the top ten fishing ports by volume in the US (ASCE 2018).

Many of the communities in the region can be seasonally accessed via water to deliver cargo, such as fuel and other objects too heavy or bulky to ship via air. Many of the regional communities are on Iliamna Lake, which can be accessed from the Kvichak River and the Williamsport-Pile Bay Road. However, Kvichak River access has been hindered due to low water levels and shoaling (McDowell Group et al. 2011a).

In addition to commercial marine traffic, personal watercraft, particularly skiffs, is a major means of travel to subsistence activities and travel between communities during the open water season on lakes and rivers. During the period when ice and snow cover allows safe travel, snowmachines provide similar access. See Section 3.12, Transportation and Navigation, for more information.

## **Health Services**

Public health services are available in communities in the EIS analysis area, but may be limited in the smaller communities. In general, healthcare services include only small clinics operated by regional providers, including Bristol Bay Area Health Corporation and the Anchorage-based Southcentral Foundation. Because of easier access to Anchorage, many residents in the Iliamna

and Lake Clark communities receive hospital care in Anchorage. Many residents in the Bristol Bay area receive hospital care in Dillingham (McDowell Group et al. 2011a).

The Bristol Bay Area Health Corporation is a regional provider that operates a hospital, sub-regional clinics, and village clinics in the Bristol Bay region. Health clinics are also supported by the boroughs. In addition, state and federal agencies have special responsibilities to support health care for Alaska Natives (McDowell Group et al. 2011a). See Section 3.10, Health and Safety, for additional information on health services.

### **Water, Sewer, and Solid Waste**

Alaska's water and wastewater systems can be generally divided into two categories: municipal, and rural. Most municipal systems that serve more densely populated areas have long-term operations, maintenance staff, and funding. The state has more than 280 rural communities, 31 of which have no centralized water or wastewater system. For the rural communities that have water and wastewater systems, operating and maintaining systems is challenged by the high cost of energy, lack of population to support higher-than-average maintenance costs, and a shortage of experienced operators to maintain the systems (ASCE 2018).

Many of the unincorporated communities have water and/or sewer systems funded through the Alaska Native Tribal Health Consortium and the State's Village Safe Water Program. The Alaska Department of Environmental Conservation (ADEC) administers the Village Safe Water Program, which is working with rural communities to develop sustainable sanitation facilities. Many of the water and sewer improvements depend on federal funding (KPB 2017).

In rural Alaska, community water and sewer systems are primarily composed of four types: washeterias and central watering points; individual wells and septic systems; water and sewer truck or trailer-haul systems; and piped water and sewer systems. There are no unserved communities in the analysis area (ADEC 2018a). In the EIS analysis area, water systems are present in Igiugig, Iliamna, Kokhanok, Levelock, Nondalton, Newhalen, and Port Alsworth.

Limited road access makes dealing with solid waste a challenge. Most waste must be disposed of in the community, unless it can shipped out, which is expensive. Many rural communities have local facilities such as landfills, incinerators, or burn boxes to handle solid waste. The ADEC supports many landfill facilities (ASCE 2018).

### **3.3.2 Potentially Affected Communities**

Construction and operation of the project would have impacts to local and regional socioeconomic conditions. This section provides information about the current socioeconomic conditions of potentially affected communities. Potentially affected communities were identified based on potential impacts from any of the major components of the project. Although the project could have some impact on many residents of Alaska, the potentially affected communities are those where the project would likely have the greatest impact on the community. The following sections describe the general social and economic characteristics of the potentially affected communities. For additional information on each community, see McDowell Group 2018a.

#### **3.3.2.1 Population**

Table 3.3-1 presents population characteristics of the potentially affected communities. Many of the potentially affected communities in the LPB are relatively small. Although some communities have seen an increase in population from 2010 to 2018, others have decreased. See Section 3.4, Environmental Justice, for the racial characteristics of the potentially affected communities.

Table 3.3-2 shows the population projections through 2045 at the borough and state level. The population of the LPB through 2045 is not projected to increase much, whereas the population for Alaska is projected to increase about 22 percent by 2045. The Dillingham Census Area would see a modest increase, whereas the Bristol Bay Borough is projected to decrease by 34 percent.

**Table 3.3-2: Population Projections for the EIS Analysis Area**

Area	2018 <sup>1</sup>	2025 <sup>2</sup>	2035 <sup>2</sup>	2045 <sup>2</sup>
Lake and Peninsula Borough	1,663	1,708	1,720	1,751
Dillingham Census Area	5,021	5,289	5,556	5,984
Kenai Peninsula Borough	58,471	62,845	66,271	68,423
Bristol Bay Borough	879	790	675	581
Anchorage	295,365	318,629	330,821	339,171
State of Alaska	736,239	802,352	854,104	899,825

Sources:

<sup>1</sup>ADOL 2019

<sup>2</sup>ADOL 2016

### 3.3.2.2 Economy and Income

Median household income and unemployment vary across the potentially affected communities (Table 3.3-3). Iliamna had the highest median household income of the communities reviewed, at \$93,750, while the community of Levelock had the lowest, at less than \$25,000 (note that there is a substantial margin of error in some cases). In comparison, the median household income for Alaska is approximately \$76,000, and \$58,000 for the US. The unemployment rate also varied across the communities, from a low of 0 percent in Igiugig, to a high of almost 40 percent in Ekwok. In addition to household income, subsistence contributes to the mixed-cash economy of the region; the importance of subsistence as it relates to income is discussed in Section 3.9, Subsistence.

**Table 3.3-3: Median Household Income and Unemployment Rate of Potentially Affected Communities**

Area	Median Household Income (margin of error)	Unemployment Rate (margin of error)
Lake and Peninsula Borough	\$45,208 (\$3,882)	13.2% (2.6%)
Igiugig	\$48,750 (\$29,077)	0.0% (46.4%)
Iliamna	\$93,750 (\$28,620)	6.1% (6.0%)
Kokhanok	\$41,250 (\$24,297)	30.8% (7.5%)
Levelock	\$25,000 (\$17,803)	16.3% (8.5%)
Newhalen	\$36,250 (\$18,127)	8.0% (7.2%)
Nondalton	\$38,750 (\$11,951)	25.0% (11.9%)
Pedro Bay	\$53,750 (\$8,466)	18.2% (21.2%)
Port Alsworth	\$86,667 (\$12,567)	1.3% (3.2%)
Dillingham Census Area	\$58,708 (\$5,073)	11.4% (1.7%)
Dillingham	\$75,764 (\$8,256)	5.1% (1.7%)

**Table 3.3-3: Median Household Income and Unemployment Rate of Potentially Affected Communities**

Area	Median Household Income (margin of error)	Unemployment Rate (margin of error)
Ekwok	\$28,750 (\$6,988)	39.5% (20.7%)
Koliganek	\$53,750 (\$20,943)	11.1% (9.6%)
New Stuyahok	\$43,750 (\$8,768)	23.8% (6.0%)
Kenai Peninsula Borough	\$65,279 (\$2,335)	8.6% (1.0%)
Bristol Bay Borough	\$79,500 (\$10,833)	6.8% (3.0%)
Anchorage	\$82,271 (\$1,398)	5.8% (0.4%)
Alaska	\$76,114 (\$979)	7.7% (0.2%)

Note:

Because of the small sample size in smaller communities, the values reported by the US Census Bureau may be misleading (i.e., may show large differences between communities that may not exist). Therefore, margin-of-error values are provided to show the potential range of the reported values.

Source: USCB 2018

In many of the potentially affected communities, employment relies heavily on the local government and education and health services industry sectors. The local government industry sector accounted for the greatest percentage of employees for all communities in the LPB. State and local government jobs are particularly important to these small communities because they are often year-round and relatively high paying. Trade/transportation/utilities and professional/business services can also be a major employer in some communities (such as Port Alsworth, Iliamna, and Newhalen). Federal government employment generally represents a small percentage of the average monthly employment (i.e., less than 5 percent in the LPB, and less than 2 percent in the Dillingham Census Area).

The commercial salmon fishery provides a large number of seasonal employment opportunities in the harvesting and processing sectors. However, these opportunities vary across the region, with more opportunities available in the Dillingham and Naknek areas compared to communities up the Kvichak River and on Iliamna Lake. In addition, with the outmigration of commercial salmon permits and the nature of the processing industry, some of these opportunities are filled by residents from outside the region and state. Details on commercial fishing are discussed in Section 3.6, Commercial and Recreational Fishing.

### 3.3.2.3 Housing

In the EIS analysis area, the housing stock consists primarily of single-family detached homes, which account for more than 90 percent of the housing units (USCB 2018). Of the occupied housing units, approximately two-thirds of the units are owner-occupied, while the rest are rental properties. It should be noted that throughout the EIS analysis area, many of the communities show a high percentage of vacant housing units, with some communities at more than 50 percent. This is likely due to a number of factors, including counting a large number of seasonal-use dwellings (e.g., camps/cabins), declining populations, and housing units that are in a state of disrepair (LPB 2012). Table 3.3-4 shows total and occupied housing units in the analysis area.

**Table 3.3-4: Housing Units in Potentially Affected Communities**

Area	Total Housing Units (margin of error)	Occupied Housing Units (margin of error)
Lake and Peninsula Borough	1,406 (104)	408 (104)
Igiugig	20 (8)	14 (7)
Iliamna	60 (9)	20 (10)
Kokhanok	59 (15)	43 (14)
Levelock	45 (14)	34 (11)
Newhalen	44 (12)	32 (11)
Nondalton	90 (14)	43 (14)
Pedro Bay	29 (6)	8 (6)
Port Alsworth	71 (14)	38 (14)
Dillingham Census Area	2,444 (59)	1,405 (77)
Dillingham	1,039 (69)	751 (78)
Ekwok	51 (13)	28 (11)
Koliganek	61 (10)	51 (11)
New Stuyahok	140 (21)	112 (20)
Kenai Peninsula Borough	31,016 (135)	21,779 (421)
Bristol Bay Borough	941 (40)	358 (37)
Anchorage	115,748 (203)	106,012 (864)
Alaska	313,937 (249)	252,536 (1,271)

Note:

Because of the small sample size in smaller communities, the values reported by the US Census Bureau may be misleading (i.e., may show large differences between communities that may not exist). Therefore, margin-of-error values are presented to show the potential range of the reported values.

Source: USCB 2018

### 3.3.2.4 Education

Education is funded from state and local sources and provided through school districts in existing borough governments or areas outside those boroughs. In general, communities in the EIS analysis area have a high school graduation rate above 80 percent, and those with bachelor's degrees or higher range from 10 to 25 percent (Table 3.3-5). The graduation rates and number of those holding a bachelor's degree or higher are higher in more densely populated areas, such as Anchorage and KPB. In comparison, across the US, the high school graduation rate is approximately 87 percent, and about 30 percent have a bachelor's degree or higher. As indicated previously, declining populations threaten the ability to keep schools open in some communities, particularly in the LPB.



**Table 3.3-5: Education Characteristics of Potentially Affected Communities**

Area	School Enrollment Pre-K—12 <sup>1</sup>	High School Graduate or Higher <sup>2</sup>	Bachelor's Degree or Higher <sup>2</sup>
Lake and Peninsula Borough	343	88%	16%
Igiugig	19	86%	21%
Iliamna	Included with Newhalen	97%	19%
Kokhanok	34	81%	8%
Levelock	22	83%	2%
Newhalen	67	90%	17%
Nondalton	26	85%	11%
Pedro Bay	0	100%	11%
Port Alsworth	62	99%	49%
Dillingham Census Area	1,092	86%	17%
Dillingham	483	91%	22%
Ekwok	15	69%	0%
Koliganek	56	83%	20%
New Stuyahok	141	78%	3%
Kenai Peninsula Borough	9,027	93%	24%
Bristol Bay Borough	128	93%	20%
Anchorage	47,624	93%	35%
Alaska	133,381	92%	29%

Sources:

<sup>1</sup>ADEED 2018

<sup>2</sup>USCB 2018

### **3.4 ENVIRONMENTAL JUSTICE**

The affected environment for environmental justice includes definitions of minority and low-income populations; a discussion of race and ethnic origin; and a discussion of the relationship between environmental justice and subsistence resources, socioeconomics, cultural resources, and community health. The Environmental Impact Statement (EIS) analysis area for this section includes the EIS analysis area described in Section 3.10, Health and Safety, corresponding to an area that could be affected by the mine site, transportation corridor, and natural gas pipeline for each alternative through changes in economic, subsistence, and health resources and activities. This includes the six Iliamna Lake communities that would be most impacted economically and by impacts to subsistence resources by project, and regional communities in the Bristol Bay area that may experience economic impacts from the project.

#### **3.4.1 Definitions of Minority and Low-Income Populations**

Executive Order 12898 (1994) requires that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories.” Essentially, the order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority communities and low-income populations, as defined by the executive order. Under Executive Order 12898, demographic information is used to determine whether minority populations or low-income populations are present in the areas potentially affected by the project. If so, a determination must be made as to whether implementation of the project may cause disproportionately high and adverse human health or environmental effects on those populations.

For the purposes of this analysis, a minority community is defined as a community with a majority (i.e., 50 percent or greater) minority population, and a low-income community is defined as having a greater percentage of the population living in households below the poverty threshold as defined by the US Census Bureau than the percentage of the population in the state living below that level. This is consistent with guidance from the Council on Environmental Quality (CEQ) (CEQ 1997). Historically, minority and low-income populations have suffered a greater share of adverse environmental and health impacts related to industry and development projects relative to the benefits. In addition, impacts to Alaska Native populations may be different from impacts on the general population due to a community’s distinct cultural practices (CEQ 1997). Subsistence populations are low income by definition; however, they are not necessarily lacking in resources. Therefore, agencies would consider impacts to subsistence and sociocultural characteristics as a component of the environmental justice analysis.

#### **3.4.2 Minority and Low-Income Populations**

The project’s potentially affected population includes those who live, work, or participate in subsistence activities in the EIS analysis area. Table 3.4-1 presents available community-level racial and ethnic characteristics, as well as the percent living below the poverty level for the population in the EIS analysis area that would be affected during construction and operations of the mine site, transportation corridor, port, and natural gas pipeline for all alternatives. Figure 3.4-1 shows minority and low-income communities in the EIS analysis area.

Data in this section were obtained from the US Census Bureau 2013-2017 American Community Survey (ACS). Estimates from the ACS are all “period” estimates that represent data collected

over a period of time (as opposed to “point-in-time” estimates, such as the decennial census, that approximate the characteristics of an area on a specific date). The primary advantage of using multi-year estimates in this analysis of low-income populations is the increased statistical reliability of the data for less populated areas and small population subgroups such as those in the vicinity of the project site. Therefore, minority and low-income populations that could be affected by the project have been adequately identified. Statistics for the state of Alaska are provided as a reference.

**Table 3.4-1: Ethnicity, Racial, and Poverty Characteristics of the EIS Analysis Area, 2017  
(Percent of Total Population)**

	White <sup>1</sup>	Black or African American <sup>2</sup>	Alaska Native and American Indians <sup>2</sup>	Asian <sup>2</sup>	Native Hawaiian and Other Pacific Islander <sup>2</sup>	Some Other Race <sup>2</sup>	Hispanic or Latino <sup>3</sup>	Total Minority	Living below Poverty Threshold
Lake and Peninsula Borough	22.4	0.7	67.6	2.2	.02	0.2	1.5	70.7	16.5
Igiugig	10.9	0	89.1	0	0	0	2.2	89.1	2.2
Iliamna	16.9	0	75.4	0	0	0	0	75.4	15.4
Kokhanok	8.1	0	91.9	0	0	0	1.3	91.9	24.3
Levelock	2.1	0	97.9	0	0	0	101	97.9	26.3
Newhalen	9.6	0	82.5	0	0	0	7.0	82.5	17.7
Nondalton	13.6	0	73.6	0	0.9	1.8	0	73.6	29.1
Pedro Bay	16.7	0	50.0	0	0	0	0	50.0	0.0
Port Alsworth	68.8	0.6	10.2	0	0	0	0	10.8	3.3
Kenai Peninsula Borough	83.6	0.5	7.3	1.5	0.3	0.7	4.0	9.6	11.0
Bristol Bay Borough	52.0	0.4	34.6	1.4	0.3	2.3	4.5	36.7	7.1
Dillingham Census Area	17.5	0.4	72.9	1.5	0	0.7	3.1	74.8	16.6
Dillingham	28.0	0.8	56.5	1.4	0	1.4	6.7	58.7	9.7
Ekwok	0	0	100	0	0	0	0	100	39.1
Koliganek	9.4	0	82.9	0	0	0	0	82.9	10.6
New Stuyahok	0.4	0	97.3	0	0	0	0	97.3	24.2
Anchorage Municipality	63.7	5.5	7.3	9.3	2.4	2.2	8.9	24.5	8.1
State of Alaska	65.3	3.2	14.2	6.2	1.2	1.4	6.8	24.8	10.2

Notes:

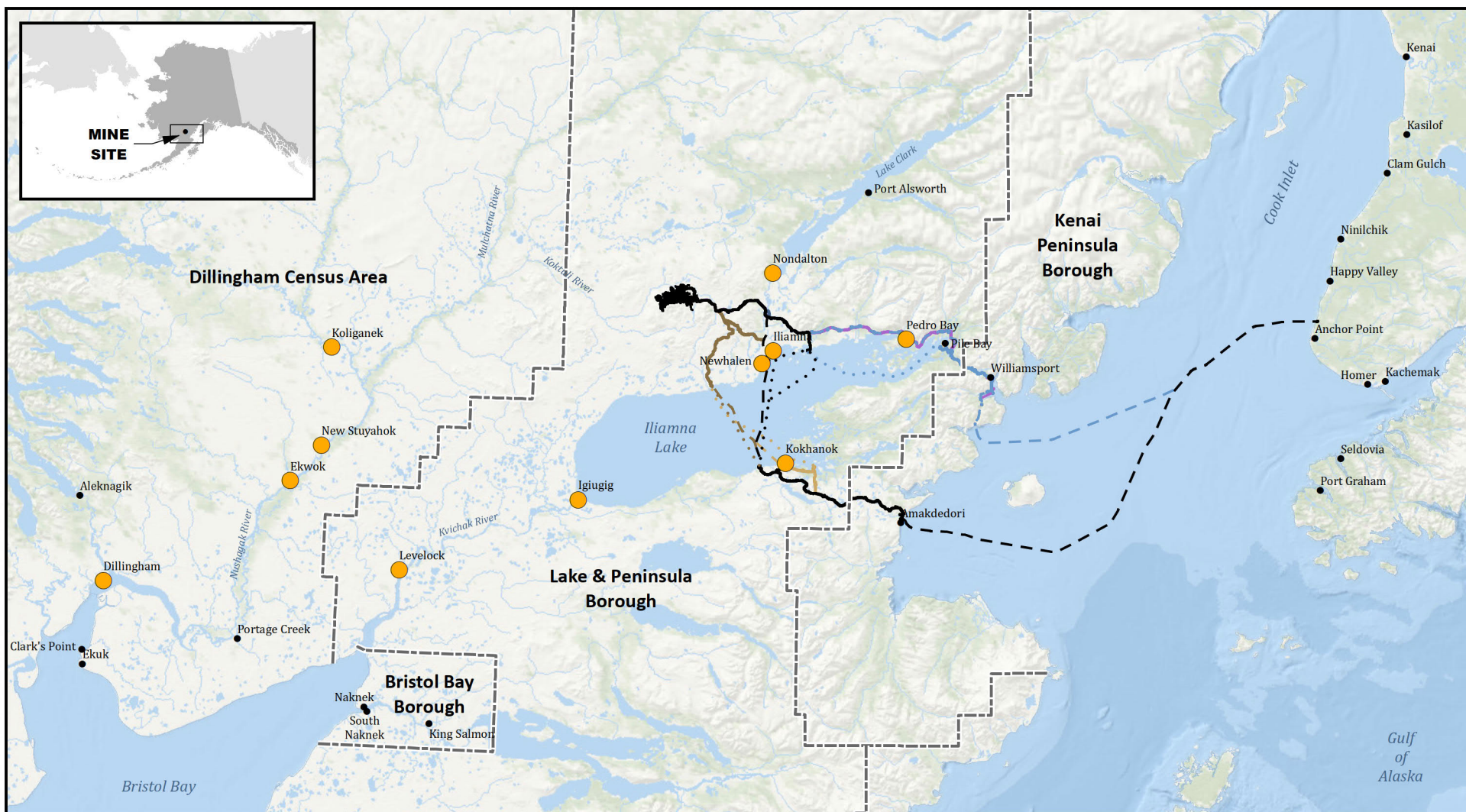
Minority population = Total population – (White, non-Hispanic population + Some Other Race Alone, non-Hispanic population)

<sup>1</sup> Alone, non-Hispanic

<sup>2</sup> Alone or in combination with one or more other races

<sup>3</sup> Of any race

Source: USCB 2018



Sources: PLP 2020-RF1168;  
PLP 2019-RF1153; ADN



**US Army Corps of Engineers**



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FIGURE 3.4-1



Most Alaskan communities tend to have a bi-modal racial structure. Most commonly, communities either have a substantial majority of the community that identify as White and other ethnic groups, or a majority that identify as Alaska Native or American Indian (Himes-Cornell et al. 2013). These trends are consistent with the EIS analysis area. As shown in Table 3.4-1, the majority of individuals in the Kenai Peninsula, Bristol Bay Borough, and Anchorage Municipality identify as White; whereas the majority of individuals in the Lake and Peninsula Borough (LPB) and the Dillingham Census Area identify as Alaska Native or American Indian.

The Kenai Peninsula Borough (KPB), Bristol Bay Borough, Municipality of Anchorage, and Port Alsworth in the LPB are not considered minority or low-income communities. Igiugig and Pedro Bay are considered minority communities, but not low-income communities. Iliamna, Kokhanok, Levelock, Newhalen, Nondalton, and the Dillingham Census Area as a whole are considered both minority and low-income communities. Of these communities, Levelock, Kokhanok, and Newhalen have the largest percentage of minority individuals. Kokhanok, Nondalton, and Levelock have the highest percentage of persons below poverty level.

In addition, median incomes through communities in the region are less than half the statewide average of \$76,114. High rates of the population living below the poverty level and low median income are partly based on economies being largely subsistence-based, because wage employment is limited (Himes-Cornell et al. 2013). Many residents seek additional wage employment outside of their community. It should be noted that ACS data are based on wage earnings and do not take into account the value of subsistence in the local economy (see Section 3.3, Needs and Welfare of the People—Socioeconomics, for detailed discussion of employment and income in the EIS analysis area).

Table 3.4-2 evaluates whether communities in the EIS analysis area meet the CEQ definitions of minority and low-income communities. The following communities meet the CEQ definition of minority and/or low-income: Igiugig, Iliamna, Kokhanok, Levelock, Newhalen, Nondalton, and Pedro Bay in the LPB; Dillingham, Ekwok, Koliganek, and New Stuyahok in the Dillingham Census Area; and the Dillingham Census Area as a whole. This environmental justice analysis considers if the project results in disproportionately high and adverse human health or environmental effects on those populations.

**Table 3.4-2: Determination of Minority and Low-Income Communities with Environmental Justice**

Community	Total Minority	Poverty Rates in excess of Poverty Rate for the State of Alaska	Meets Minority or Low-Income Definitions for Environmental Justice
Lake and Peninsula Borough	Yes	Yes	Yes
Igiugig	Yes	No	Yes
Iliamna	Yes	Yes	Yes
Kokhanok	Yes	Yes	Yes
Levelock	Yes	Yes	Yes
Newhalen	Yes	Yes	Yes
Nondalton	Yes	Yes	Yes
Pedro Bay	Yes	No	Yes
Port Alsworth	No	No	No
Kenai Peninsula Borough	No	No	No

**Table 3.4-2: Determination of Minority and Low-Income Communities with Environmental Justice**

Community	Total Minority	Poverty Rates in excess of Poverty Rate for the State of Alaska	Meets Minority or Low-Income Definitions for Environmental Justice
Bristol Bay Borough	No	No	No
Dillingham Census Area	Yes	Yes	Yes
Dillingham	Yes	No	Yes
Ekwok	Yes	Yes	Yes
Koliganek	Yes	No	Yes
New Stuyahok	Yes	Yes	Yes
Anchorage Municipality	No	No	No
State of Alaska	No	No	No

Source: Data summarized from Table 3.4-1

As stated above, impacts to Alaska Native populations may be different from impacts on the general population due to a community's distinct cultural practices; impacts associated with subsistence are a component of the environmental justice analysis. Section 3.9, Subsistence, and Appendix K3.9 describe subsistence resources, harvest, and sharing patterns for subsistence-based communities in the EIS analysis area. These communities include Igiugig, Iliamna, Kokhanok, Levelock, Newhalen, Nondalton, Pedro Bay, and Port Alsworth in the LPB; Ninilchik and Seldovia in the KPB; King Salmon, Naknek, and South Naknek in the Bristol Bay Borough; and Aleknagik, Clark's Point, Dillingham, Koliganek, Manokotak, and New Stuyahok in the Dillingham Census Area. The proportion of minority and low-income populations in the communities not listed in Table 3.4-1 are generally similar to those shown in Table 3.4-1 for the KPB, Bristol Bay Borough, and Dillingham Census Area. Other communities in the KPB and Bristol Bay Borough are not considered minority and low-income communities because there is a high proportion of White residents, and the percentage of populations at income levels below the poverty level are generally low. The populations in the Dillingham Census Area are considered minority and low-income communities, with a high proportion of Alaska Native residents and a high percentage of populations at income levels below the poverty level (Himes-Cornell et al. 2013; SOA 2017).

### 3.4.3 Relationship to Subsistence, Health, and Environment

Environmental justice analysis is an intersection between several resource topics. The relationship includes subsistence users, subsistence resources, cultural practices, socioeconomic characteristics, and community health, with a potential for both beneficial and adverse impacts. Socioeconomic impacts associated with population, housing, and employment are described in Section 4.3, Needs and Welfare of the People—Socioeconomics. Section 4.9, Subsistence, describes impacts to subsistence resources and harvest patterns for subsistence-based communities in the EIS analysis area. Project-related impacts to human health are described in Section 4.10, Health and Safety, including effects from changes in air quality and water quality, as well as concerns about contamination and subsistence food consumption. In Section 4.4, Environmental Justice, each alternative is evaluated for possible disproportionate impacts to minority and low-income communities using the information provided in the socioeconomic, subsistence, and human health sections of this EIS; determinations are made on whether environmental justice effects would occur.



## **3.5 RECREATION**

The Environmental Impact Statement (EIS) analysis area for recreation is defined as the area from Lake Clark National Park and Preserve south to Katmai National Park and Preserve, and from the Nushagak River east to the western Kenai Peninsula (Figure 3.5-1). This area is mostly remote and undeveloped. These lands and waters support a wide variety of dispersed recreational activities, including sport hunting, hiking, camping, and snowmachining. Due to the economic importance of fishing and subsistence in this region, recreational and commercial fishing and subsistence are discussed in other sections (see Section 3.6, Commercial and Recreational Fisheries, and Section 3.9, Subsistence).

### **3.5.1 Recreation Management**

#### **3.5.1.1 State Lands**

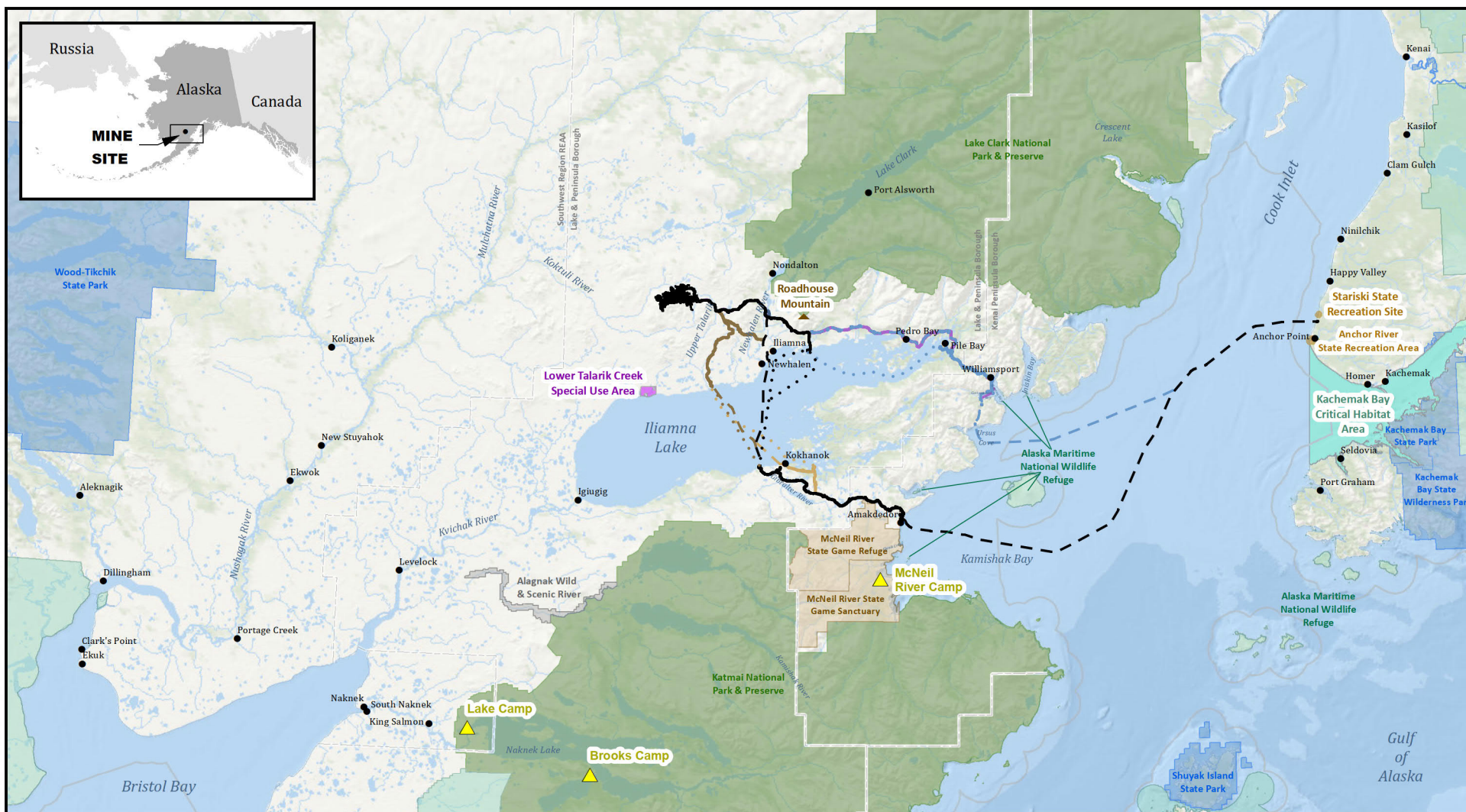
##### **Alaska Department of Fish and Game**

##### ***McNeil River State Game Sanctuary and Refuge***

The McNeil River State Game Sanctuary (Sanctuary) and Refuge (Refuge) are south of the Amakdedori port site and port access road. They extend north and east from Katmai National Park and Preserve to the shore of Kamishak Bay. The refuge is the northern portion of the unit. The Sanctuary hosts visitor facilities (campground, visitor support buildings, trails) and a brown bear viewing program, which primarily occurs at McNeil River, Mikfik Creek, and along the coast. The Refuge does not have any developed visitor facilities. Most bear-viewing activities in the refuge occur near Chenik Creek. Guided bear viewing and private visitor bear viewing occurs during the month of July. The boundary of the refuge would be within a mile of Alternative 1a and the Alternative 1 port access road (approximately 630 feet at its nearest point) and 2 miles from Amakdedori port. The refuge boundary would be more than 10 miles from Alternative 2—North Road and Ferry with Downstream Dams or Alternative 3—North Road Only components.

The McNeil River State Game Refuge and Sanctuary were established for the purpose of preserving wildlife habitats and unique brown bear concentrations, managing human use and activities compatible with that purpose, to maintain and enhance unique bear viewing opportunities in the sanctuary, and provide opportunities for compatible wildlife-related uses. The 2008 Management Plan includes policies that support low-intensity recreational uses such as information and education, camping, boating, hunting, trapping, fishing, hiking, photography, and wildlife viewing (ADF&G 2008a).

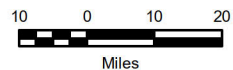
The Sanctuary is closed to all hunting and trapping, while the Refuge is closed to brown bear hunting, but open to other hunting and trapping. Fishing is allowed in portions of the refuge and sanctuary.



Sources: PLP 2020-RF1168;  
PLP 2019-RF1153; ADN



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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1
- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2

- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3
- Other Features**
- Camps
- Borough Boundary
- Three Nautical Mile Line
- National Park

- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary
- Critical Habitat Area
- State Recreation
- Special Use Area

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REGIONAL RECREATION AREAS

FIGURE 3.5-1

### ***Kachemak Bay Critical Habitat Area***

Kachemak Bay, south of Homer, has been designated as a State of Alaska Critical Habitat Area and a National Estuarine Research Reserve, the largest in this system of reserves (NOAA no date). The bay has year-round fish and shellfish populations and hosts tens of thousands of seabirds, shorebirds, and waterfowl in the spring, summer, and fall. Main access to the bay is from the Homer Spit, although access is also available from Seldovia and other small communities around the bay. Popular recreational activities in the bay include sport fishing and wildlife-watching tours in the summer, and clamming on low tides throughout the year. The area is open to most public uses without a permit (ADF&G 2018o). The Critical Habitat Boundary is southwest of Anchor Point, about 4 miles from the natural gas pipeline for all alternatives.

### **Alaska Department of Natural Resources**

#### ***Bristol Bay Area Plan***

The Bristol Bay Area Plan (BBAP) directs the management of State lands just inland of Cook Inlet, west to Bristol Bay. The plan includes a stated goal to provide land for accessible outdoor recreational opportunities with recreational facilities where the demand warrants. The EIS analysis area would occur in Regions 6, 8, 9, and 10 of the plan area.

A variety of general uses are allowed on State lands without a permit from the Division of Mining, Land, and Water. Such uses include hiking, backpacking, skiing, horseback riding, using a vehicle (below a certain weight depending on the type of vehicle), landing an aircraft, using watercraft, hunting, fishing, trapping, harvesting plants, recreational gold panning, hard-rock mineral prospecting or mining, and non-commercial camping (ADNR 2011). The BBAP states that recreational uses in the Bristol Bay area include camping, hunting, sport fishing, river excursions, and wildlife viewing, rafting, and jetboat tours. Permanent facilities related to commercial recreation are prohibited in Unit 23 (ADNR 2013a).

In Region 6, the EIS analysis area (specifically, the mine site and a portion of the transportation corridors for all alternatives) is in Unit 23—Pebble and Unit 24—Pebble Streams. Both of these units are designated Minerals, a designation that is given to areas associated with significant resources that may experience mineral exploration or development.

In Region 8, the Alternative 1a and Alternative 2 mine access roads and the Alternative 3 transportation corridor would be in two units: Unit 5—Newhalen River, and Unit 6—Roadhouse Mountain. Unit 5 is designated as Settlement to facilitate remote recreational use and community expansion west of the Newhalen River. The BBAP also notes that there are several lakes accessible by floatplane in this unit (ADNR 2013a). Unit 6, which encompasses lands around Roadhouse Mountain, is designated as General Use, to be managed for a variety of uses, including dispersed recreation. In addition, some forms of recreational use, including commercial, may be appropriate in the unit (ADNR 2013a).

In Region 9, the Alternative 1a and Alternative 1 port access road southeast of Iliamna Lake would be in Unit 7—Tommy Creek/Chigmit. Unit 7 is designated General Use, and is managed for a variety of uses, including dispersed recreation. General Use areas are not intended for intensive forms of development other than occasional use at specific sites, usually associated with mining, oil and gas exploration, or recreation (ADNR 2013a). The Alternative 3 transportation corridor would be in small portions of Unit 1A—Moose Wintering Areas—NE Iliamna Lake. This unit is designated Habitat and Public Recreation and Tourism—Dispersed. This unit is managed for dispersed recreation and habitat values. The joint designation of Habitat and Public Recreation and Tourism—Dispersed Use applies to navigable rivers in the region (along with Iliamna Lake);



authorizations in these waterbodies should not interfere with recreational uses or navigability (ADNR 2013a).

In Region 10, a portion of the Alternative 1 transportation corridor (north of Iliamna Lake) and a portion of the Alternative 1a, Alternative 2, and Alternative 3 transportation corridors would be in Unit 1—Upper Talarik Creek and Unit 2—Pebble 2. Unit 1 is designated General Use, and is to be managed for a variety of uses, including public recreation and tourism. Unit 2 is designated Minerals and Habitat. Specifically, Upper Talarik Creek, in both Unit 1 and Unit 2, is to be protected for its recreational, habitat, and water resource values. Permanent, commercial recreation-related facilities are prohibited in Unit 2. The BBAP also notes that impacts to dispersed recreation along Talarik Creek should be avoided in Unit 2 (ADNR 2013a).

The Nushagak River and the Mulchatna River headwaters and lands that provide the waters for these rivers (e.g., Koktuli River) include the mine site lands, and are managed by the Alaska Department of Natural Resources (ADNR) under the Nushagak and Mulchatna Rivers Recreation Management Plan (ADNR 2005). More information is provided in Section 3.2, Land Ownership, Management, and Use.

### ***Lower Talarik Creek Special Use Area***

The Lower Talarik Creek Special Use Area was established in 1999, and is designated as a public recreation and public use tourism site. This area is 10 miles from the mine site and 10 miles from the Alternative 1 transportation corridor. This area is used for commercial and non-commercial sport fishing and hunting (ADNR 2013a).

### ***Kenai Area Plan***

The Kenai Area Plan (KAP) directs the management of State lands on the Kenai Peninsula and the western side of Cook Inlet. The eastern end of the gas pipeline (under all alternatives) would be in Region 7, while Amakdedori port, Diamond Point port, the eastern end of the Alternative 1a and Alternative 1 port access road, and the western end of the underwater portion of the gas pipeline corridor (under all alternatives) would be in Region 12 of the KAP plan area.

On the Kenai Peninsula, the eastern end of the gas pipeline (for all alternatives) would be in the KAP Unit 552—Deep Creek to Anchor Point Tidelands, which is designated Habitat, Harvest, and Public Recreation and Tourism – Dispersed Use. The compressor station would be on State lands just inland of Unit 552; the KAP notes that there are outstanding scenic and recreational values, clam digging, and beach combing in this unit. The nearest public recreation areas are the 60-acre Stariski State Recreation Site, 1.2 miles north of the compressor station; and Anchor River State Recreation Area at the mouth of the Anchor River, 3.5 miles south of the compressor station. Both sites offer camping and picnicking. Stariski does not offer water access, whereas Anchor River provides boat and fishing access. Both sites are accessible via the Sterling Highway.

In KAP Region 12, Alternative 1a and Alternative 1 components, including a portion of Amakdedori port, the western end of the underwater portion of the gas pipeline, and the Kamishak Bay lightering location, would be in Unit 522A—Region 12 General Use Tidelands, which is designated Public Recreation and Tourism—Dispersed Use. The KAP notes that beaches in this unit are used for aircraft landing, and there is commercial fishing activity in the unit (ADNR 2001).

The eastern end of the Alternative 1a and Alternative 1 port access road and a portion of the Amakdedori port would be in Unit 19—Bruin Bay Uplands, which is designated Habitat. This unit contains habitat for brown bear (spring feeding), moose, Dolly Varden/Arctic char, seabird nesting, ducks and geese, and herring spawning. The head of Bruin Bay, north of the facilities, is highly scenic and has nice beaches (ADNR 2001). Given the habitats and species in this unit and

expanse of State lands, there is likely some hunting, fishing, wildlife viewing, and beach combing use in Unit 19.

The Alternative 1a and Alternative 1 pipeline would also pass south of Augustine Island, while the Alternative 2 and 3 gas pipeline would pass north of the island, and a lightering location for all alternatives would be west of the island. The island itself is under an Interagency Land Management Assignment to the University of Alaska for research, and is managed for scientific and educational purposes. The island is also part of the Alaska Maritime National Wildlife Refuge. The plan states that any authorized recreational uses of the island should minimize impacts on research opportunities and natural processes on the island. State lands are in Unit 522A both immediately south of the island, as well as slightly north of the island. The plan designates this unit as Public Recreation and Tourism, and notes that these areas attract recreationists that range throughout the area and may have a high potential for dispersed recreation because of desirable recreational conditions (ADNR 2001). It is assumed that recreational opportunities in the waters surrounding the island include sightseeing, fishing, wildlife viewing, and boating.

The Diamond Point port under Alternative 2 and Alternative 3 would be in Region 12 Unit 587—Iniskin Peninsula and Bay Tidelands and Unit 522A (described above). The Iniskin Bay lightering location would also be in Unit 587, which is designated as Habitat. This unit contains habitat for waterfowl, harbor seals, Pacific herring spawning and migration, juvenile fish/shellfish rearing, anadromous fish, and bears. Commercial fishing occurs in this unit, and there may be potential requests for mooring buoys for ships to use during log loading (ADNR 2001). There is likely recreational fishing and wildlife viewing use in Unit 587.

The portion of the gas pipeline for Alternative 2 and Alternative 3 in Cottonwood Bay and Ursus Cove crosses Unit 522A (described above), Unit 590—Head of Cottonwood Bay Tidelands, and Unit 594—Ursus Cove Tidelands. Units 590 and 594 are both designated Habitat. Commercial fishing activity occurs in both units 590 and 594. Given the fish habitat in this unit, there is likely also recreational fishing use of both units.

### **3.5.1.2 Federal Lands**

#### **National Park Service**

The National Park Service (NPS) is charged with promoting and regulating the use of national parks and preserves to conserve the natural and cultural areas, scenery, and wildlife for the enjoyment, education, and inspiration of this and future generations. The following section provides information on the recreational uses and management of the three NPS units in the regional recreation area of the project.

#### ***Lake Clark National Park and Preserve***

Lake Clark National Park and Preserve includes the private community of Port Alsworth and is not accessible by road. The boundary of the park and preserve is about 15 miles northeast of the mine site, and 3 miles from the Alternative 1a and Alternative 2 and Alternative 3 mine access road (at the closest point, which is the northern side of Roadhouse Mountain). The park covers the eastern two-thirds of the park unit and the preserve is a north-to-south strip of land adjacent to the western side of the national park. Most of the park is designated Wilderness, and it is the sixth largest park unit in the nation.

The purpose of Lake Clark National Park and Preserve is to “protect a region of dynamic geologic and ecological processes that create scenic mountain landscapes, unaltered watersheds supporting Bristol Bay red salmon, and habitats for wilderness dependent populations of fish and wildlife, vital to 10,000 years of human history” (NPS 2009c). It is managed to provide for visitor

access, recreation, and use in the park unit, including development, access, commercial use, visitor use, visitor information, and interpretive materials (NPS 1984). The preserve is primarily land determined suitable—and is included in lands proposed to Congress—for Wilderness designation; therefore, it is managed to maintain its wilderness eligibility.

Lake Clark National Park and Preserve's 2010 Long Range Interpretive Plan describes desired visitor recreational experiences as opportunities to hike, explore, and camp in a trail-less wilderness with no signs of human impact; experience solitude in a pristine unchanged natural landscape of extraordinary scenic quality and character; fish for all species that inhabit the park; discover the subsistence lifestyle; circumnavigate Lake Clark via kayak; see the watershed of Bristol Bay protected in perpetuity, including clean water and clean shorelines; see salmon spawning; hunt for moose, spruce hens, and other species; pick berries; collect drinking water; hear natural sounds; experience the remote natural landscape encompassing the cultural heritage and history of the region; and other descriptions of undeveloped recreational opportunities (NPS 2010).

The following recreational activities are available in Lake Clark National Park and Preserve: sightseeing, backpacking/overnight camping, boating, wildlife viewing, group camping, hiking/walking, kayaking, mountaineering, paddle boarding, photography, sport fishing, sport hunting, skiing, and snowshoeing (NPS 2018a).

### ***Katmai National Park and Preserve***

The Katmai National Park and Preserve boundary is approximately 7 miles south of the Alternative 1a and Alternative 1 port access road at its nearest point. This NPS unit is primarily national park, with the preserve adjacent to the western part of the northern boundary of the park. Most of the park is designated Wilderness, and it is the fifth largest park unit in the nation. There are also over 20,000 acres of privately owned lands in the unit (Kevin Waring and Associates 2011b).

The purpose of Katmai National Park and Preserve is “to protect, study, and interpret active volcanism surrounding the Valley of Ten Thousand Smokes, extensive coastal resources, habitats supporting a high concentration of salmon and brown bears, and an ongoing story of humans integrated with a dynamic subarctic ecosystem” (NPS 2009d).

The following recreational activities are available in Katmai National Park and Preserve: sightseeing, backpacking/overnight camping, boating, wildlife viewing, group camping, hiking/walking, kayaking, photography, sport fishing, and sport hunting (NPS 2018a).

### ***Alagnak Wild River***

The Alagnak River is designated a Wild River in the Wild and Scenic Rivers System. The Wild and Scenic Rivers Act was enacted to protect certain rivers with outstanding natural, cultural, and recreational values for the benefit and enjoyment of present and future generations. The Alagnak Wild River consists of 67 miles of river corridor that is mostly (i.e., 93 percent) federally owned, with some privately owned Native Allotments and other private inholdings in the river corridor. The Wild River begins downstream of Kukaklek Lake, and flows westward, although the last 12 miles of the Alagnak River are outside the designated corridor. The river was designated a Wild River in 1980, and there is no road access to it (Kevin Waring and Associates 2011b). This river is approximately 50 miles south of the Alternative 1 mine access road at its nearest point.

The following recreational activities occur in the Alagnak Wild River: sightseeing, backpacking/overnight camping, boating, wildlife viewing, group camping, hiking/walking, photography, and sport fishing (NPS 2018a).



## **US Fish and Wildlife Service**

### ***Alaska Maritime National Wildlife Refuge***

The Alaska Maritime National Wildlife Refuge (NWR) includes 3.4 million acres (USFWS 2013a) from Forrester Island in southeastern Alaska to the tip of the Aleutian chain, and almost to Utqiagvik on the Arctic Ocean (USFWS 2011a). In the EIS analysis area, there are several islands that are near project facilities. Augustine Island would be 7.5 miles north of the Alternative 1a and Alternative 1 pipeline, and approximately 6 miles south of the Alternative 2 and Alternative 3 pipeline, as well as 2.5 miles east of the Amakdedori port and Iniskin Bay offshore lightering locations (for all alternatives). Cook Inlet islands east of McNeil River State Game Refuge would be 7.5 miles south of Amakdedori port and the Alternative 1a and Alternative 1 gas pipeline. White Gull Island in Iliamna Bay would be 2.6 miles from Diamond Point port. Several islands at the mouth of Iniskin Bay would be 7.5 miles from the Diamond Point port, and less than 1 mile from the offshore lightering location in Iniskin Bay.

The purposes of the Alaska Maritime NWR are conservation, treaty obligations, subsistence use, scientific research, and water quality/quantity. The wildlife resources in the Alaska Maritime NWR attract recreational visitors. As stated in the Land Protection Plan for the NWR, “the Alaska Maritime Refuge is managed to conserve native fish and wildlife populations and their habitats, while providing opportunities for subsistence, compatible types of recreation, and research” (USFWS 2011a). Recreational use of the NWR includes hunting, wildlife viewing, photography, interpretation/environmental education, hiking, and camping (USFWS 2014a).

#### **3.5.1.3 Private Land**

Land owned by Native corporations and Native Allotments are considered to be private property, and therefore are not open for public recreational use. Permission and/or permits for access and seasonal recreational use of these lands must be obtained from the landowner. Similar to nearby State lands, it is likely that hunting and fishing are the primary permitted/allowed recreational uses of private land in the EIS analysis area.

### **3.5.2 Regional Recreation**

The region around the project infrastructure is primarily accessed via small aircraft, except for the Kenai Peninsula area near the eastern end of the gas pipeline (under all alternatives), which is accessible via road. There is a limited road system that connects Iliamna with Newhalen, and supports sport fishing activities and lodges. The few developed public recreation facilities that are present in the area are generally accessed via air or water.

#### **3.5.2.1 Recreation Opportunities**

##### **Sport Fishing**

Sport fishing is the primary recreational activity that occurs in the EIS analysis area. Rivers such as the Nushagak, Mulchatna, Gibraltar, Kvichak, Koktuli, and Upper and Lower Talarik Creek, as well as Iliamna Lake, Lake Clark, and all surrounding aircraft-accessible lakes support recreational fishing for species of salmon, rainbow trout, and other freshwater fish. Sport fishing use is increasing in the area; most public use is guided, with operators flying their clients to a place for the day from nearby lodges, or basing out of camps established nearby. Sport fishing is managed by the Alaska Department of Fish and Game (ADF&G) through a permit system for guides, regulations, and the board process. The ADF&G uses a number of tools such as effort,

catch, harvest information, abundance, and size composition to manage sport fishing. For information on sport fishing effort, see Section 3.6, Commercial and Recreational Fisheries.

### **Sport Hunting and Trapping**

Hunting, primarily for moose, caribou, and bear, is a major recreational activity in the region (Kevin Waring and Associates 2011b). Much of the region is open to sport hunting, except Lake Clark National Park, Katmai National Park, and McNeil River State Game Sanctuary. However, hunting and trapping are allowed by the NPS and State of Alaska in the Lake Clark National Preserve, Katmai National Preserve, and McNeil River State Game Refuge (excluding brown bears in the refuge) (ADF&G 2018e; NPS 2017g, 2018a). Hunting and trapping are also allowed in the Alagnak Wild River and on certain islands in the Alaska Maritime NWR (NPS 2016a; USFWS 2014a). State lands are open to hunting unless otherwise restricted by the ADF&G, which manages hunting in Alaska. Hunting on private property, including on village corporation lands and Native Allotments, requires landowner permission.

The NPS and State of Alaska cooperatively manage wildlife resources in the three regional NPS units (Lake Clark, Katmai, Alagnak Wild River), and hunters in these units must follow current state and federal hunting regulations and must have all required licenses and registrations (NPS 2016a, 2017g, 2018a). Lake Clark National Preserve is divided into three authorized hunting guide areas; there are currently two concessioners authorized to guide sport hunters in these areas. Alaska residents may hunt without a guide (NPS 2017g). There are also two concessioners authorized to guide sport hunters at Katmai National Preserve (NPS 2018a). The Refuge is open to hunting and trapping of various species, with the exception of brown bears (ADF&G 2018e).

The region is in Game Management Units (GMUs) 9 (most of the region), 17B (western portion of EIS analysis area), and 15C (Kenai Peninsula). The EIS analysis area is specifically in GMUs 9B, 17B, and 15C. The species hunted in GMU 9B include brown bear, caribou, Dall sheep, moose, wolf, and wolverine. Species hunted in GMU 17B include black bear, brown bear, emperor goose, moose, wolf, and wolverine. Species hunted in GMU 15 include black bear, brown bear, caribou, Dall sheep, moose, mountain goat, wolf, and wolverine. In Alaska, non-residents who hunt for brown bears, mountain goats, and Dall sheep need to be personally accompanied by a licensed hunting guide or an Alaska resident 19 years or older who is a close relative. Although numbers of hunters by GMU are not available, Table 3.5-1 below shows 2017 harvest information by animal species and GMU (ADF&G 2018-RFI 089).

**Table 3.5-1: 2017 Harvest Data by Species and Game Management Unit**

Species	GMU 9B	GMU 17B	GMU 15C
Brown bear	31	35	15
Black bear	1	6	159
Moose	42	45	176
Caribou	16	74	3
Wolf	9	33	13
Wolverine	5	12	7
Goat	0	0 <sup>1</sup>	39
Sheep	0	0 <sup>1</sup>	2

Note:

GMU = Game Management Unit

<sup>1</sup>These species are not hunted in this GMU

Source: ADF&G 2018-RFI 089

### **Water-Related Recreation (Boating)**

Various forms of boating (e.g., canoeing, kayaking, rafting, and power boating) are popular in most recreation areas in the region. Whitewater and non-whitewater river boating opportunities are available in the three NPS units in the region.

Boating occurs on the Mulchatna River all the way to its confluence with the Nushagak River. The Koktuli River is also floated to its confluence with the Mulchatna River, both by individuals and as part of guided float trips. Commercial rafting and jetboat tours also occur on the Newhalen River (ADNR 2013a).

River-based boating opportunities vary based on season, amount of rainfall, and temperatures. Generally, river levels are lowest in early spring, and increase throughout spring and early summer as spring rains fall and snow and glacier melt occurs, with river levels generally peaking in July and then declining into the fall (NPS 2015a).

Due to lack of road access to the region, and because many visitors travel to the area by small plane, boating equipment that can be brought to the region by visitors is limited. Guided trips are available in the national parks, and via other companies in and around the region.

Lake boating opportunities occur during the ice-free season, and are available on several lakes in both Lake Clark and Katmai national parks and preserves. Motorboating opportunities are available at Lake Clark and Crescent Lake in Lake Clark National Park and Preserve, and Naknek Lake in Katmai National Park and Preserve (NPS 2017h, 2018a). All three lakes are popular destinations for visitors. In 2017, there were 10 companies authorized to provide boating trips in Lake Clark National Park and Preserve (NPS 2018a). The Lake Camp area at Naknek Lake in Katmai National Park and Preserve is accessible via the road from King Salmon, and contains a boat ramp, parking area, picnic area, and restrooms. In Katmai National Park and Preserve in 2017, 11 companies were authorized to provide boating trips (NPS 2018a).

The Refuge is open to boating (ADF&G 2018e). Powerboating, canoeing, and kayaking opportunities are available in Cook Inlet, such as along the Lake Clark National Park and Preserve boundary. Boating opportunities, including guided kayaking trips (AELO 2018), are also available at Iliamna Lake, Alaska's largest body of freshwater (Van Lanen 2012), although most use of the lake is for sport fishing or subsistence fishing. Access is available from Iliamna, Newhalen, Igiugig, Pedro Bay, Pile Bay, and Kokhanok, and private docks along the lake. In early June, approximately 60 commercial fishing boats make the trek from Homer to Bristol Bay via Iliamna Lake and the Kvichak River. The boats also make the return trip from Bristol Bay back to Homer along the same route at the end of summer (Dischner 2015a).

Kayaking and boating opportunities are also available on the eastern side of Cook Inlet near the terminus of the gas pipeline at the Anchor River State Recreation Area. Tractor-assisted boat launching is available at this location. Such activities primarily occur during the summer months. The mouth of Anchor River at the Anchor Point State Recreation Site is heavily used for boat launching, as well as camping, sport fishing, and beach combing (ADNR 2001).

### **Wildlife and Nature Viewing**

The region surrounding the EIS analysis area offers highly valued opportunities for wildlife and nature viewing. The most popular wildlife viewing activity in the region is brown bear viewing, both inland and along Cook Inlet, with the best opportunities provided at food-rich locations, such as major salmon rivers and the Cook Inlet shoreline. Bear viewing is especially popular at Lake Clark and Katmai national parks, and McNeil State Game Refuge and Sanctuary. Popular locations for bear viewing at Lake Clark National Park and Preserve include Chinitna Bay, Crescent Lake, Silver Salmon Creek, Shelter Creek, and Tuxedni Bay (NPS 2017c). Katmai has many food-rich

areas where bears tend to congregate, such as Brooks Camp, in the preserve, and along the Cook Inlet coast. Bears can also be found in the Katmai backcountry (NPS 2018a).

McNeil State Game Refuge and Sanctuary was designated a wildlife sanctuary in 1967 to protect the world's largest concentration of wild brown bears. McNeil River Falls are about a mile from the mouth of McNeil River; the falls slow the movement of salmon heading upstream to spawning grounds, causing salmon to congregate. Large numbers of brown bears can be seen at McNeil State Game Refuge and Sanctuary in early July through mid-August (ADF&G 2018b).

Notable bird watching opportunities are also available at most recreation areas in the region. Raptors, waterfowl, seabirds, shorebirds, songbirds, and upland birds can be found throughout the region. There have been 187 species of birds documented at Lake Clark National Park and Preserve (NPS 2017d); millions of sea birds, endemics, and birds from Asia can be found in the Alaska Maritime NWR (USFWS 2016a).

Although bear-viewing opportunities are world-class in the region, opportunities for viewing other wildlife species are also available at all of the recreation areas in the region. At McNeil State Game Refuge and Sanctuary, harbor seals, moose, caribou, wolves, wolverines, red foxes, and arctic ground squirrels can also be seen (ADF&G 2018b). There are also wildlife viewing opportunities at Iliamna Lake, which contains a population of freshwater seals (Van Lanen 2012; ADNR 2013a).

Other nature-related opportunities available in the region include nature photography, beach combing, clam digging, and berrypicking (LPB 2018a). Often, these activities are combined with activities such as bear viewing, sightseeing, backpacking, hiking, and camping during the summer and fall.

### **Flightseeing/Sightseeing**

Due to the lack of road access in the region and the heavy use of small planes and floatplanes for transportation, there are many opportunities for flightseeing in the region. Flightseeing (i.e., sightseeing by plane) is an effective way to see the broader landscapes of the region and even see wildlife and bird species, particularly in the two national park units. Flightseeing occurs primarily during the summer months from June through September. In 2017, there were 32 authorized air taxi commercial use authorization (CUA) holders that offered flightseeing opportunities in Lake Clark National Park and 39 in Katmai National Park; most operators originated out of Anchorage, Homer, King Salmon, Kodiak, and Soldotna (NPS 2018a).

### **Camping/Backpacking/Hiking**

Due to the relative lack of developed facilities or trails and presence of large expanses of wilderness, backcountry recreational activities such as camping, backpacking, and wilderness hiking are popular in the two national park units. There are also a few developed camping opportunities at both national parks. Between the two parks, there are very few developed trail opportunities, with fewer than 5 miles of trail in Katmai National Park, and 6.8 miles of trail in Lake Clark National Park (NPS 2016b, NPS no date b). In 2017, there were 29 authorized CUA holders that provided guided hiking or overnight backpacking services in Katmai National Park, and 22 in Lake Clark National Park (NPS 2018c, 2018d).

Primitive camping opportunities are also provided along the Alagnak Wild River corridor (NPS 2015a). Developed, but low-impact, camping and hiking opportunities are available in the McNeil State Game Refuge and Sanctuary (ADF&G 2018c).

Camping is allowed on most of the Alaska Maritime NWR, although no developed campgrounds exist in the NWR (USFWS 2014a).

On State land, access, travel, improvements and structures, and other miscellaneous uses are generally allowed, and are managed by the Division of Mining, Land, and Water. Camping is also available on the eastern side of the Cook Inlet near the terminus of the gas pipeline at the Stariski State Recreation Site and Anchor River State Recreation Area, which also offers hiking opportunities.

Due to harsh winter weather conditions in the region, camping, backpacking, and hiking activities generally occur during the summer months, from June through September.

### **Other Opportunities**

Biking on ice using fat tire bikes is a new winter use in Lake Clark National Park and Preserve. There is currently no restriction on bike use in the park (NPS 2016d). Other winter activities in the region include cross-country skiing, snowshoeing, trekking, riding snowmachines, birding, and night sky and aurora viewing. There is recreational use of Roadhouse Mountain to the northeast of Iliamna, as well as some all-terrain vehicle (ATV) use on trails around Iliamna Lake and the Upper and Lower Talarik Creek areas, which are used for transportation, subsistence, and recreation.

### **3.5.2.2 Recreation Facilities**

#### **Commercial Lodges**

Commercial lodges are the main form of lodging in the region due to the lack of consistent visitation to support hotels and motels. In 2012, there were 38 lodges in the area with active business licenses (Kevin Waring and Associates 2015d). There are clusters of commercial lodges at Port Alsworth, King Salmon, Naknek, Iliamna/Newhalen, Nondalton, Homer, Pedro Bay, and Kokhanok, as well as along the Kvichak, Mulchatna, and Alagnak rivers (ADNR 2013a). There are also commercial lodges scattered around the region on private inholdings in Lake Clark and Katmai national parks (NPS 2015a, 2017f). Commercial lodges often provide guide services for hunting, fishing, and other recreational activities on private property, Native corporation land, and/or public lands. Therefore, commercial lodges provide a home base for many recreationists, as well as a starting point for trips onto public lands. See Section 3.6, Commercial and Recreational Fisheries, for more details on the economic effect of commercial lodges present in the region.

#### **Public Recreation Facilities**

Public recreation facilities in the region include lodges, campgrounds, cabins, a primitive camping area, trails, and visitor centers. The only public lodge facilities in the region are in Katmai National Park. There are two lodges in the park, Brooks Lodge and Grosvenor Lodge, both operated by a concessioner. In addition to a lodge, Brooks Camp includes a campground for 60 people, a visitor center, ranger station, and an auditorium with daily ranger-led programs. Facilities at Brooks Camp are available from June 1 to September 18. There is also a six-person public use cabin, Fures Cabin, on the Bay of Islands on Naknek Lake in Katmai National Park that is available from June 1 to September 17. There are 5 miles of trail in the national park and one scenic overlook. The Lake Camp area at Naknek Lake in Katmai National Park and Preserve contains a boat ramp, parking area, picnic area, and restrooms (NPS 2018a).

Developed facilities at Lake Clark National Park include a cabin and primitive camping area. The maintained trails in the park are the Tanalian Trails that begin in Port Alsworth and continue to Tanalian Falls or Tanalian Mountain (NPS 2017e).



McNeil River Camp at McNeil State Game Sanctuary provides 14 camp sites, a trail to the viewing areas, a public use cook cabin for food storage and cooking, restrooms, a wash house, and staff facilities (ADF&G 2018c).

The two state park units on the Kenai Peninsula near the terminus of the gas pipeline both include camping and picnicking facilities. There are 13 camp sites and some picnic sites at Stariski State Recreation Site. There are 186 campsites total in five separate campgrounds at Anchor River State Recreation Area, along with 20 picnic sites and a boat launch.

There are no developed facilities in the Alagnak Wild River corridor, but the US Fish and Wildlife Service (USFWS) has a nearby visitor center in King Salmon. The Alaska Maritime NWR does not include any recreational facilities in the region other than a visitor center in Homer (USFWS 2014a).

### **3.5.2.3 Recreation Access**

#### **Air-based Access**

Air-based travel via small plane is the main form of access to recreational areas in the region, primarily from Anchorage, Homer, Iliamna, King Salmon, Port Alsworth, Kodiak, Dillingham, and Soldotna. Airport facilities near the EIS analysis area include Iliamna, Igiugig, Levelock, Big Mountain, Koggiung, Kvichak-Diamond J, Kokhanok, and Pedro Bay (ADNR 2013a). Only certain air-based operators are allowed to operate in the three NPS units, McNeil State Game Refuge and Sanctuary, and Alaska Maritime NWR (NPS 2018a; USFWS 2014a; ADF&G 2018f). Different operators can land on different surfaces depending on the landing gear of the plane (e.g., floats/amphibious gear, wheels, skis/wheeled skis), and therefore have various seasons and conditions in which they can operate.

#### **Overland Access**

The EIS analysis area on the western side of Cook Inlet is not connected by road to the rest of the state. Access to the region is by boat or plane, and then there are limited road options. Much of the area is traversed in the winter by snowmachine. Road access to or in the public recreation areas in the region is limited to Katmai National Park, in the vicinity of Iliamna/Newhalen, and from the Sterling Highway between Soldotna and Homer on the eastern side of the region. There are unpaved and paved roads between the town of King Salmon (west of the park) and Lake Camp on Naknek Lake in the park. These roads allow access from nearby towns to the boat ramp facility in the park on Naknek Lake. There is also an unpaved road from Brooks Camp to the Valley of Ten Thousand Smokes viewpoint at the Three Forks Overlook (NPS no date). Daily bus tours are provided by the concessioner from Brooks Camp to the overlook when the camp is open (June 1 to September 18) (NPS 2018a).

On the eastern side of the region, the Sterling Highway provides road access to the Stariski State Recreation Site and Anchor River State Recreation Area on the Kenai Peninsula.

Locally in the EIS analysis area, skiffs, ATVs, snowmachines, and trucks are the primary modes of local surface transportation around Iliamna Lake (ADNR 2013a).

#### **Water-Based Access**

Inland of Cook Inlet, water-based access to public recreation areas occurs on major rivers and lakes. Small boats can travel up the Naknek River to Lake Camp in Katmai National Park, and boats can travel the Alagnak Wild River as well (Kevin Waring and Associates 2011b; NPS 2015a). Lake Clark and Naknek Lake provide water-based access to portions of Lake Clark and

Katmai national parks, respectively. Water-based access can also be provided at Iliamna, Newhalen, Pedro Bay, Kokhanok, Igiugig, and Nondalton. In and along the shoreline of Cook Inlet, water-based access is essential to reaching public recreation destinations such as the eastern portions of Lake Clark and Katmai national parks and the Alaska Maritime NWR. Commercial boat businesses operate in the three NPS units and Alaska Maritime NWR (NPS 2018a; USFWS 2014a).

#### **3.5.2.4 Recreation Settings**

Apart from a few developed sites previously described, the regional public recreation areas generally provide a primitive, remote recreational setting where solitude is common and there are no lights or sounds from human development. In popular areas (primarily popular bear-viewing locations), the few developed sites such as Lake Camp and Brooks Camp, and areas closer to villages/towns, the recreational setting may include views of limited human development and other visitors, although the setting is still primarily remote and primitive.

#### **3.5.2.5 Regional Recreational Use and Users**

Given the lack of easy access and limited, dispersed development in the region, overall recreational use is estimated to be relatively low for all public recreation areas in the region compared to other parts of the state. Southwest Alaska shows among the lowest level of tourism compared to other areas of the state in general, with only 17 percent of visitors to Alaska traveling to southwest Alaska (ADNR 2013a). Of those visitors traveling to southwest Alaska, only 3 percent travel to this part of Alaska as their sole destination, with the majority of these visits to Katmai National Park and Wood-Tikchik State Park (ADNR 2013a). However, there are areas in the region that receive moderate to high use relative to the region, and some areas have experienced significant increases in visitation in recent years. These areas tend to be the more accessible locations in the national parks and the Refuge, or areas on the Kenai Peninsula that are accessible by road; others are accessible by small aircraft.

Between 2009 and 2017, Katmai National Park and Preserve averaged 40,031 visitors per year (NPS 2018e). During the same period, Lake Clark National Park and Preserve averaged 13,402 visitors per year through its commercial services program. Visitor use at Lake Clark National Park and Preserve has been increasing over the last 10 years to almost 17,000 visitor-use days, with the number of visitor-use days increasing dramatically for bear viewing, sport fishing, and photography, while participation in other activities has stayed fairly constant (NPS 2018d); however, Lake Clark itself has seen a 200 percent increase in commercial visitation between 2012 and 2017. This does not include visitors who do not use commercial services such as local residents boating, fishing, skiing, or otherwise using Lake Clark and the surrounding lands. In 2017, Lake Clark reported 22,755 in total visitation, which is more than double the amount of visitation in 2010 (9,931) (NPS 2018e). Over the same time period, commercial visitor use at Katmai National Park and Preserve generally fluctuated between 25,000 and 30,000 visitor-use days (NPS 2018c). According to monthly visitation data, peak use of these two areas is from June to September. This is when the majority of annual use occurs, especially at Katmai National Park and Preserve, with 97 to 100 percent of the park's visitation occurring during these months. In the last 6 years, about 80 percent or more of visitation to Lake Clark National Park and Preserve has been during the peak season (June to September). The Long Range Interpretive Plan for Katmai National Park and Preserve notes that most of the park's visitors participate in two primary activities: bear viewing, and sport fishing. There are virtually no drop-in visitors due to the effort needed to reach the park (NPS 2009a).

The number of bear-viewing visitors at McNeil River Camp was an average of 178 people per year between 2008 and 2017. The number of bear-viewing visitors at McNeil River Camp is

capped at 257 visitors per year. In 2017, there were 1,092 user days (i.e., the participation in a recreational activity at a given resource during a 24-hour period by one person) associated with the bear-viewing program at McNeil River Camp in McNeil State Game Refuge and Sanctuary, and another 513 user days reported by guides or the public using the Kamishak River and Chenik Creek areas of the refuge and sanctuary, primarily for fishing and bear viewing (ADF&G 2018a). The annual visitation to the Kamishak River and Chenik Lake areas likely varies due to the number of commercial transporter permits issued and used at each of these areas each year. There are no visitation estimates available for the Alagnak Wild River, Alaska Maritime NWR, or state lands/park sites.

Overall, due to the remoteness and lack of easy access and lodging facilities, it is expensive to visit the recreation areas in the region. As stated in the Alaska Maritime NWR Land Protection Plan, “recreational use is limited by the difficult logistics and expense of visiting remote islands. However, it is possible that the demand for visitor services would increase in the future as adventure travel becomes increasingly popular” (USFWS 2011a). This may be true for other areas as well.

### **3.5.3 Recreational Use at Project Components**

#### **3.5.3.1 Mine Site**

Recreational use at the mine site consists of some sport hunting and fishing, as well as occasional snowmachine use. Flights taking recreationists to various destinations in the region and the state may also pass over the mine site. Although there is no existing estimate of recreational use at the mine site, given the remoteness of the mine site and relative closeness of Lake Clark National Park and Preserve and other more well-known and accessible fishing and hunting destinations, recreational use at the mine site is likely low.

#### **3.5.3.2 Alternative 1a Transportation Corridor**

There is recreational use of Roadhouse Mountain to the northeast of Iliamna, as well as use of some ATV trails around the Iliamna and Kokhanok areas for transportation, subsistence, and recreation in the transportation corridor. There are no visible ATV trails along the port access road nearing Amakdedori port.

There are recreational opportunities (primarily fishing) in the general transportation corridor area, particularly along the Newhalen River, including where it would be crossed by the mine access road. There are also recreational opportunities in the Gibraltar River and Gibraltar Lake portions of the port access road corridor (including where the Gibraltar River would cross the port access road), where some local lodges advertise guided fishing, hunting, and sightseeing trip options (Haugen, Bush, and Rice 2003). Recreational sport hunting and snowmachine use may occur occasionally in the road corridors.

At Iliamna Lake, both motorized and non-motorized boating occur (AELO 2018), both as an activity in itself and as a means of accessing other recreation opportunities, primarily fishing. Recreational resources and uses in Region 9 of the BBAP, which contains Iliamna Lake, are primarily related to use of the lake for boating and fishing, and to commercial and non-commercial sport fishing and hunting (ADNR 2013a). Snowmachine use occurs on the lake in the winter; however, most of this use is for transportation and subsistence, and minimally for recreation.

There is no recreational use estimate for the transportation corridor. Due to its inaccessibility, and location of nearby higher-quality recreation opportunities, recreational use of the port access road, mine access road corridors, and Kokhanok spur road is expected to be low.

### **3.5.3.3 Amakdedori Port**

The Amakdedori port would be on State lands designated for habitat use by the KAP (ADNR 2001). The KAP also notes that the head of Bruin Bay, north of the Alternative 1a facilities, is highly scenic and has nice beaches (ADNR 2001). The KAP does not discuss recreational use at the port site specifically, although there may be recreational boating, overflights, hunting, fishing, and incidental wildlife viewing, and beach combing near the port site. Scoping comments mentioned local bear hunting use at the port site. There is no existing estimate of recreational use at the port site, although there is some boating use on Cook Inlet. Due to the large size of the inlet and other nearby locations with known fishing and wildlife-viewing opportunities, there is likely low use of the port site itself for recreation other than some bear hunting use.

### **3.5.3.4 Alternative 1a Natural Gas Pipeline Corridor**

Recreational use along the pipeline alignment in Cook Inlet and on the Kenai Peninsula surrounding the pipeline and compressor station consists of boating on Cook Inlet; beach combing, clamming, fishing, and hunting in and around the compressor station location; and recreational use at the state park sites on the Kenai Peninsula. Boating on Cook Inlet is both an activity in itself and a means of accessing other recreation opportunities, such as fishing, wildlife viewing, birdwatching, and beach combing, as well as access to the recreation areas on the western side of the Cook Inlet. The Stariski State Recreation Site, near where the compressor station would be, offers camping and picnicking opportunities. The Anchor River State Recreation Area offers boating, camping, fishing, picnicking, wildlife viewing, and hiking opportunities. There is no existing estimate of recreational use for the Cook Inlet or either state park unit site. Recreational opportunities and use on the western end of the pipeline corridor would be the same as described for the Amakdedori port site and transportation corridor.

### **3.5.3.5 Alternative 1 Transportation Corridor**

The Alternative 1 port access road and Amakdedori port have the same recreational uses as discussed under Alternative 1a. There is recreational use of some ATV trails around Upper and Lower Talarik creeks and the Iliamna and Kokhanok areas for transportation, subsistence, and recreation. There are no visible ATV trails along the mine access road corridor nearing the mine site.

There are also recreational opportunities (primarily fishing) in the general transportation corridor area, particularly along the Newhalen River and Upper Talarik Creek by the mine access road. Recreational sport hunting and snowmachine use may occur occasionally in the mine access road corridor.

There is no recreational use estimate for the transportation corridor. Due to its inaccessibility, and the location of nearby higher-quality recreation opportunities, recreational use of the port access road and mine access road corridors, the Kokhanok spur roads, and the Iliamna spur road is expected to be low.

### **3.5.3.6 Alternative 2 and Alternative 3 Transportation Corridor**

There are recreational use opportunities along the Newhalen River and at Iliamna Lake, as well as on Iliamna River. Fishing is the primary recreational opportunity in these areas, including guided sport fishing opportunities from lodges in the northern Iliamna Lake area, particularly around Pedro Bay. One lodge in the northern lake area offers guided kayaking trips on Iliamna Lake (AELO 2018). The BBAP notes that recreational resources and uses in Region 9, which includes Iliamna Lake, are primarily related to use of the lake for boating and fishing, and to commercial and non-commercial sport fishing and hunting. Recreational sport hunting use may

also occur elsewhere in the transportation corridor. Tourism is increasing on the lake; each summer, thousands of sport fishermen visit the area for trophy rainbow trout fishing on the lake (ADNR 2013a). There is no existing estimate of recreational use, including for Iliamna Lake, although given the presence of lodges and communities around northern Iliamna Lake, there is likely more recreational use in the Alternative 2 and Alternative 3 transportation corridors than the Alternative 1a and the Alternative 1 transportation corridor.

### **3.5.3.7 Diamond Point Port**

The Diamond Point port site would be at the junction of Iliamna Bay and Cottonwood Bay. There is known commercial fishing use of this area (ADNR 2001), and likely undocumented recreational fishing opportunities as well. There are also opportunities for wildlife viewing in Iliamna Bay, because there are large colonies of seabirds at the mouth of the bay, as well as brown bears, moose, and shorebirds in the area (ADNR 2001). Therefore, there may also be opportunities for hunting. There is no existing estimate of recreational use at the port site.

Although there may be opportunities for recreational boating in the bays, there is one concentrated boat traffic effort in Iliamna Bay every year. In early June, approximately 60 commercial fishing boats make the trek from Homer to Bristol Bay via Iliamna Lake and the Kvichak River. The boats cross Cook Inlet and head to Williamsport to be transported on the road from Williamsport to Pile Bay (Dischner 2015b). The boats also make the return trip from Bristol Bay back to Homer along the same route at the end of summer (Dischner 2015a).

### **3.5.3.8 Alternative 2 and Alternative 3 Natural Gas Pipeline Corridor**

Under Alternative 2 and Alternative 3, the natural gas pipeline would come into Ursus Cove and then cross land north to reach Cottonwood Bay and the Diamond Point port site. Ursus Cove is a known bear-hunting location (H&H Alaskan Outfitters 2018), and both Ursus Cove and Cottonwood Bay are known commercial fishing locations (ADNR 2001). Both Ursus Cove and Cottonwood Bay may also be used for other hunting activities, recreational fishing, and wildlife viewing, given the large seabird colonies at the mouth of Iliamna Bay, as well as the presence of moose and shorebirds around Iliamna Bay (ADNR 2001). There is no existing estimate of recreational use in Ursus Cove or Iliamna Bay.

The pipeline corridor under Alternative 2 would overlap with areas of the Alternative 3 transportation corridor. Alternative 2 and Alternative 3 would also include the same areas on the Kenai Peninsula as Alternative 1a.



### 3.6 COMMERCIAL AND RECREATIONAL FISHERIES

The Environmental Impact Statement (EIS) analysis area for commercial and recreational fisheries is limited to river systems hydrologically connected to the project that contribute to the Bristol Bay salmon fishery, to recreational fisheries in connected river and lake systems, and to the Cook Inlet saltwater environment. The EIS analysis area includes the Alaska Department of Fish and Game (ADF&G) commercial registration Area T and Area H, the Cook Inlet Management Area (including associated federal waters), and the ADF&G Statewide Harvest Survey (SWHS) areas S, T, N, and P. The EIS analysis area also covers the Area H Cook Inlet Salmon Fishery and the groundfish and shellfish fisheries of the Cook Inlet Management Area.

#### 3.6.1 Bristol Bay Commercial Fishery

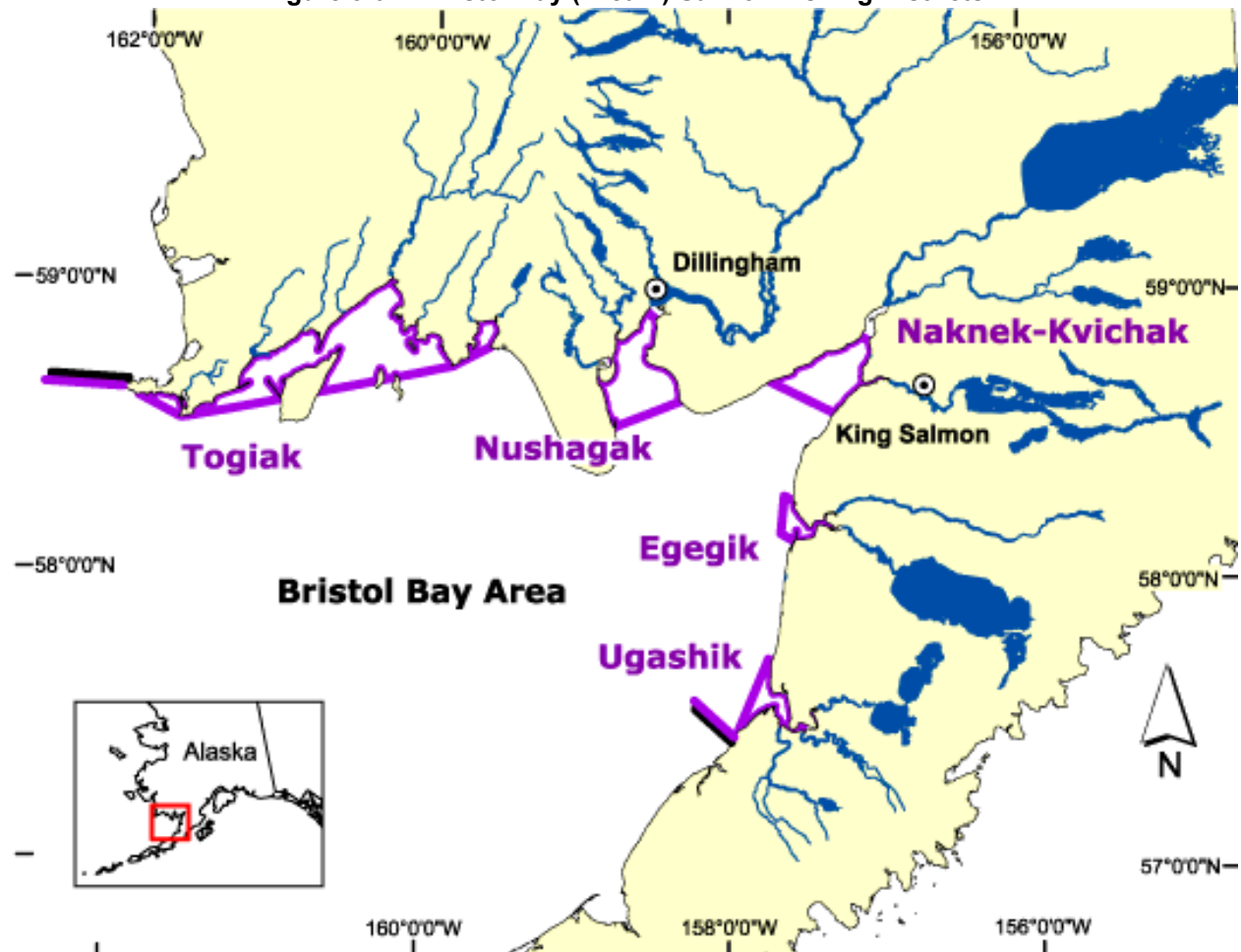
The inshore waters of Bristol Bay are home to the world's largest sockeye fishery and some of the world's largest natural salmon runs. Between 2000 and 2010, Bristol Bay provided 45 percent of the world's sockeye harvest, 7 percent of the world's wild salmon harvests, and 2 percent of world salmon supply (EPA 2014). Between 2011 and 2016, Bristol Bay provided between 4 and 11 percent of all wild salmonid harvests and between 1.1 and 2.3 percent of world salmon supply (FAO 2018). Each year, roughly 2,840 holders of State of Alaska Area T salmon permits (Figure 3.6-1) have the opportunity to harvest salmon from five major fishing districts managed by the ADF&G.<sup>1</sup> Bristol Bay's economic ecosystem is driven by the annual return of salmon to the region. Average monthly employment in June, July, and August can be more than double that of the winter months, and the salmon harvest generates 60 percent of regional self-employment income (Abrahamson 2011). The regional Comprehensive Economic Development Plan for the Bristol Bay Region (excluding the Bristol Bay Borough) prioritizes the health of the Bristol Bay salmon fishery as a key economic and cultural driver (BBNA 2019).

In comparison to the inshore state waters salmon fishery, fisheries outside of the 3-mile limit of state waters are limited by the federally managed Nearshore Bristol Bay Trawl Closure Area. The closure area bans trawl fishing in federal Bristol Bay waters, with the exception of the seasonal opening of a very small area west of Cape Constantine and Nushagak Point. With localized federal conservation measures in place to protect juvenile red king crab, the Area T Bristol Bay salmon fishery is the only commercial fishery in the Bristol Bay portion of the EIS analysis area.

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<sup>1</sup> In Alaska, commercial fishing salmon permits are issued by the State and can be used in one specific fishery as defined by state regulations. The State assigns each fishery a letter designation. The designation for Bristol Bay is "Area T."

Figure 3.6-1: Bristol Bay (Area T) Salmon Fishing Districts



Source: ADF&G 2018k

### 3.6.1.1 The Bristol Bay Salmon Fishery

The Area T Bristol Bay salmon fishery (the fishery) is divided into five districts (Naknek/Kvichak, Egegik, Ugashik, Nushagak, and Togiak) encompassing nine major river systems. Only the Kvichak drainage in the Naknek/Kvichak district and the Nushagak/Mulchatna drainage (via the Mulchatna) in the Nushagak district are hydrologically connected to the project. Across all five districts, sockeye salmon (*Oncorhynchus nerka*) is the most commonly harvested species, representing 94.8 percent of all salmon harvested from 2000 through 2019. In the Naknek/Kvichak district, the Egegik district, and the Ugashik district, sockeye salmon represented 97.5 percent or more of the harvest (see Appendix K3.6, Table K3.6-1). In the Nushagak district, sockeye represent nearly 90 percent of the 20-year (2000 through 2019) harvest, with chum salmon (*O. keta*) and pink salmon (*O. gorbuscha*) representing 6.8 percent and nearly 2.5 percent of the harvest, respectively.<sup>2</sup> Although Chinook salmon (*O. tshawytscha*) accounted for less than one-half a percent of annual Nushagak harvest over the last 20 years, the number of fish harvested averages nearly 35,000 fish annually, making the Nushagak district the most important Chinook salmon fishery, by volume, outside of Southeast Alaska (ADF&G 2018k). The Togiak district also harvests sizeable portions of chum salmon and pink salmon, with those

<sup>2</sup> Unless otherwise stated, 20-year average and 20-year retrospective data refer to the 2000-2019 fishing seasons.

species accounting for 19.3 percent and 4.3 percent of the 20-year harvest, respectively. Over the last 20 fishing seasons (2000 through 2019), the fishery's average annual harvests were 27 million sockeye salmon, 1.1 million chum salmon, 257,000 pink salmon, 96,000 coho salmon (*O. kisutch*), and 40,000 Chinook salmon (ADF&G 2020).

Harvest varies significantly across the five fishing districts and in each district from year to year. On average, the most productive fishing districts are the Nushagak district (8.8 million total salmon/7.9 million sockeye annually) and Naknek/Kvichak district (8.6 million total/8.4 million sockeye), followed by the Egegik (7.3 million total/7.2 million sockeye), the Ugashik (2.9 million total/~2.9 million sockeye), and the Togiak (0.8 million total/0.6 million sockeye). Harvest size in each district can vary substantially due to differing productivity of the river systems, which are encompassed by each district and the natural year-to-year variation in the number of returning fish (also referred to as a run). Under the direction of the Alaska Board of Fish, which helps establish regulations and management practices, the ADF&G manages each district to ensure that the required number of salmon reach their spawning grounds to maximize long-term productivity. This management includes significant investment in the understanding of the long-term productivity of Bristol Bay's fishery resources through efforts such as genetic testing and other biological research, management plans to provide regulatory structure across a variety of productivity scenarios, in-season management of the fishery, post-season summarization and analysis of each year's fishery, and pre-season estimation of the upcoming year's fishery.

The number of salmon that are not harvested by the fishery is known as the "escapement number." Harvest numbers tend to vary more than escapement numbers because the escapement goal is a set range, while fishing effort is the tool used to balance between the number of fish returning and the escapement goal. In particular, the Naknek/Kvichak district is known for its varying run strength for sockeye. The 20-year minimum harvest in this district was 1.4 million sockeye, compared to an average of more than 8.4 million and a maximum of 16.5 million. The largest harvest was nearly 11.6 times the smallest harvest. In the Nushagak district, which is also connected to the project area by surface waters, the largest harvest of 24.2 million sockeye was 9.1 times larger than the smallest harvest of 2.7 million. The smaller districts (by harvest) can be highly variable as well; in the Ugashik district, which is not connected to the project area via surface waters, the largest harvest was nearly 14 times the smallest harvest. Across the entire Bay, the average largest sockeye harvest was four times the smallest harvest between 2000 and 2019. In all districts, the average harvests from 2010 to 2019 have been larger than the average harvests from 2000 to 2009. Across the entire Bay, sockeye salmon harvests have average 38 percent higher for the latest 10 years compared to the preceding 10 years. These higher harvests may be due in part to changes in management and escapement goals resulting from research completed in 2012. The ADF&G periodically reviews escapement goals to ensure that, to the extent possible, fisheries are managed for maximum sustained yield (Fair et al. 2012). Harvests by district are shown in Table K3.6-2 in Appendix K3.6.

The 20-year average sockeye escapements for each of the districts are 6.8 million sockeye in the Naknek/Kvichak district (which contains two major river systems), 3.3 million sockeye in the Nushagak district, 1.4 million sockeye in the Egegik district, 1.1 million sockeye in the Ugashik district, and 0.25 million sockeye in the Togiak district (see Table K3.6-3 in Appendix K3.6). In all districts, average escapement was higher from 2010 to 2019 than from 2000 to 2009. Fish that "escape" the commercial fishery are then a source for harvest opportunities for freshwater subsistence and recreational users.

Administration of the Bristol Bay fishery occurs through two different sets of permits: drift net permits and set net permits. Drift nets are attached by one end to boats and set nets are attached to land. On average, drift net permit holders harvest four out of every five fish harvested in the fishery, but the ratio has been as low as two out of every three fish (Table 3.6-1). Drift net permit

holders are able to move from district to district during and between fishing seasons to adjust to changing run strength (i.e., the number of returning fish) and timings. Set net permit holders hold long-term tenure to selected fishing sites, which are registered with the State of Alaska, are often handed down from generation to generation, and generally cannot change sites without identifying a new site in another watershed and moving their operations. In the event of lost productivity in a specific watershed, the set net permit holders with sites at the mouth of that watershed would experience a disproportionate level of economic harm. At the same time, drift net permit holders, who have mobility in where they fish, can mitigate changes in individual watershed productivity by moving their operations. Set net permit holders in other watersheds would not experience harm if the productivity in their watersheds did not change and the overall price for salmon in the fishery did not change.

**Table 3.6-1: Sockeye Drift Net and Set Net Harvest Split (Percent)**

	20-Year Min.	20-Year Max.	20-Year Median	20-Year Average	2000-2009 Average	2010-19 Average
Drift Net Portion	66	85	81	80	79	80
Set Net Portion	15	34	19	20	21	20

Note: The maximums and minimums do not add to 100 because the maximum percentage year for drift nets is the minimum for set nets, and the maximum for set nets is the minimum for drift nets.

Source: ADF&G 2020

### 3.6.1.2 Nushagak and Kvichak District Historical Harvest and Escapement

As previously discussed, the EIS analysis area is limited to river systems hydrologically connected to the project area, which contribute to the Bristol Bay salmon fishery. Only the Naknek/Kvichak district and the Nushagak district contain rivers that are hydrologically connected to the project area.

The Naknek/Kvichak district contains three of the nine major river systems in the Bristol Bay fishery, but only the Kvichak River is hydrologically connected to the project area. Over the last 20 years, the river contributed 14 percent of the average annual inshore sockeye salmon return (i.e., harvest plus escapement) to Bristol Bay and 39 percent of the total average annual inshore returns for the district (see Table K3.6-4 and Figure K3.6-1 in Appendix K3.6). The Kvichak River is known for its variable sockeye salmon return strength; the smallest return to this river in the last 20 years was 707,000 fish, and the largest number of returning fish was 15.5 million. At the same time, the average sockeye salmon return to the river system from 2010 to 2019 was more than double the average return from 2000 to 2009 (ADF&G 2020).

The Nushagak district is also composed of three large river systems: the Wood River, the Igushik River, and the Nushagak River. The Nushagak River is hydrologically connected to the project via the Mulchatna River system, but the other two river systems are not. The Wood River, fed by the Wood-Tikchik Lake system, is the dominant sockeye salmon producer in the district and accounted for 62 percent of estimated sockeye returns over the last 20 years. The return to this system averaged slightly more than 7 million fish per year between 2000 and 2019. In comparison, the Nushagak River accounted for more than 2.9 million sockeye salmon per year from 2000 to 2019, or 25 percent of the district total. The Nushagak River experiences significant variations in number of returning salmon. Although not as extreme as the variations found on the Kvichak and Alagnak rivers, the largest number of returning fish in the past 20 years was nearly 14 times the size of the smallest return (see Table K3.6-5 and Figure K3.6-2 in Appendix K3.6).

In the context of other Bristol Bay rivers and other Alaska rivers such as the Kenai River and the Copper River, the Nushagak River is of lesser magnitude in the average number of returning sockeye salmon and the Wood River is the dominant producer of sockeye in Nushagak district. Both rivers can have extraordinary years where productivity surges. For example, in 2018 the total number of returning sockeye salmon in the Wood River was 22.4 million and the total run in the Nushagak River's was 8.2 million. Both numbers are four times greater than the typical averages for both rivers. Where the Nushagak River and its tributary, the Mulchatna River, truly stand out is the average number of returning Chinook salmon. From 2000 to 2019, the entire Bristol Bay commercial fishery harvested an average of 40,246 Chinook each year; 34,290 of these fish (87 percent) were harvested in the Nushagak district. By comparison, the average annual harvest from the Naknek-Kvichak district is slightly more than 1,727 fish for the same time period. The 20-year average number of returning Chinook for the Nushagak is nearly 161,000 (ADF&G 2020), which makes the Nushagak system one of the most productive for Chinook salmon in Alaska.<sup>3</sup> The average numbers of returning Chinook in other river systems in Alaska are approximately 260,000 in the Kuskokwim drainage, 166,000 in the Yukon drainage, 100,000 to 200,000 in the Susitna drainage, 56,000 in the Kenai River, and 55,000 in the Copper River (JTC 2018; Poetter and Tiernan 2017; ADF&G 2008c, 2016a; Russell et al. 2017).

Annually, the Bristol Bay salmon fishery creates thousands of jobs and generates hundreds of millions of dollars in economic activity and wages. A 2013 study by the Institute for Social and Economic Research at the University of Alaska, Anchorage, found that in 2010 the industry created 12,000 seasonal jobs in Bristol Bay (equal to 2,000 annual jobs); another 1,000 jobs involved in shipping, secondary product processing, and retailing after the fish left Bristol Bay; and 6,800 in ancillary and indirect employment in industries that serve fishing and processing operations in Bristol Bay. In total, the fishery generated \$1.5 billion in output value (i.e., the value of goods and services produced) and \$500 million in income (Table 3.6-2).

**Table 3.6-2: Bristol Bay Economic Contribution, 2010**

<b>Annual average employment: 9,800 jobs</b>	<b>Output value: \$1.5 billion</b>	<b>Income: \$500 million</b>
<b>Fishing and Processing in Bristol Bay</b>		
12,000 seasonal jobs (= 2,000 annual jobs)	\$390 million	\$140 million
<b>Shipping, secondary processing, and retailing after Bristol Bay</b>		
1,000 jobs	\$110 million	\$40 million
<b>Multiplier impacts in other industries</b>		
6,800 jobs	\$970 million	\$320 million

Source: Knapp, Guettabi, and Goldsmith 2013

A more recent study for the Bristol Bay Regional Seafood Development Association (BBRSDA) found similar estimated economic contributions from 2013 to 2017, including an average of 12,500 annual jobs, annual labor income of just over \$650 million, and total economic contribution of \$1.2 billion (WRC 2018).

The drivers of this economic contribution are the quantity of the salmon harvest and the value of that product on the world market. Volume and real value have increased in recent years, which

<sup>3</sup> Chinook harvest in the Bristol Bay fishery has dropped in recent years. In comparison to the current 20-year average of 40,256 Chinook per year through 2019, the 20-year 1997 to 2016 average was 51,869 Chinook per year with 44,271 of these fish (85 percent) harvested in the Nushagak district.



along with inflation helps explain the differences between Knapp, Guettabi, and Goldsmith (2013) and WRC (2018). The average price per pound that processors pay permit holders for their salmon depends largely on the condition of world salmon markets, including salmon produced by other wild and farmed sources (Knapp 2004; McDowell Group 2014, 2015, 2016, 2017; Seeger 2015; Valderrama and Anderson 2010). Individual and collective efforts around marketing, improving product quality, and developing new markets and products can also have long-term effects on the value of salmon at the harvester level. The connection to a world commodity market means that ex-vessel prices (i.e., the price paid to the permit holder at the point of delivery) for salmon can vary markedly from year to year. In 2018, permit holders in Bristol Bay received an average of \$1.62 (\$US 2019) per pound for sockeye salmon, including postseason adjustments and bonuses.<sup>4</sup> In 2015, they received \$0.64 (\$US 2019) per pound on average (Figure 3.6-2). From 2010 to 2018, the average price swing from year to year was +/- 26 percent.

With the exception of 1998, when prices for sockeye were at their modern high, the prices that Bristol Bay permit holders receive for their salmon are lower than prices received for the same species of fish caught in other major Alaskan salmon fisheries. Between 1997 and 2017, the ex-vessel prices for sockeye salmon in the Cook Inlet, Copper River, Prince William Sound, and Southeast Alaska fisheries averaged 50 percent, 150 percent, 60 percent, and 54 percent higher, respectively, than the price paid for Bristol Bay sockeye (Table 3.6-3). Annual data show that the price gap tends to be smaller when demand for sockeye is higher, and tends to increase when demand for sockeye is low. The price differential can be explained as noted by McDowell Group (2014):

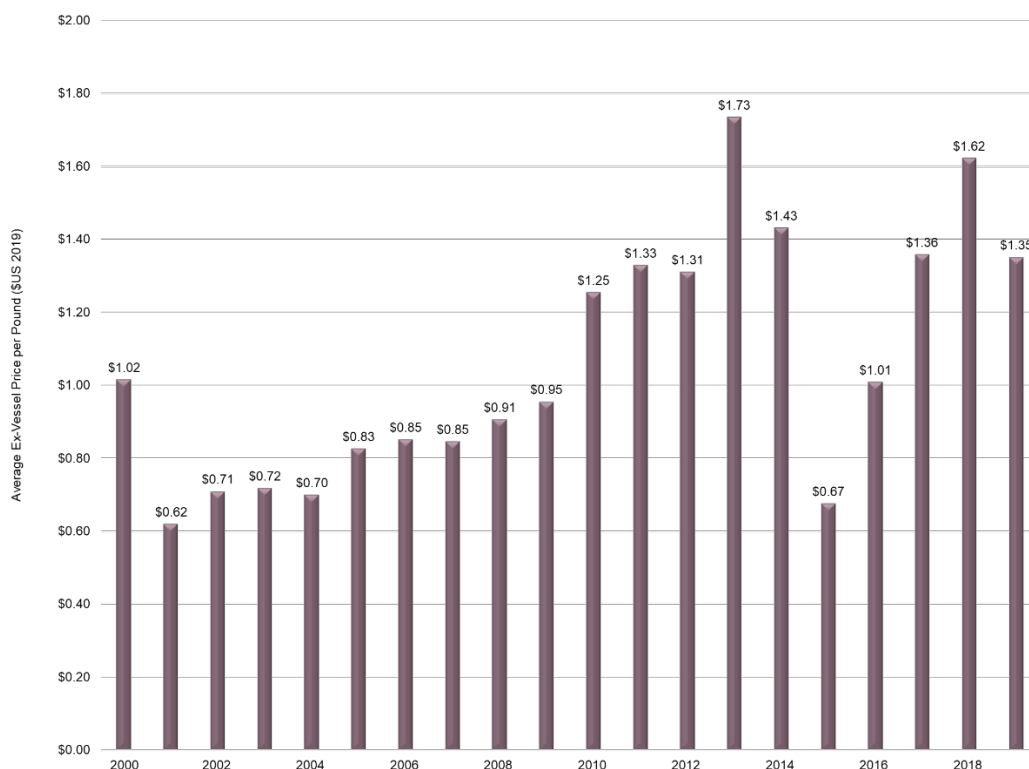
Bristol Bay fishermen typically receive lower sockeye prices due to the fishery's remote location, intense run timing,<sup>5</sup> and product mix. A larger percentage of sockeye caught in Cook Inlet and Southeast is sold into fresh markets, resulting in a higher average wholesale price. Copper River is typically Alaska's first major sockeye fishery, thus yielding a higher market price.<sup>6</sup> Additionally, plants in other areas often have access to other species that allows them to cover fixed expenses and offer better prices to fishermen for high-value sockeye while Bristol Bay plants rely almost solely on sockeye.

<sup>4</sup> The average price per pound paid for sockeye salmon in 2019 *including* postseason adjustments and bonuses was not available at the time of analysis. The average prices paid in 2019 *excluding* postseason adjustments and bonuses was \$1.35 per pound.

<sup>5</sup> Intense run timing refers to the fact that in Bristol Bay a large number of fish return to the bay in a very short amount of time. Instead of a fishing season that lasts 2 months, fishing in Bristol Bay tends to be concentrated in a period of 2 to 3 weeks. The large volume of fish arriving at one time can limit the flexibility of processors to pursue the highest value products. Processors are forced to consider what products can be made to process this volume of fish rather than what products should be made to maximize value. *This footnote is not part of the original quotation. Added for value to the reader.*

<sup>6</sup> Copper River's position as the first salmon fishery to open each year means that salmon harvested in that fishery are the first fresh, wild salmon to reach the market in 6 to 7 months. This market position contributes to Copper River's price premium. *This footnote is not part of the original quotation. Added for value to the reader.*

**Figure 3.6-2: Average Price per Pound for Bristol Bay Sockeye, 2000-2019<sup>7</sup>**



Source: ADF&G 2020

**Table 3.6-3: Percentage Price Premium (Discount) for Other Alaska Sockeye Fisheries Relative to Bristol Bay, 1998-2017**

	Cook Inlet	Copper River	Prince William Sound	Southeast
20-Year Min. Price	-6	-2	-9	11
20-Year Max. Price	150	316	133	105
20-Year Median Price	53	159	61	55
20-Year Average	50	150	60	54
1998-2007 Average	35	143	56	56
2008-17 Average	63	156	64	52

Source: ADF&G 2018k

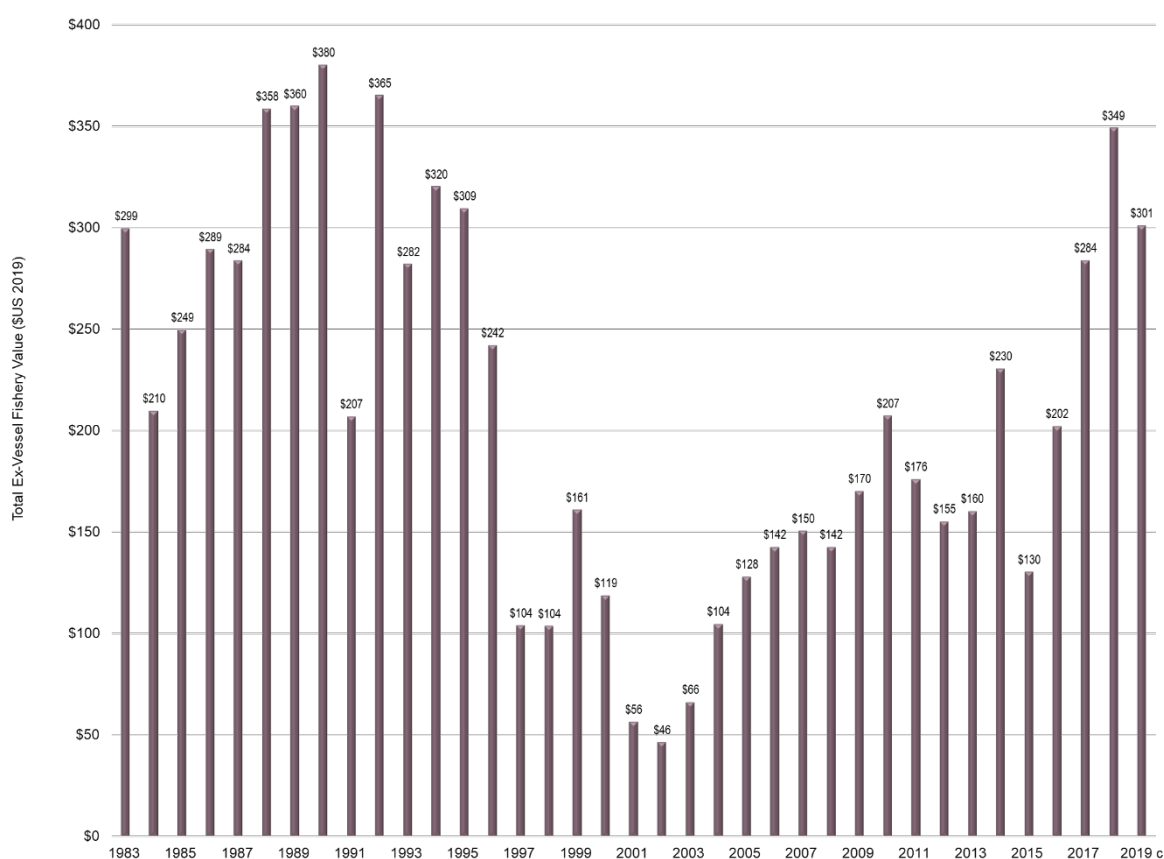
In recent years, Bristol Bay permit holders have worked with processors to increase quality throughout the chain of custody, especially through better handling practices, and to begin the process of establishing a brand identity (BBRSDA 2018a; Dischner 2016b; Hagenbuch 2016; National Fisherman 2019; McDowell Group 2015, 2016, 2017). These efforts have a goal of increasing the price and value of Bristol Bay's fish. McDowell Group (2014) documents the value of an established brand and reputation. In 2013, Copper River branded sockeye averaged \$1.92 (18.8 percent) more per pound at the retail level than unbranded sockeye salmon, including Bristol Bay sockeye. The benefit of establishing a brand for Bristol Bay sockeye was noted as early as

<sup>7</sup> Prices for 2019 do not include post-season adjustments or bonuses.

2002 to 2003 (NEI 2003). The BBRSDA established the fishery's first cohesive brand in 2016. As then noted by the BBRSDA's communications consultant, "...and the idea is, to able to show, every link in our supply chain—retailer, processor, distributor—that when we put some effort into branding Bristol Bay sockeye, it impacts sales. And that's really hard to do when you have a commodities brand like Bristol Bay sockeye or Alaska Seafood" (Dischner 2016a). The BBRSDA's efforts focused on a localized test market (Boulder, Colorado) in 2016, but expanded to national efforts in 2017 and 2018 (BBRSDA 2018b).

In 2019, the Bristol Bay commercial salmon fishery generated \$301 million (\$US 2019) in ex-vessel payments to all Area T permit holders, making that year the second-best year for permit holders collectively since 2000 and the eighth best year in real (i.e., inflation-adjusted) terms since 1983 (Figure 3.6-3).<sup>8</sup> The 20-year inflation-adjusted (\$US 2019) ex-vessel value of the fishery is approximately \$166 million, but over the last 10 years the ex-vessel value has averaged roughly \$219 million per year in real terms.

**Figure 3.6-3: Total Ex-Vessel Fishery Value for Bristol Bay (Area T), 1983-2019 (\$US 2019)**



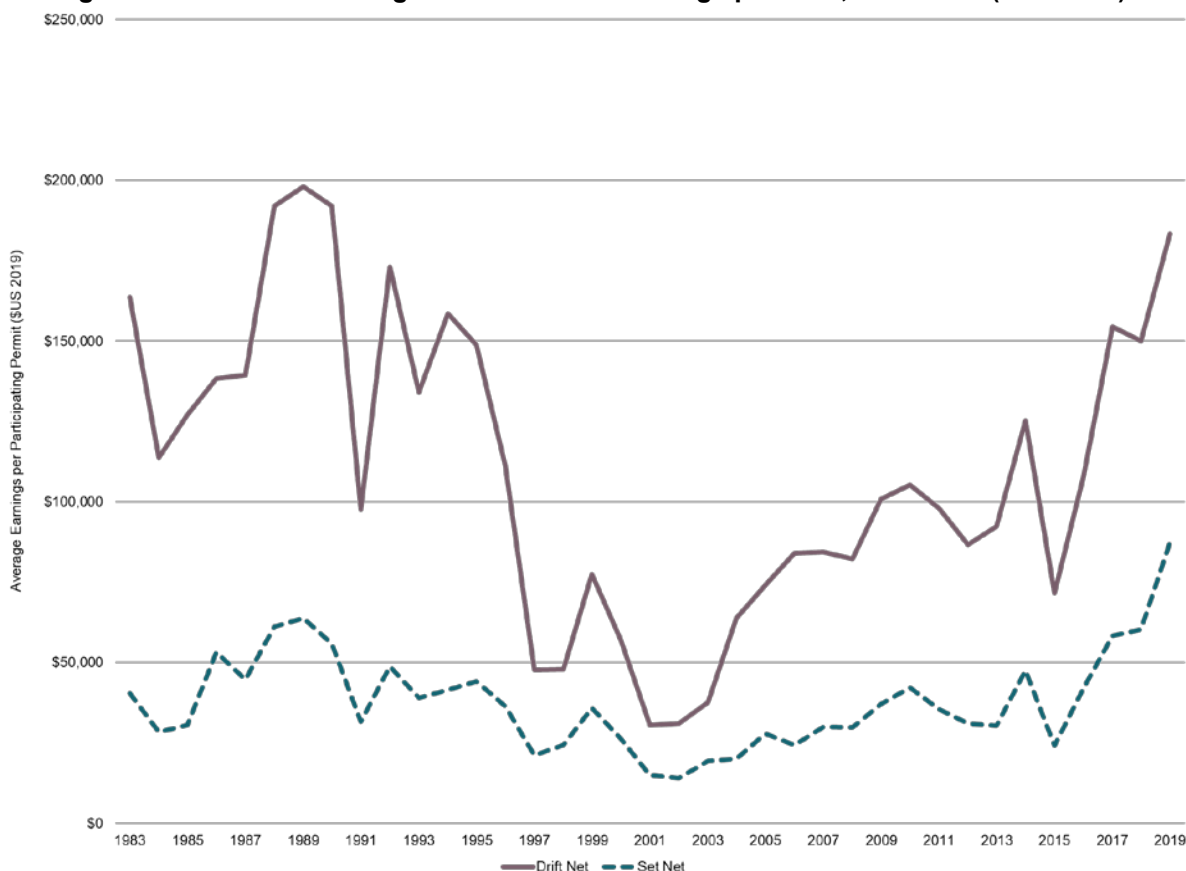
Source: ADF&G 2020

Average permit holder gross earnings vary from year to year with return and market strength but increased substantially in both the set net and drift net fisheries since 2001 and 2002, when the fishery generated the lowest level of ex-vessel value in the modern era (Figure 3.6-4). In 2019, based on preliminary numbers, drift net permits earned an average of more than \$183,000, which is 66 percent higher than the average annual earnings between 1983 and 2019 and the highest annual amount since 1991. Average earnings were boosted not only by the record-setting harvest,

<sup>8</sup> 2019 data do not include post-season bonuses or adjustments. These data were unavailable at the time of analysis.

but by the lowest number of permits fished since 2006. Set net permits earned an average of \$87,000, an amount greater than any other year between 1983 and 2019 and more than twice the average real earnings during that period of \$37,900.

**Figure 3.6-4: Annual Average Permit Holder Earnings per Year, 1983-2019 (\$US 2019)**

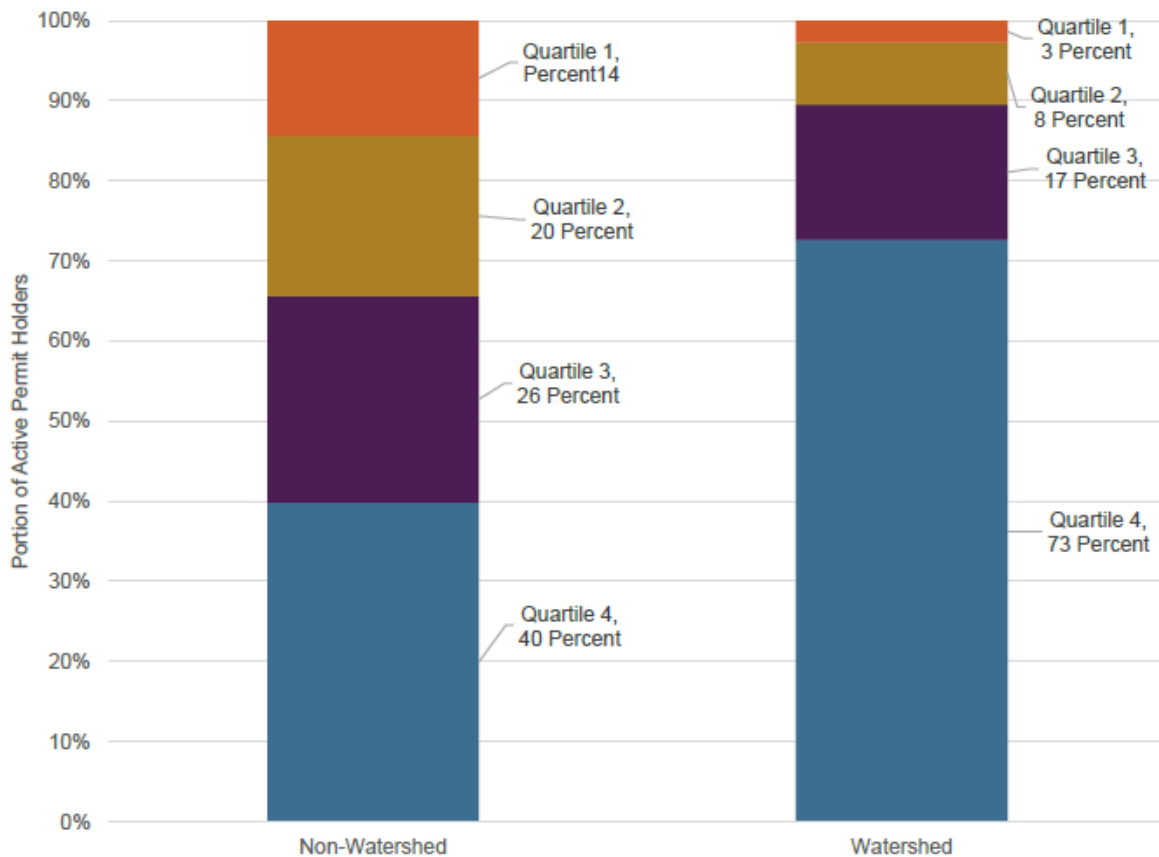


Source: CFEC 2020a

Alaska Commercial Fisheries Entry Commission (CFEC) data divide permit holders into four earnings groups (i.e., quartiles). The total amount of earnings in each group is the same, but the number of permit holders and the average earnings per permit holder is different. For example, each quartile group earned roughly \$73.5 million total in 2019; however, the top group included just 154 permit holders earning an average of \$477,491 each, and the bottom group included 860 permit holders earning an average of \$85,495 each (CFEC 2020a). Permit holders who are residents of District T are more likely to be in the bottom quartile than are non-residents, and 80 percent less likely to be in the top quartile (Figure 3.6-5). Between 2002 and 2012, 73 percent of watershed residents were in the bottom earnings quartile, and 40 percent of non-watershed residents were in the bottom quartile.

In the same period, 3 percent of watershed resident permit holders were in the top quartile, and 14 percent of non-watershed residents earned enough to be in the top quartile (NEI 2014). These statistics may help explain permit ownership and participation trends.

**Figure 3.6-5: Distribution of Quartiles in the Drift Net Fishery by Area of Residence, 2002-2012**



Note: Non-Watershed refers to those who live outside the watershed boundaries of Area T.

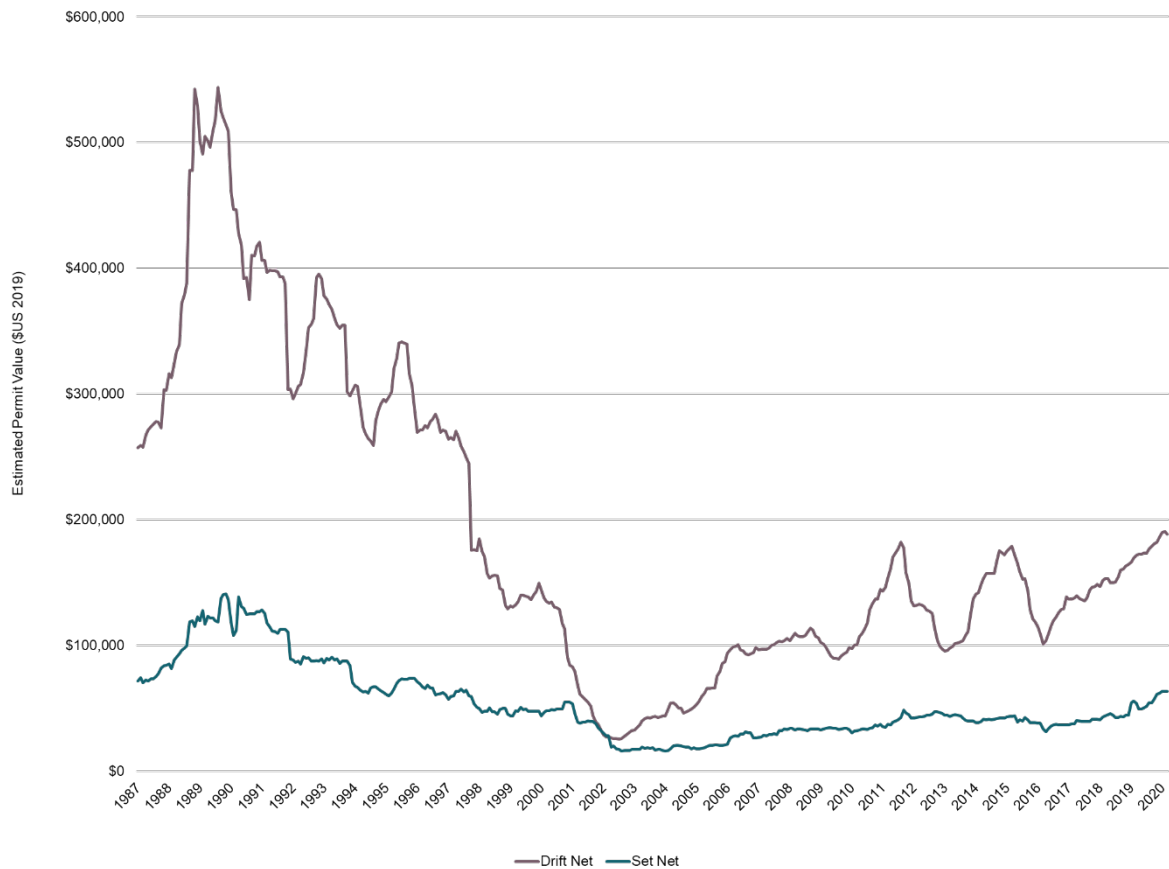
Source: NEI 2014

Participation in the fishery requires ownership of a limited-entry permit managed by the State of Alaska. Permits change hands through an open market system between willing buyers and sellers; the value of permits changes over time, particularly in relationship to expected catch volumes and per pound ex-vessel prices. Permit prices are therefore representative of expected future earnings in the fishery, and buying a permit is a business investment decision of similar magnitude to buying a home.

The CFEC estimates the March 2020 value of a drift net permit to be \$188,300; set net permits are valued at \$63,000 (CFEC 2020b and 2020c). The values are based on market transaction data recorded when permit holders sell and buy permits. The lower value of a set net permit reflects the lower earnings potential of these permits in the fishery. In real dollar terms, the current value of a drift net permit is nearly the highest seen since 1997, just above other recent spikes seen in March 2015 and August 2011. Drift net permit prices, and therefore CFEC estimates of value, tend to spike after exceptional runs (such as in the 2019 fishing season) when permit holders see high returns as reflective of potential future earnings. As of March 2020, set net permit prices are trading at their high point since 1996. The values of both permit types have risen steadily since the 2002/2003 low point caused by the influx of farmed salmon onto the world market. This reflects both an increase in salmon consumption and the work of some wild salmon producers to focus on their products' unique values. Inflation-adjusted values for drift net permits have increased by nearly 600 percent since 2002/2003, but they are still a third of what they were before the collapse of the Japanese economy in the late 1980s and the subsequent collapse of world salmon prices. Similarly, set net permit values are currently four times the post-1987 low, but less than half of the post-1987 high (Figure 3.6-6).



**Figure 3.6-6: Real (Inflation-Adjusted) Permit Value by Permit Type, 1987-2019**



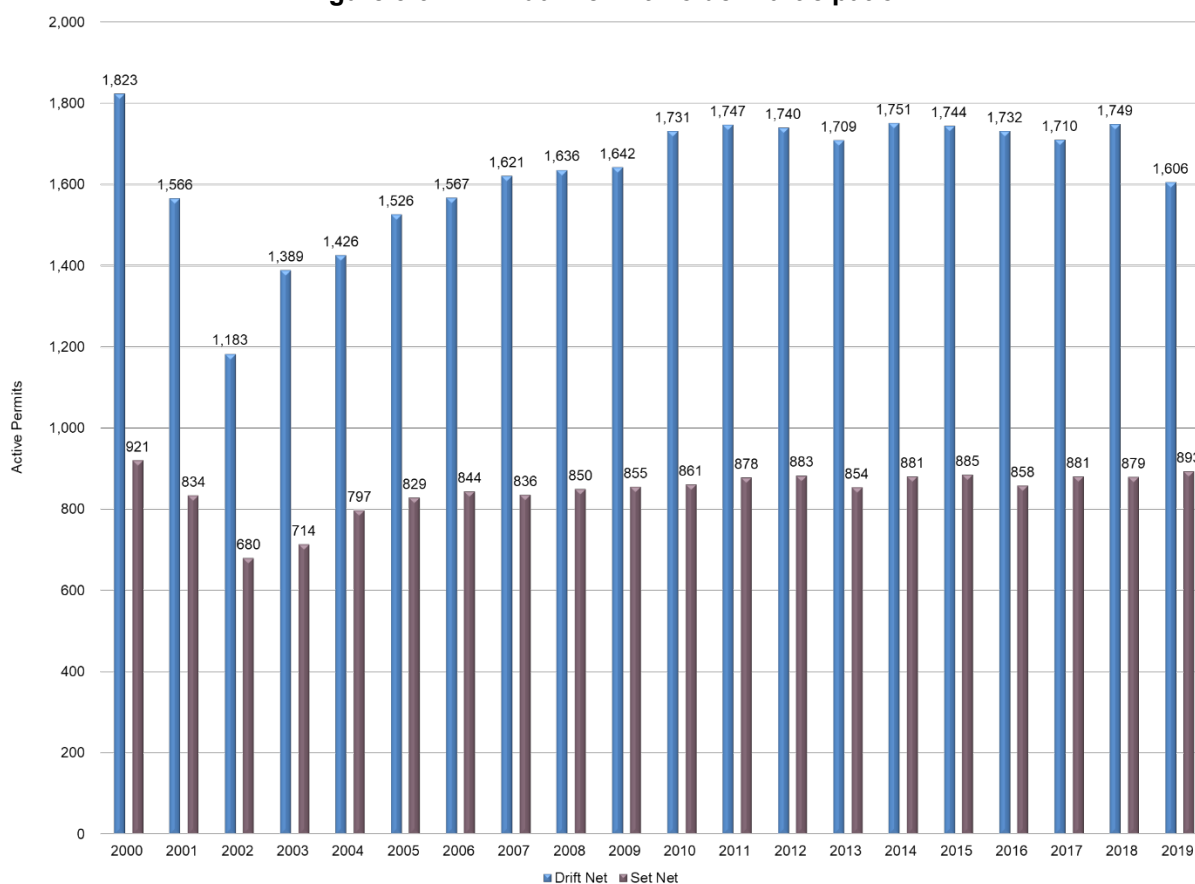
Source: CFEC 2020b, 2020c

### **Participation in the Fishery and Permit Ownership**

Permit holder participation in the fishery varies from year to year, depending on permit holder expectations for both prices and the number of returning Bristol Bay salmon. Several distinct periods define permit holder participation over the past 20 years. Between 1997 and 2000, more than 97 percent of drift net permit holders and 90 percent of set net holders participated in the fishery. Fishery participation dropped substantially in 2001 and 2002 because low prices discouraged permit holders from fishing; only 63 percent of drift net permit holders and 67 percent of set net holders participated in the 2002 fishery. As ex-vessel prices have recovered and the fishery has become better organized with the creation of the BBRSDA and combined permit holder/processor efforts to improve the value of the fishery, a greater percentage of permit holders are fishing their permits. Between 2010 and 2018, at least 1,700 (91 percent) drift net permit holders have participated in the fishery each year. The participation rate dipped in 2019 to 86 percent, possibly because the 2019 season forecast was for a smaller harvest than 2018 (ADF&G 2018t). In the set net fishery, at least 830 (85 percent) set net permit holders have participated since 2007, and 93 percent participated in 2019 (Figure 3.6-7).

The fishery has experienced a gradual out-migration of permits from Alaskans to non-Alaskans—in particular from watershed residents (i.e., those who live in the watershed boundaries of Area T) to non-watershed Alaskans and non-Alaskans (ADF&G 2018m). Overall Alaskan permit ownership in the drift net fishery dropped from 55 percent to 46 percent between 1990 and 2019, while in the same period Alaskan ownership of set net permits fell from 76 percent to 65 percent (Table 3.6-4).

**Figure 3.6-7: Annual Permit Holder Participation**



Note: As limited-entry fisheries, there are a relatively fixed number of permits for the Bristol Bay drift net and set net salmon fisheries. Although there are small changes from year to year, the overall number of permits is stable. For example, from 2007 to 2017, the total number drift net permits (including active and inactive permits) in any year was no lower than 1,862 and no higher than 1,864. The number of set net permits in the same period ranged from 983 in 2007, to 972 in 2017. In recent years, it has been typical for roughly 90 percent of set net permits and 92 to 95 percent of drift net permits to remain active in the fishery by recording harvest each year. Thus, the figure above is essentially a proxy for the percentage of all permits that were active.  
Source: ADF&G 2020

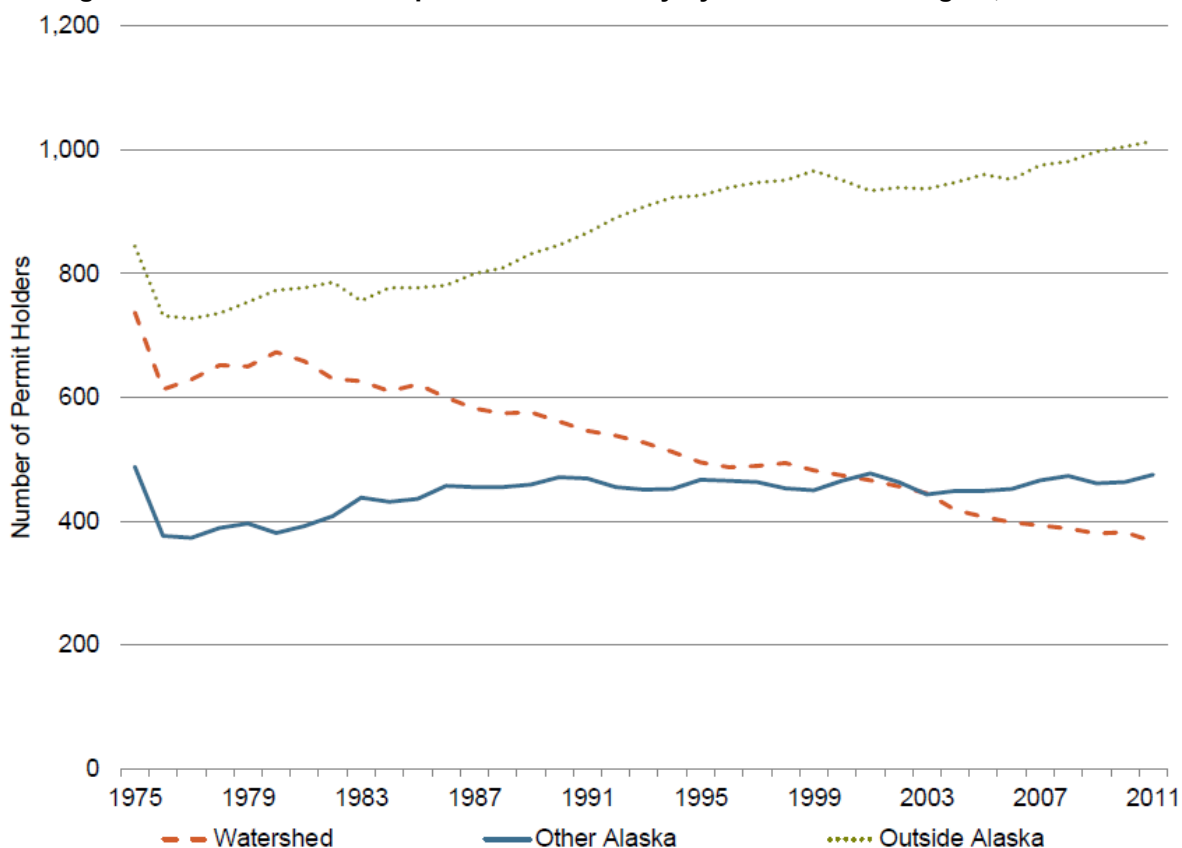
**Table 3.6-4: Permits Owned by Alaskans and Non-Alaskans**

Year	Drift Net			Set Net		
	Alaskan	Non-Alaskan	Percent Resident	Alaskan	Non-Alaskan	Percent Resident
1990	1,039	839	55	783	243	76
1995	967	921	51	762	257	75
2000	959	940	51	757	262	74
2005	895	967	48	688	300	70
2010	866	997	46	672	311	68
2015	834	1,030	45	639	336	66
2019	840	1,022	46	632	333	65

Source: ADF&G 2020

The collective data show a loss in Alaska-owned permits, but more refined data show that out-migration of permits is really an issue specific to the Bristol Bay watershed residents; ownership by Alaskans based outside of the watershed is stable or increasing (Figure 3.6-8). Between 1975 (when the limited-entry program started) and 2011, non-Alaskan ownership of the permits increased from roughly 850 permits to more than 1,000. Permit ownership by non-watershed Alaskans dipped after initial issuance as the CFEC adjudicated temporary permits, but has risen from a low of fewer than 400 permits to nearly 500 permits in 2011. Permit ownership by residents of the watershed fell steadily between the late 1970s and 2011, from roughly 700 permits to fewer than 400 permits. As permits leave the region, so does the associated earnings-related spending. With average permit holder earnings of more than \$100,000 in 2017, the roughly 300 drift net permits that have out-migrated from the watershed between 1975 and 2011 represent approximately \$30 million dollars in annual gross income that is not available to support the local economy.

**Figure 3.6-8: Drift Net Participation in the Fishery by Permit Holder Region, 1975-2011**



Source: NEI 2014

Theories as to why permit holders have left Bristol Bay include lower access to and higher cost of capital; the long-term effect of consistently earning less than non-watershed peers; financial hardship; population decline; and the relative desirability of joining the fishery to outsiders because of its possibly higher earning potential compared to other Alaska salmon fisheries (Apgar-Kurtz 2012). Prior research shows that Bristol Bay resident vessels tend to be older and have less horsepower, smaller fuel tanks, and less refrigeration capacity (see Table K3.6-6 in Appendix K3.6) (NEI 2009).

The rate of loss of permits is not equally spread across communities in the watershed. Apgar-Kurtz (2012) showed that the rate of permit loss was higher amongst communities that were not

part of the Bristol Bay Economic Development Corporation (BBEDC) region, despite the fact that many of these communities are eligible for BBEDC's permit loan program (BBEDC 2019). The non-BBEDC watershed communities include those that are closest to the project, including Iliamna, Nondalton, Pedro Bay, Port Alsworth, and Newhalen. The group also includes communities farther from the project but still in water systems hydrologically connected to the project, including Igiugig, Koliganek, Kokhanok, and New Stuyahok. When permit holders sell their permits, there are secondary effects on the community that lower earnings and the likelihood of community participation in the fishery:

1. There are now fewer opportunities for community members to obtain crew member jobs and bring a share of their earnings back to that community. Permit holders prefer to hire people they know, and they are more likely to know people from their own community (Apgar-Kurtz 2012).
2. People predominantly learn to fish in the region through their family; if a family sells their permits, the next generation is less likely to take part in commercial fishing (Apgar-Kurtz 2012).

It should be noted that the discussion of the geographic distribution of permit ownership is a proxy for the geographic distribution of ex-vessel earnings. The economic impact of the Bristol Bay fishery extends beyond Bristol Bay, with residents of Alaska, Washington, Oregon, and California accounting for approximately 86 percent of job holders in Bristol Bay in 2010 (see Table 3.6-5).

**Table 3.6-5: Seasonal Employment In the Bristol Bay Salmon Industry by State of Residence, 2010**

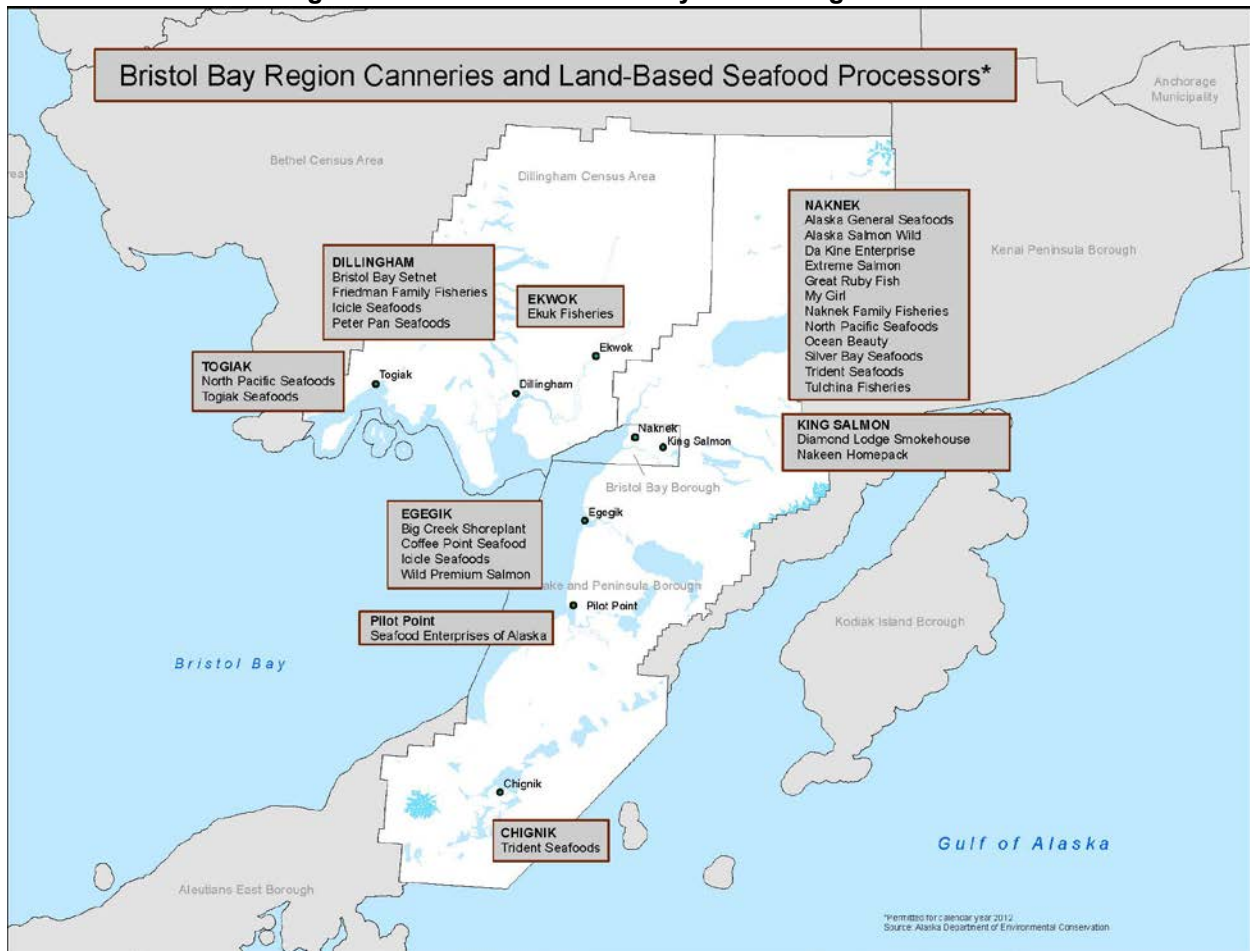
	Total US	Alaska	Washington	Oregon	California	Other States
Fishing	7,035	3,734	1,948	362	345	646
Processing	4,886	635	1,279	1,781	208	983
<b>Total</b>	<b>11,921</b>	<b>4,369</b>	<b>3,227</b>	<b>2,143</b>	<b>553</b>	<b>1,629</b>

Source: Knapp, Guettabi, and Goldsmith 2013

### 3.6.1.3 The Processing Sector

After harvest, permit holders deliver salmon to processors who pay them for their catch and prepare the fish for distribution and sale into the broader seafood market. The processing sector in Bristol Bay ranges from small family owned operations to business units of multi-national corporations with operations across Alaska, the US, and the rest of the world. Although the Alaska Department of Environmental Conservation (ADEC) documents processing facilities in seven Bristol Bay communities, the heart of processing in Bristol Bay is in the Bristol Bay Borough community of Naknek (Figure 3.6-9). In 2015, the last year for which data are available, the processing sector employed 3,087 people in the Bristol Bay Borough, 908 in the Dillingham Census Area, and 162 in the Lake and Peninsula Borough (LPB) (ADLWD 2018a).

**Figure 3.6-9: Current Bristol Bay Processing Locations**



Notes: This figure was sourced externally and incorrectly shows the Friedman Family Fisheries in Dillingham and the Ekuk fisheries shore plant in Ekwok. Both of these facilities are in Ekwok.

The Chignik processing facilities service the Chignik area salmon fisheries. These runs return to their spawning grounds via the Gulf of Alaska and not via Bristol Bay.

Source: ADLWD 2018b.

From 1998 to 2018, the processing sector in Bristol Bay produced \$7.87 billion of first wholesale value seafood products; processors derived \$7.0 billion of this value (89.2 percent) from non-roe products from sockeye salmon (Table 3.6-6).<sup>9</sup> The next most valuable species across that time frame was Pacific herring (*Clupea pallasii*), a fishery that occurs every May in the Togiak/Twin Hills region of the Bristol Bay. Non-roe products from the remaining salmon species represented 3.5 percent, or \$277.5 million, of wholesale value; other species and salmon roe products generated \$90.2 million in wholesale value.

From 2004 to 2015, the processing sector provided jobs for an average of 4,106 workers; 2.4 percent of those workers were residents from the Bristol Bay watershed, and another 12.2 percent were Alaska residents from outside the watershed. The remaining 85.4 percent were from out of state. Collective watershed resident wages averaged \$1 million per year from 2004 to 2015, and total worker wages averaged \$29.4 million (Table 3.6-7).

<sup>9</sup> All values in \$US 2019.



**Table 3.6-6: Bristol Bay Wholesale Values by Species and Year (\$US 2019)**

Year	Sockeye Salmon	Herring	Chum Salmon	Chinook Salmon	Coho Salmon	Pink Salmon	Other Species	Total
1998	\$195.8	\$25.8	\$1.9	\$3.5	\$2.0	\$0.8	\$12.5	\$242.3
1999	\$300.1	\$42.4	\$1.9	\$0.7	\$0.3	\$0.0	\$13.8	\$359.2
2000	\$247.1	\$34.4	\$2.6	\$0.6	\$2.2	\$0.2	\$19.3	\$306.3
2001	\$154.2	\$29.3	\$3.4	\$0.5	\$0.8	\$0.0	\$20.3	\$208.7
2002	\$135.9	\$19.2	\$1.9	\$1.0	\$0.4	\$0.0	\$12.3	\$170.7
2003	\$160.9	\$24.5	\$8.2	\$1.1	\$0.6	\$0.0	\$4.2	\$199.6
2004	\$239.7	\$22.4	\$2.9	\$3.3	\$5.1	\$0.6	\$0.3	\$274.3
2005	\$289.3	\$27.5	\$6.7	\$2.7	\$0.8	\$2.3	\$0.5	\$329.7
2006	\$302.9	\$22.5	\$11.9	\$4.6	\$1.2	\$0.4	\$0.4	\$343.9
2007	\$309.7	\$16.5	\$26.8	\$2.1	\$0.7	\$0.0	\$0.3	\$356.1
2008	\$318.7	\$21.7	\$11.2	\$1.4	\$1.4	\$1.0	\$0.1	\$355.5
2009	\$344.1	\$26.1	\$9.5	\$1.3	\$0.6	\$0.1	\$0.0	\$381.7
2010	\$450.4	\$28.3	\$8.5	\$1.3	\$1.5	\$5.1	\$0.0	\$495.1
2011	\$394.3	\$22.3	\$8.6	\$3.4	\$0.8	\$0.0	\$0.0	\$429.3
2012	\$311.5	\$20.4	\$7.5	\$0.9	\$1.3	\$6.7	\$0.0	\$348.2
2013	\$331.5	\$23.8	\$9.8	\$0.7	\$0.5	\$0.4	\$0.0	\$366.8
2014	\$414.3	\$16.5	\$4.7	\$0.9	\$3.1	\$3.5	\$0.0	\$443.1
2015	\$388.4	\$17.4	\$6.6	\$1.6	\$0.1	\$0.0	\$0.0	\$414.2
2016	\$483.6	\$15.6	\$9.6	\$1.3	\$1.1	\$3.5	\$5.8	\$520.6
2017	\$558.7	\$14.0	\$16.9	\$1.8	\$2.9	\$0.2	\$0.0	\$594.5
2018	\$687.9	\$9.7	\$21.0	\$2.7	\$4.1	\$1.6	\$0.3	\$727.3
<b>Total</b>	<b>\$7,019.0</b>	<b>\$480.3</b>	<b>\$182.1</b>	<b>\$37.5</b>	<b>\$31.5</b>	<b>\$26.4</b>	<b>\$90.2</b>	<b>\$7,867.1</b>

Source: ADF&G 2018x

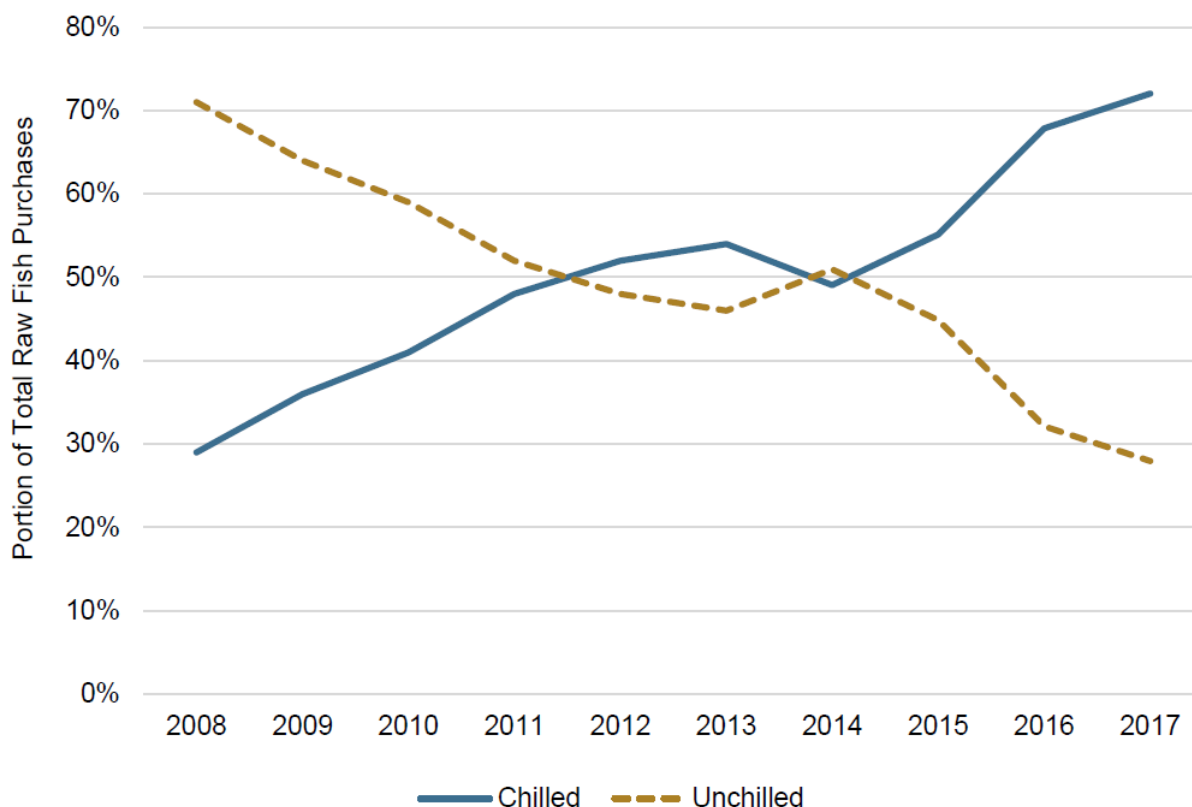
**Table 3.6-7: Residency and Wages of Processing Workers**

Year	Total Worker Count	Percent of All Processing Workers			Wages (\$M Nominal/Not Inflation Adjusted)		
		Percent Non-resident Workers	Alaska Resident Ex-Watershed Workers	Watershed Resident Workers	Non-Resident Wages	Alaska Resident Wages, Ex-Watershed	Watershed Resident Wages
2004	3,594	83.0	13.5	3.5	\$18.7	\$2.2	\$1.2
2005	3,357	81.6	14.9	3.5	\$19.5	\$2.3	\$1.2
2006	3,090	84.2	12.3	3.5	\$21.5	\$2.4	\$1.3
2007	3,655	84.1	12.4	3.5	\$25.2	\$3.2	\$1.4
2008	3,987	83.8	13.5	2.7	\$24.3	\$3.1	\$1.4
2009	4,855	87.0	11.8	1.2	\$28.8	\$2.9	\$0.7
2010	4,886	87.0	11.3	1.7	\$30.1	\$3.2	\$0.7
2011	4,574	87.8	10.5	1.7	\$26.1	\$2.7	\$0.8
2012	4,026	85.6	12.0	2.4	\$22.5	\$2.6	\$0.8
2013	4,328	84.7	13.3	2.0	\$25.1	\$4.2	\$0.8
2014	4,791	87.6	10.5	1.9	\$33.5	\$3.7	\$0.9
2015	4,134	85.9	12.0	2.1	\$29.9	\$3.5	\$0.6

Source: ADF&G 2018x

Over the last decade, processors, the BBEDC, and the BBRSDA have focused several efforts on increasing raw product quality in the fishery. Processors consistently identify chilling fish at the point of harvest as the most important action that permit holders can take to increase product quality and have offered bonuses to permit holders who chill their fish. From 2008 to 2017, these bonuses added between 12 percent and 28 percent to the base price paid to permit holders, depending on the year. Permit holders responded to these incentives by increasing the portion of Bristol Bay salmon that is chilled immediately at harvest from 24 percent in 2008 to 73 percent in 2018 (Figure 3.6-10) (NEI 2018).

**Figure 3.6-10: Raw Product Forms Processed in Bristol Bay, 2008-2017**



Source: NEI 2018

### 3.6.1.4 Fishery Fiscal Contributions

The fiscal contributions of the Bristol Bay salmon fishery depend on the long-term health of the fishery. The harvest and processing of salmon in the Bristol Bay region provides millions of dollars in tax revenues to federal, state, and local governments. The federal government benefits through personal and corporate income taxes; the State of Alaska benefits from Alaska Fisheries Business Tax (AFBT) (AS 43.75.015); and local governments benefit from general taxes such as sales taxes, real and personal property taxes, and raw fish taxes on the ex-vessel value of salmon processed in the jurisdiction (EPA 2014). Each municipality generates revenue in different ways. The Bristol Bay Borough, home to many processing plants, relies on real/personal property taxes and raw fish taxes. There are not as many processing plants in city limits, but Dillingham is home to lay-down and repair yards for boats, and a major provisioning center for fishing crews; therefore, the city relies on sales and property taxes. The LPB lacks a centralized population area that could provide it with sales and property tax revenues, but instead relies on raw fish taxes (Table 3.6-8). Overall, these taxes depend on the long-term value of the fishery, the attractiveness of the fishery to investors who build business around the fishery, and total employment in the fishery, including processing workers.

The State of Alaska shares revenues generated from the AFBT with local municipalities. As noted in EPA (2014), the State does not break out AFBT revenue by species or fishery. However, in 2010, when the ex-vessel value of the Bristol Bay fishery topped \$180 million in nominal terms, the Institute for Social and Economic Research estimated that the processors paid a minimum of \$6.38 million in AFBT taxes (EPA 2014) (Table 3.6-9). In 2016 and 2017, the ex-vessel value of the fishery was \$156 and \$216 million, respectively. Therefore, one could conclude that in 2016 the AFBT payment was slightly less than it was in 2010 and that in 2017 it was slightly more than it was in 2010.

**Table 3.6-8: Community Revenue Sources, 2017**

Community	Sales Tax	Real Property Tax	Raw Fish Tax
Bristol Bay Borough	No	\$4,918,466	\$2,117,857
City of Dillingham	\$2,528,395	\$2,256,826	No
Lake and Peninsula Borough	No	No	\$1,638,335
Egegik	No	No	\$1,230,569
Nondalton	\$0	No	No
Newhalen	\$272	No	No

Source: ADCCED 2018

### 3.6.2 Upper and Lower Cook Inlet Commercial Fisheries

The project alternatives include a natural gas pipeline extending from north of Anchor Point on the Kenai Peninsula across Cook Inlet to Amakdedori port or Ursus Cove. This route crosses a complex set of fishing boundary areas, including the southern edge of the Upper Cook Inlet (UCI) Management Area, the Lower Cook Inlet (LCI) Management Area, and federally managed waters more than 3 miles offshore. The UCI Management Area, which includes fisheries dependent on salmon headed to the Kasilof, Kenai, Susitna, Little Susitna, and Matanuska/Knik drainages, is home to extensive oil and gas pipeline infrastructure, which has operated since the 1960s. The LCI Management Area includes commercial salmon fisheries and has historically included a commercial Pacific herring fishery. Both the UCI and LCI host State-managed groundfish fisheries for Pacific cod (*Gadus macrocephalus*), sablefish (*Anoplopoma fimbria*), walleye pollock (*Gadus chalcogrammus*), and rockfish species (i.e., black rockfish [*Sebastes melanops*], dark rockfish [*Sebastes cilatus*], and yelloweye rockfish [*Sebastes ruberrimus*]). In addition, Cook Inlet has hosted historic fisheries for Weathervane scallops (*Patinopecten caurinus*), Dungeness crabs (*Metacarcinus magister*), and a variety of hard shell clam fisheries, including razor clams (*Siliqua patula*).

**Table 3.6-9: Estimates of Historic Fishing-Related Revenues 2000-2010**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Simple Lower-Bound Estimate of Fisheries Business Tax Obligations</b>											
Ex-vessel value of Bristol Bay salmon harvests (\$ 000)	\$84,014	\$40,359	\$31,898	\$46,684	\$76,461	\$94,556	\$108,570	\$115,763	\$116,717	\$144,200	\$180,818
Canned share (assumed tax rate = 5.0%)	37%	32%	49%	39%	34%	32%	34%	35%	28%	25%	27%
Non-canned share (assumed tax rate = 3%)	63%	68%	51%	61%	66%	68%	66%	65%	72%	75%	73%
Lower-bound estimate of fishers tax obligation (\$ 000)	\$3,145	\$1,467	\$1,270	\$1,760	\$2,818	\$3,439	\$3,998	\$4,287	\$4,163	\$5,061	\$6,383
<b>State of Alaska Share Business Tax Payments to Bristol Bay Boroughs and Cities (\$ 000)</b>											
Bristol Bay Borough	\$1,440	\$918	\$494	N/A	\$451	\$835	\$1,178	\$1,296	\$1,564	\$1,543	\$1,797
Lake and Peninsula Borough	\$357	\$246	\$162	N/A	\$113	\$71	\$99	\$134	\$138	\$152	\$215
Dillingham	\$203	\$176	\$49	N/A	\$100	\$154	\$148	\$184	\$176	\$187	\$239
Egegik	\$30	\$176	\$78	N/A	\$36	\$29	\$29	\$74	\$63	\$63	485
<b>Total</b>	<b>\$2,029</b>	<b>\$1,517</b>	<b>\$784</b>	<b>N/A</b>	<b>\$700</b>	<b>\$1,089</b>	<b>\$1,454</b>	<b>\$1,687</b>	<b>\$1,941</b>	<b>\$1,944</b>	<b>\$2,335</b>

Sources: ADR 2018; EPA 2014



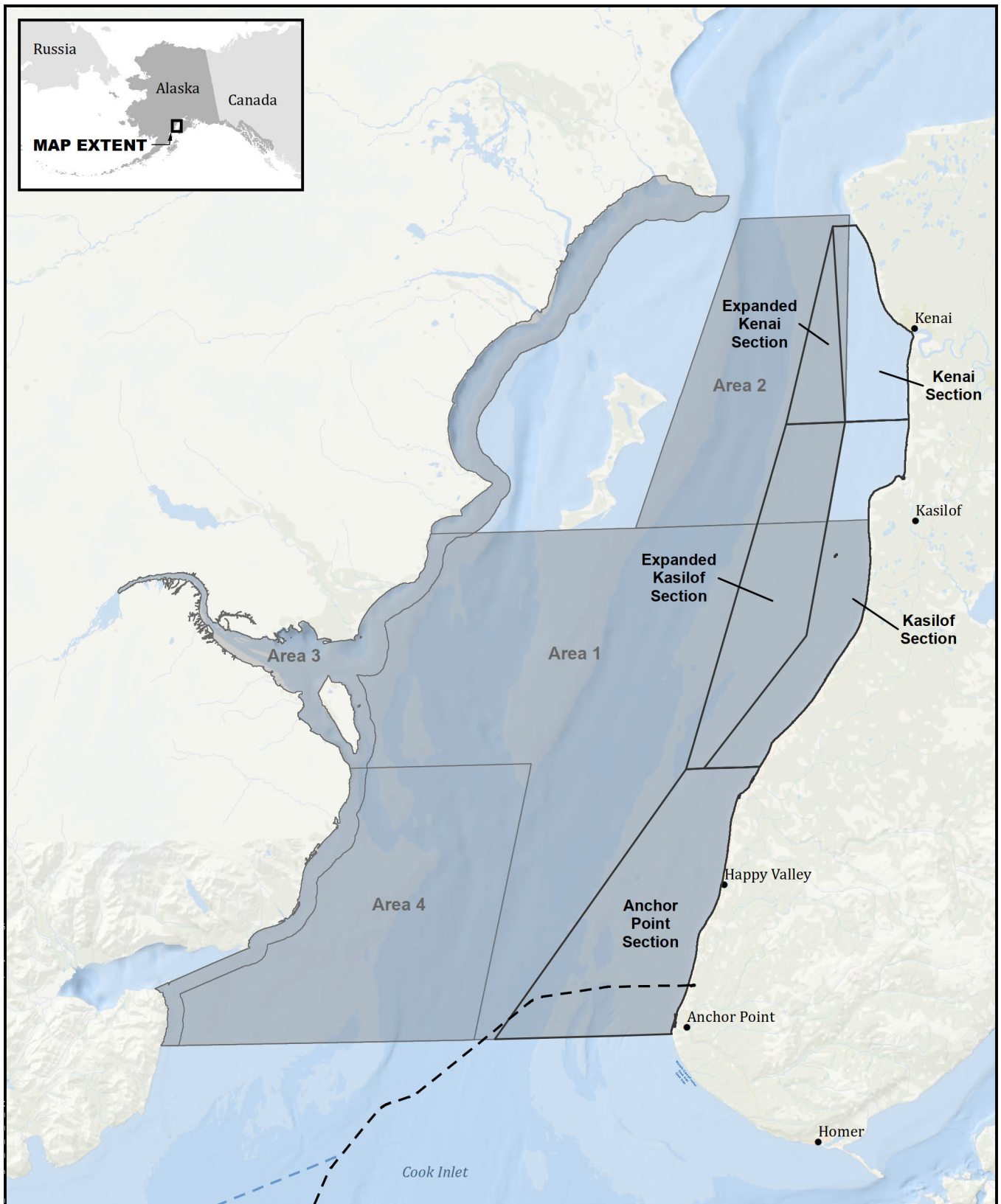
### 3.6.2.1 Upper Cook Inlet and Lower Cook Inlet Salmon

The UCI Management Area is one of the Alaska's most complex salmon management areas because management must balance escapement goals for multiple river systems and competing user groups, including commercial set net permit holders, commercial drift net permit holders, fresh and saltwater recreational anglers and guides, and personal use fisheries. From 2007 to 2016, commercial fisheries harvested an average of 3.48 million fish per year, generating \$29.8 million in ex-vessel value on average. The 20-year average harvests for the fishery are 2.9 million sockeye salmon, 457,000 pink salmon, 288,000 coho salmon, 421,000 chum salmon, and 14,600 Chinook salmon (Shields and Frothingham 2018). Although 20-year average harvests for sockeye salmon are representative of more recent trends, 10-year average harvests for the other species have been smaller than the 20-year harvests.

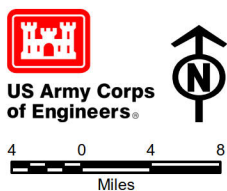
The 10-year average harvests are 2.9 million sockeye salmon, 245,000 pink salmon, 167,000 coho salmon, 149,000 chum salmon, and 9,500 Chinook salmon (Shields and Frothingham 2018). These smaller harvests result from changes in abundance (e.g., Chinook salmon) and changes in commercial management to allow more late-season harvest opportunities for northern Cook Inlet recreational anglers fishing coho salmon. The project's pipeline would originate just north of Anchor Point, with the highest potential to affect drift net commercial fisheries and saltwater recreational anglers in the vicinity of the pipeline. Although the UCI Management Area primarily encompasses salmon fisheries, the ADF&G also manages small commercial herring, smelt, and razor clam fisheries within the area boundaries.

The project's pipeline would pass through ADF&G drift gillnet statistical areas 244-63 and 244-70 before passing into the LCI Management Area (Figure 3.6-11). The pipeline would be south of any set net fisheries in ADF&G statistical area 244-21 (encompassing the unnamed/unshaded area east of Area 244-61 in Figure 3.6-11). It is not possible to determine the amount of drift fleet harvest in areas 244-63 and 244-70 because the ADF&G does not collect harvest data or attempt to estimate harvest in these specific areas. Instead, harvest from areas 244-60, 245-80, 245-90, 244-70, and 244-63 are reported in total as "Area 244-60" or "Area 1/District Wide." In 2016, the drift net fleet harvested 728,037 of the 1,266,696 sockeye salmon from this aggregate area, an amount equal to 57.5 percent of all UCI Management Area drift sockeye harvests. In the same year, the combined areas produced 70 percent of the coho salmon harvest and nearly two-thirds of the pink salmon harvest (Shields and Frothingham 2018). Despite the uncertainty regarding the magnitude of the overlap between drift net fleet harvest activities and the project's natural gas pipeline, the potential for conflict is low because of the depth of the pipeline on the sea floor, and the specifications of drift gillnet gear (ADF&G 2017c). An exception would be during construction, when some modest adjustments of gear deployment might be required.

The harvest in the LCI Management Area focuses primarily on pink and sockeye salmon from a combination of hatchery and wild sources and is much smaller than UCI salmon harvests. Harvests in this area average \$2.95 million per year in ex-vessel value between purse seine, set gillnet, and hatchery recovery operations. On average, 35 to 40 permit holders participate in salmon fisheries in these areas per year (Hollowell, Otis, and Ford 2017). Salmon harvests occur in most years in the Amakdedori/Chenik sub-district of the LCI. Between 1997 and 2018, fishing occurred from 2004 to 2014, and from 2016 to 2018. In the years when fishing occurred, permit holders harvested an average of 57,596 sockeye salmon, 3 coho salmon, 791 pink salmon, and 353 chum salmon. During these years, sockeye salmon harvest ranged from fewer than 5,500 fish to more than 171,000 fish, with a median harvest of 54,205 sockeye salmon (ADF&G 2018q).



Sources: PLP 2019-RF1153; ADFG



- |                                   |                            |
|-----------------------------------|----------------------------|
| <b>ADF&amp;G Central District</b> | <b>Action Alternatives</b> |
| Drift Gillnet Areas               | Natural Gas Pipelines      |
| Drift Gillnet Corridors           | Alternative 1a             |
|                                   | Alternative 2              |

## UPPER COOK INLET DRIFT NET MANAGEMENT AREAS

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FIGURE 3.6-11

Commercial fishing activity near the Diamond Point port site differs from fishing activity at the Amakdedori port site (Alternative 1a and Alternative 1). ADF&G LCI finfish management reports show fishing activity in the Cottonwood Bay sub-district (249-83) where the Diamond Point port would be located (Hollowel, Otis, and Ford 2017). The data provided by the ADF&G indicated that chum salmon were harvested near the port site in 15 of 32 years between 1986 and 2017, and pink salmon were harvested in 10 of 32 years during the same period. The average harvest in years when harvest was recorded was slightly more than 27,000 chum salmon and approximately 3,600 pink salmon. The same ADF&G comments indicate that the escapement goal for Cottonwood Creek is approximately 5,000 to 12,000 chum salmon per year and that total district harvest has been as high as 160,000 (ADF&G 2018q).

The ADF&G also manages a commercial Pacific herring fishery in the LCI Management Area; however, the spawning biomass has been too small to allow the opening of this fishery since 2000.

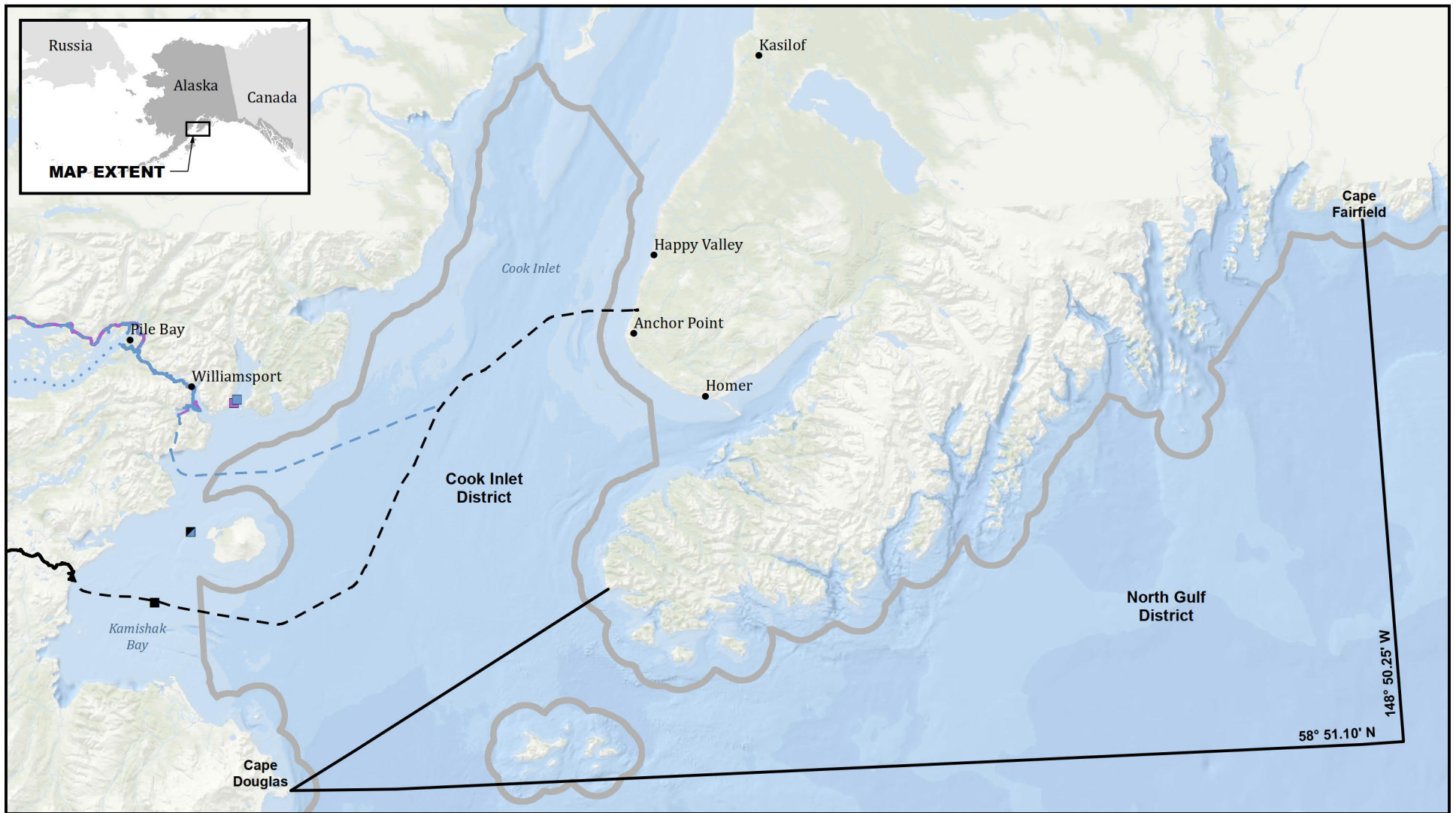
### **3.6.2.2 Upper Cook Inlet and Lower Cook Inlet Groundfish**

The pipeline would cross waters within the 3 nautical miles of shore managed by the State for groundfish fisheries for Pacific cod, sablefish, rockfish, and walleye pollock (Figure 3.6-12). These species are generally harvested by baited longlines or pots laid across the ocean floor but can also be harvested using mechanical jigs or hand troll gear. ADF&G data indicate that Pacific cod is commercially the most important species of this group, with Cook Inlet district harvests averaging between 1.7 and 3 million pounds annually; ex-vessel values average less than \$2 million per year. Much of this harvest takes places in Kachemak Bay, south and east of the pipeline (Rumble et al. 2016b). The federally managed commercial Pacific halibut fishery in the Cook Inlet district had an average annual harvest of approximately 437,000 pounds of halibut over the past 10 years, with 66 percent of that harvest occurring in the federal waters between Kamishak and Kachemak bays. In 2017, 42 vessels participated in the halibut fishery. Other commercially important species harvested in the Cook Inlet district include lingcod, spiny dogfish, and skate species.

The pipeline would cross the Cook Inlet district and federally managed waters in Cook Inlet beyond 3 nautical miles from shoreline. Commercial fisheries in these areas include fisheries for Pacific halibut, Pacific cod, and other groundfish (Figure 3.6-13). The halibut fishery is co-managed with the State of Alaska and the federal government, operating under limits established by the International Pacific Halibut Commission. The fishery for halibut uses longlines consisting of baited hooks laid on the ocean floor, and the cod fishery primarily uses longlines and pots. Federal management areas are much larger than State management areas; therefore, harvesters have greater flexibility to avoid fixed assets such as pipelines and undersea cables in federal waters. For example, halibut harvesters holding halibut quota for International Pacific Halibut Commission Area 3A, which includes Cook Inlet, can fish anywhere in the 3A management area. However, flexibility is not without cost. Greater travel distance from home ports increases operating costs and, if commercial harvesters are forced to harvest from less familiar or less productive areas, increases uncertainty.

The following sections describe current and historical fishing for each groundfish or shellfish species or species group.

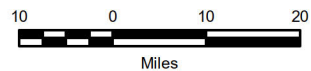




Sources: PLP 2020-RF1168;  
PLP 2019-RF1153; ADFG



**US Army Corps  
of Engineers®**



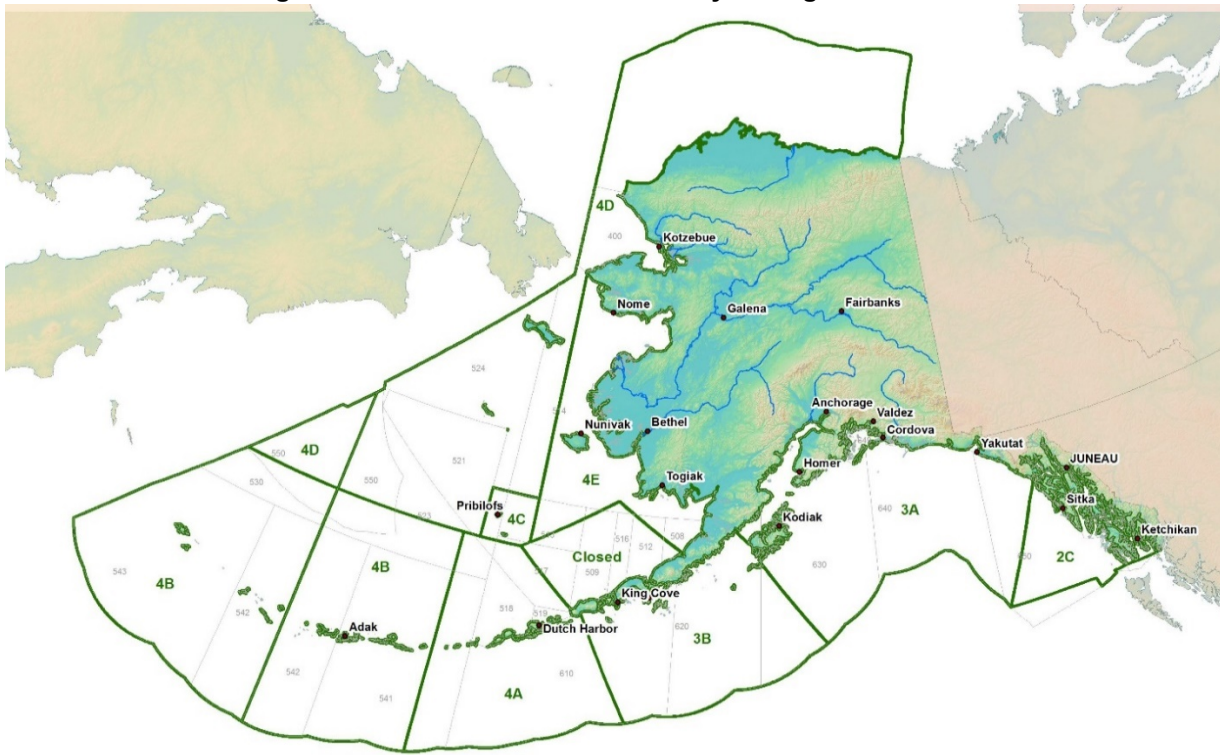
- |                            |                   |
|----------------------------|-------------------|
| — ADF&G District Boundary  | .... Ferry Routes |
| — Three Nautical Mile Line | ■ Alternative 1a  |
| <b>Action Alternatives</b> | ■ Alternative 2   |
| — Natural Gas Pipelines    | ■ Alternative 3   |
| ■ Lightering Locations     |                   |

**PEBBLE PROJECT EIS**

## COOK INLET MANAGEMENT AREA GROUNDFISH AREAS AND DISTRICT BOUNDARIES

**FIGURE 3.6-12**

**Figure 3.6-13: Federal Halibut Fishery Management Areas**



Source: NOAA 2018d

### **Pacific Halibut**

The Pacific halibut fishery is Cook Inlet's most valuable groundfish fishery. In 2018, quota holders made more than 300 landings of halibut, totaling 2.25 million pounds or 14 percent of all US landings of the species. The port of Homer had the second-largest total of landed halibut weight in the country, after Sitka in 2018 and Kodiak in 2017 and 2016. In these years, the port of Homer experienced a similar number of landings and total landed weight. The halibut season runs from March through November and operates on a quota system under which quota owners pick when and where to fish, subject to other regulations. Area 3A halibut quota can be fished anywhere from Kodiak to east of Yakutat.

### **Pacific Cod**

The Pacific cod fishery is the largest commercial groundfish fishery by value and weight in the Cook Inlet area, accounting for approximately 90 percent of groundfish ex-vessel value in 2015. About half of the total harvest occurs in the Cook Inlet district (waters of Cook Inlet north of a line from Cape Douglas to Point Adam). Fishers catch Pacific cod using jig gear, pots, and longlines, and participate in two fishing seasons: the state waters fishery and the "parallel season" fishery, which runs concurrently with the federal fishing season. For combined federal and state waters of the Cook Inlet district over the past 20 years, annual Pacific cod harvest has averaged approximately 2.7 million pounds, with a high of approximately 4.4 million pounds, about 40 percent of which typically occurs in the federal waters between Kamishak and Kachemak bays. From 1997 to 2015, Pacific cod harvest in the Cook Inlet district state-waters fishery averaged 1.2 million pounds per year. The 10-year average is slightly higher at 1.4 million pounds, with the parallel season fishery adding another 350,000 to 500,000 pounds of harvest on average. The ex-vessel value of the fishery in the Cook Inlet district in 2017 was slightly less than \$1 million,



with 37 vessels harvesting Pacific cod. ADF&G data indicate that nearly all the Cook Inlet district harvest occurs south of Anchor Point in Kachemak Bay, with less than 50,000 pounds of total harvest from 2012 to 2015 in the area encompassing Kamishak Bay (Rumble, Russ, and Russ 2016). The Pacific cod fishery in the Gulf of Alaska was closed in 2020 due to low abundance.

### **Walleye Pollock, Lingcod, Sablefish, and Other Species**

The Cook Inlet Management Area does not host a walleye pollock directed fishery, but the species may be kept as bycatch. Total harvest in the entire management area, including the North Coast district and the Cook Inlet district, ranges from less than 5,000 pounds per year to less than 50,000 pounds per year.

Lingcod harvests in the Cook Inlet Management Area (including federal waters) have varied dramatically in recent years, from 6,700 pounds in 2015 to more than 52,000 pounds in 2018 (ADF&G 2019a). ADF&G management reports indicate that the majority of this harvest comes from state waters and that “virtually all” of the harvest comes from the North Gulf district outside of the EIS analysis area (Rumble, Russ, and Russ 2016).

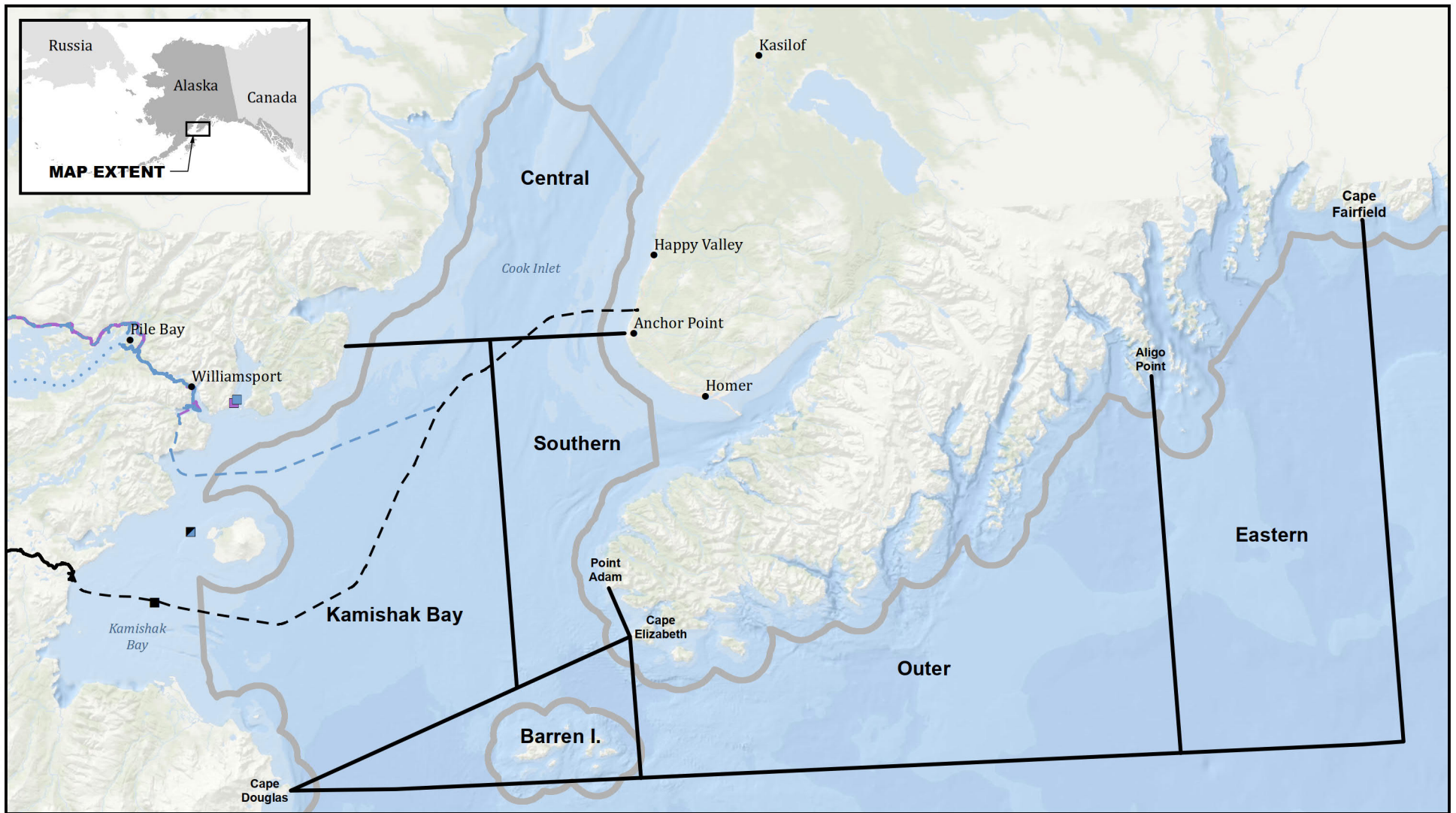
In 2018, seven commercial harvests of nearly 25,000 pounds of sablefish came from Cook Inlet Management Area waters (ADF&G 2019a). This amount is less than half the historical harvest experienced between 2008 and 2014 and a more than two-thirds decline from the 83,000 pounds harvested in 2005 (Rumble, Russ, and Russ 2016).

### **Rockfish Species**

The rockfish complex includes dozens of species of the genus *Sebastes*. In the Cook Inlet Management Area, the majority of the rockfish harvest comes from pelagic shelf rockfish, such as black rockfish and dark rockfish. Demersal rockfish, primarily yelloweye rockfish, make up the second-largest harvest group. According to ADF&G management reports, “Within the Cook Inlet Area, the [North Gulf District] historically yielded greater than 95 [percent] of the commercial rockfish harvest during any given year and also supported active sport and personal use rockfish fisheries, with the exception of a low of 85 [percent] in 2008. The rocky, high-relief habitat typical of the [North Gulf District] was more suitable to nearshore rockfish than the glacial-mud substrate of the [Cook Inlet District]” (Rumble, Russ, and Russ 2016). Thus, the vast majority of commercial rockfish effort and harvest is outside of the EIS analysis area of the Cook Inlet district.

#### **3.6.2.3 Upper Cook Inlet and Lower Cook Inlet Shellfish and Miscellaneous Species**

The Cook Inlet Management Area (i.e., ADF&G Registration Areas H and G) includes several active or historic shellfish fisheries. In these areas, the ADF&G manages all commercial shellfish in state and territorial waters, as well as delegated fisheries in the federal waters of the exclusive economic zone. Current and historic resources targeted in these management areas include weathervane scallops, octopus and squid, shrimp, hard-shell clams and mussels, razor clams, Dungeness crab, sea cucumbers, and green sea urchins (Rumble et al. 2016b). The project would interact with this management area and associated fisheries through the positioning of the natural gas pipeline, which would run from just north of Anchor Point in central shellfish district, through the northwestern corner of the Southern shellfish district, and through the Kamishak Bay shellfish district (Figure 3.6-14). The pipeline would pass through Kamishak Bay and Amakdedori port under Alternative 1a and Alternative 1, and through Ursus Cove, before reaching the Diamond Point port area under Alternative 2 and Alternative 3.



Sources: PLP 2020-RF1168;  
PLP 2019-RF1153; ADFG



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of Engineers®



10 0 10 20  
Miles

- Shellfish Districts
- Three Nautical Mile Line
- Action Alternatives**
- Natural Gas Pipelines
- Lightering Locations
- .... Ferry Routes
- Alternative 1a
- Alternative 2
- Alternative 3

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**COOK INLET MANAGEMENT AREA AND SHELLFISH DISTRICTS**

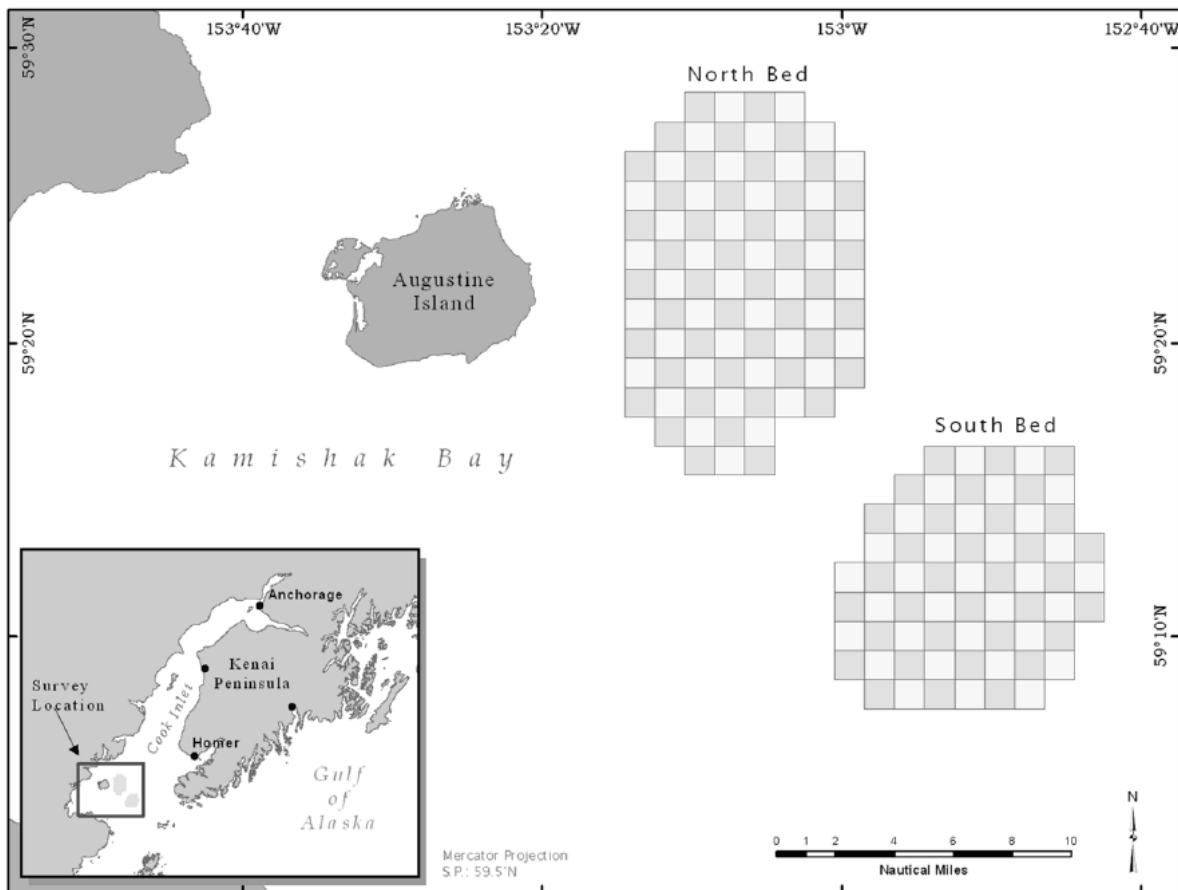
FIGURE 3.6-14

### **Weathervane Scallops Fishery**

Kamishak Bay is home to a historic Weathervane scallop fishery composed of two scallop beds east of Augustine Island (Figure 3.6-15). This fishery is still actively managed by the ADF&G but has been intermittently closed due to low abundance. The northern bed is historically the more biologically and commercially productive of the two beds. From 1993 to 2012, an average of roughly two vessels per year harvested from the bed, with an average total harvest of 11,000 to 14,000 pounds. In 1995, 2003, 2007, 2008, and 2009 the fishery was either closed or had no vessels pursuing the fishery. The bed was closed in 2013 and 2014, opened in 2015 and 2016 when it was worked by one vessel, opened but not worked in 2017, and closed again in 2018.

The southern bed is the less productive of the two beds. ADF&G records show that since 1993 harvest from the southern bed was only recorded in 2002, 2003, and 2004. In 2007 and 2008, the bed was open for harvest, but no harvest was recorded. In all other years, the bed has been closed (Rumble et al. 2016b; NPFMC 2018).

**Figure 3.6-15: Kamishak Bay Shellfish Beds**



Source: Rumble et al. 2016b

### **Octopus Fishery**

Octopus are a bycatch species harvested incidentally by other fisheries, particularly in the Pacific cod pot fishery. Every year since 2007 (with the exception of 2010), ADF&G has issued an Emergency Order banning retention of incidentally harvest octopus when the harvest has approached the Guideline Harvest Level of 35,000 pounds. Over the past 20 years, an average

of 11 vessels per year have reported octopus landings totaling 30,000 pounds for the year (Rumble et al. 2016b; ADF&G 2019a).

### **Pacific Herring Fishery**

The Kamishak Bay district of the LCI includes a historical Pacific herring fishery, which has been closed since the 2000 season. Between 1961 and 1999, the fishery harvested an average of 2,520 short tons of Pacific herring in the district (Hollowell, Otis, and Ford 2019).

### **Shrimp, Dungeness Crab, Tanner Crab, Red King Crab, and Hard Clams Fisheries**

Cook Inlet was home to a historical fishery for shrimp, which averaged 5 million harvested pounds per year between 1969 and 1983. The fishery closed in 1987 and 1997 because of low abundance (Rumble et al. 2016b).

Although a Dungeness crab fishery existed in the southern district until the 1990s, there is currently no open fishing season for the species in the Cook Inlet Management Area. Similarly, tanner crab, red king crab, and hard-shell clams were harvested in Kachemak Bay until 1981, 1994, and 2006, respectively. There have been no recorded commercial harvests since (Rumble et al. 2014, Rumble et al. 2016b). There are no razor clam fisheries in the EIS analysis area.

## **3.6.3 Guided and Unguided Recreational Fishing**

### **3.6.3.1 Freshwater Fishing**

The EIS analysis area hosts numerous freshwater fishing resources that anglers use primarily to target Chinook salmon, sockeye salmon, rainbow trout (*O. mykiss*), and other salmonid species. They value the area's low angler density, catch rates, and wilderness fishing conditions (EPA 2014). In turn, these well-known fisheries resources support sport fishing lodges, fishing guides, and related services such as air taxis, and generate revenue for the state of Alaska and local municipal governments. There are some special management areas for rainbow trout along the upper Nushagak River and Upper Talarik Creek.

The ADF&G measures recreational fishing effort via the annual SWHS. The SWHS measures effort and catch (i.e., harvest plus catch and release) across a set of geographic statistical areas via a mail survey distributed to a sample of individuals who purchased an Alaska fishing license in the year being surveyed. Each year, the ADF&G mails 47,000 SWHSs to anglers who bought licenses; it divides anglers into four sample frames: Alaskans, non-Alaskan US citizens, Canadian residents, and all other anglers. In 2016, response rates across the frames varied between 26 percent and 50 percent; the ADF&G expects approximately 17,000 responses each year (ADF&G 2017d).

**Figure 3.6-16: Map of ADF&G Recreational Fishing Areas**



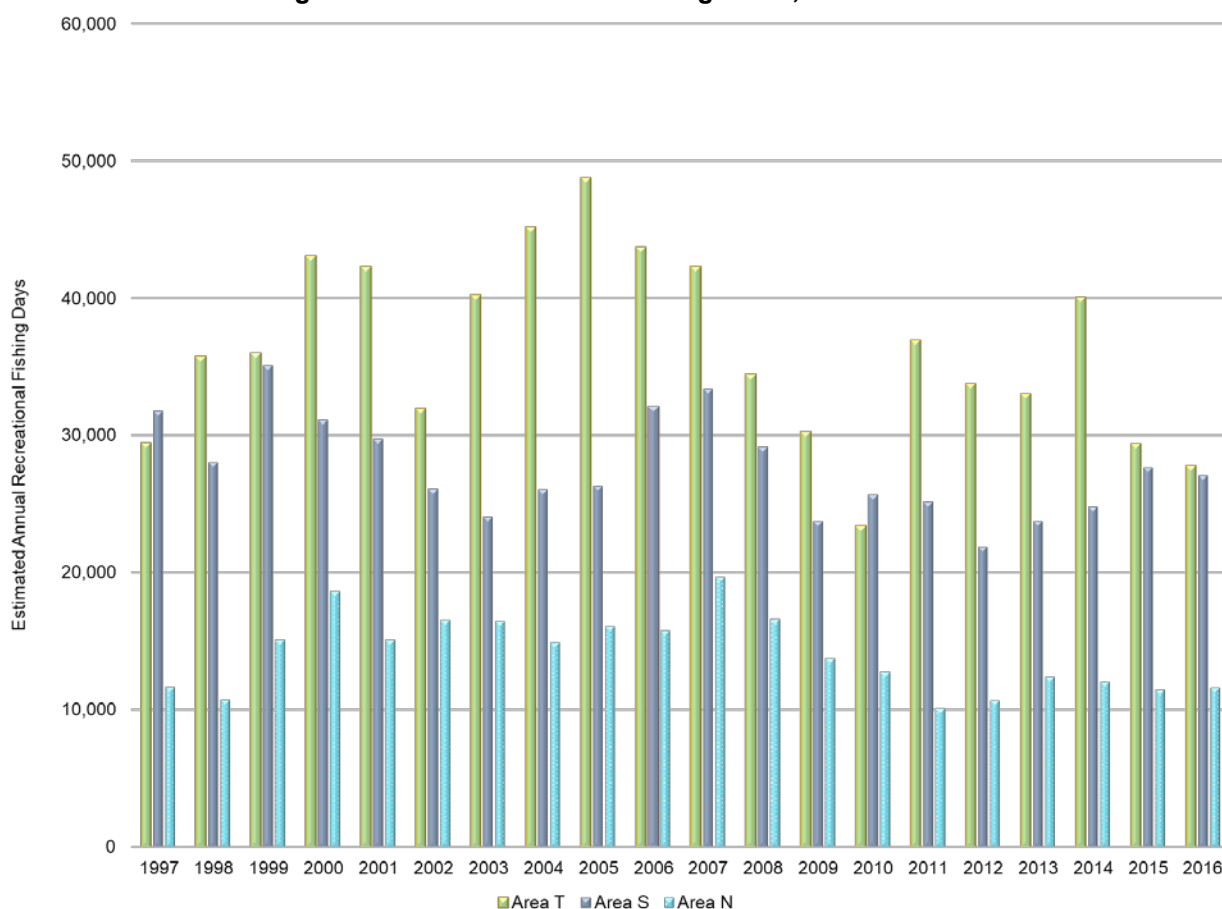
Source: ADF&G 2018d

The ADF&G SWHS statistical areas S, T, and N contain the waterbodies hydrologically connected to the project area; Area S contains the Kvichak River drainage and Area T contains the Nushagak, Wood, and Togiak river drainages (Figure 3.6-16). In 2016, the ADF&G estimated that anglers fished approximately 27,000 days in Area S, nearly 28,000 days in Area T, and 11,600 days in Area N; the vast majority of these days were freshwater fishing days (Figure 3.6-17). The EIS analysis area also includes Area P, which is not hydrologically connected to the project area.<sup>10</sup>

<sup>10</sup> Area P includes the eastern terminus of the natural gas pipeline, where the pipeline would connect with the existing natural gas supply system on the Kenai Peninsula. The primary facility would be a new compressor station connecting to existing natural gas infrastructure north of Anchor Point and the Anchor River, which hosted an estimated 12,699 angler days in 2016. The facility would not be expected to affect angling in the area except for minor increases in construction traffic during the construction phase; for this reason, Area P is not discussed in further detail in this section.



**Figure 3.6-17: Recreational Fishing Effort, 1997-2016**



Source: ADF&G 2018d

Each year, the ADF&G publishes angler count, fishing day, and harvest estimates of waterbodies for which they have received enough completed surveys to generate results of a certain statistical reliability. The SWHS combines all waterbodies for which there are not enough responses into an “other” category. Busier waterbodies generate enough angler survey responses for the ADF&G to create effort estimates every year, but waterbodies that are less busy may only generate enough results a couple of times in a 10-year period. The absence of an estimate in a particular year for one of these waterbodies does not indicate the absence of effort in that year, but rather a lack of angler survey responses. Therefore, for these waterbodies it is particularly important to look at effort across time to get a stronger sense of measured effort.

From 1997 to 2016, angler responses allowed the SWHS to estimate angling effort for eight distinct waterbodies, drainages, or systems in Area T. The survey identified the Nushagak River (excluding the Mulchatna drainage), the Wood River System, and the Togiak River System as the most frequently fished systems. These three systems accounted for 84 percent of estimated angling effort between 1997 and 2016. The Nushagak River received the most angler effort in the area, accounting for slightly more than 44 percent of total angler days. Data do not differentiate where along the Nushagak effort takes place; however, comments from the US Environmental Protection Agency (EPA) on the Draft EIS suggest that there are four areas of concentrated recreational effort in the drainage: the lower 15 miles of the Nushagak River near the village of Portage Creek; the middle section of the Nushagak River in the vicinity of the village of Ekwok; the section of the Mulchatna River between the Stuyahok and Koktuli Rivers;

and the upper Nushagak River from the outlet of the Nuyakuk River upstream to the outlet of the King Salmon River. Of the areas mentioned, the lower portion of the Nushagak River and the fishery in the immediate vicinity of the Nuyakuk River outlet have long been the most significant (EPA 2019c). The Wood River system accounted for 27 percent of area effort, and the Togiak River accounted for 13 percent. The Mulchatna River, which eventually flows into the Nushagak River, is the only system in Area T known to be directly connected to the project area via surface waters (of the Koktuli River); the river accounted for 6.4 percent of estimated angling effort in the 20 years between 1997 and 2016. However, average annual angling effort on the Mulchatna River was 45 percent lower from 2007 to 2016 than it was from 1997 to 2006 (Table 3.6-10).<sup>11</sup>

**Table 3.6-10: Area T Waterbodies, Average Annual Angler Days and SWHS Appearances**

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Nushagak River	16,990	10	14,958	10
Wood River System	10,992	10	8,416	10
Togiak River System	4,601	10	4,984	10
Tikchik-Nuyakuk Lake System	2,053	10	1,950	6
Mulchatna River Drainage*	2,999	10	1,672	10
Nuyakuk River Drainage	--	0	1,327	6
Other Waterbodies	1,798	10	1,065	10
Kulukak River	--	0	758	1
Chilikadrotna River	1,031	2	--	0
<b>Freshwater Total</b>	<b>39,638</b>	<b>10</b>	<b>33,137</b>	<b>10</b>

Notes:

-- = Unknown

SWHS = Statewide Harvest Survey

\*This estimate includes any activity on the Koktuli River. Data from the ADF&G from 2007 through 2016 indicate that, on average, 2.3 anglers per year return harvest surveys indicating they fish the Koktuli; this number is below the threshold for estimating effort on a specific waterbody (Borden 2018). In comparison, Lower Talarik Creek responses ranged from 2 to 17 and averaged 9.5 responses per year in same period. The department only estimated effort for Lower Talarik Creek when the number of responses in a single year reached the mid-teens at a minimum. Responses indicating effort on the Koktuli are typically a fraction of the ADF&G's minimum for estimating and publishing specific waterbody effort.

Source: ADF&G 2018d

Angler responses allowed the ADF&G to estimate angling effort for twice as many waterbodies in Area T than in Area S in the 1997 to 2016 period. However, Area S averages roughly one-quarter fewer angler days than Area T. The most popular waterbodies in Area S are the Alagnak/Branch River, the Kvichak River, the Copper River (tributary of Iliamna Lake), and the Lake Clark and

<sup>11</sup> Several cooperating agencies noted during their review of the Draft EIS that the angler effort estimates underestimated the importance of both the Mulchatna and the Koktuli to a subset of anglers who conducted independent or guided "float trips" during which the anglers float in rafts down the waterbody and are picked up by airplane at the end of the trip.

Iliamna Lake drainages. Waterbodies included in the SWHS annual report that have the potential to be directly affected by the project, including transportation activity, are the Newhalen River, Lower Talarik Creek, Kvichak River, Gibraltar River, and Iliamna Lake (Table 3.6-11).

**Table 3.6-11: Area S Waterbodies, Average Annual Angler Days, and SWHS Appearances**

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Alagnak (Branch) River drainage	9,394	10	6,320	10
Kvichak River	7,813	10	5,167	10
Copper River (tributary of Iliamna Lake)	2,118	7	2,396	10
Lake Clark drainage	2,133	10	2,371	10
Other Waterbodies	2,133	10	2,371	10
Iliamna Lake and tributaries	1,931	7	2,187	10
Newhalen River drainage	2,972	7	1,862	7
Kulik River	1,073	7	1,652	10
Moraine Creek	1,063	6	1,616	10
Iliamna River	--	0	990	6
Kukaklek River	--	0	724	6
Gibraltar River drainage	--	0	655	7
Funnel Creek	--	0	515	4
Lower Talarik Creek	576	6	441	3
Battle River	--	0	436	5
Tazimina River	589	1	--	0
Gibraltar Lake	630	1	--	0
<b>Freshwater Total</b>	<b>29,036</b>	<b>10</b>	<b>26,239</b>	<b>10</b>

Notes:

-- = Unknown

SWHS = Statewide Harvest Survey

Source: ADF&G 2018d

In Area N, the SWHS estimated an average of 15,102 fishing days between 1997 and 2006, and 13,113 days between 2007 and 2016. Angler effort is concentrated north of the project area for all the named sites, with the exception of the Kamishak River. The Kamishak River, which appears once as a named site in 20 years' worth of data, is south of the project area near the McNeil River State Game Sanctuary, roughly 20 air miles from the Amakdedori port site (Table 3.6-12).

**Table 3.6-12: Area N Waterbodies, Average Annual Angler Days and SWHS Appearances**

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Wolverine Creek mouth	3,783	3	2,393	10
Other Freshwater	2,693	10	2,249	10
Chuitna River	2,634	10	1,412	6
Kustatan River	2,557	7	0	0
Big River Lakes	1,615	8	2,168	10
Silver Salmon Creek	1,087	10	856	8
Theodore River	850	9	765	3
Crescent Lake	--	0	692	1
Kamishak River	--	0	276	1
<b>Freshwater Total</b>	<b>15,102</b>	<b>10</b>	<b>13,113</b>	<b>10</b>

Notes:

-- = Unknown

SWHS = Statewide Harvest Survey

Source: ADF&G 2018d

In addition to the SWHS, the ADF&G collects data on guided saltwater and freshwater fishing trips via the Alaska Guide Logbook Program. Under the program, Alaska guides record data on each day they spend guiding, including data and location of the trip(s), the license numbers of guided anglers, harvest, and catch. Although SWHS data are superior in their breadth, including both guided and unguided angler effort, logbook data are a census of guided trips as opposed to estimates based on a survey. Table K3.6-7 in Appendix K3.6 summarizes the 2011 through 2014 program data for SWHS areas N, P, S, and T. Table 3.6-13 shows the summarized data for “high interest” waterbodies, which would either be directly affected by the project, have potential for cumulative or downstream effects, or have been mentioned in public scoping. The data provide insights into guided effort in the area, including:

- The vast majority (i.e., 95+ percent) of all guided Nushagak/Mulchatna effort is on the Nushagak River.
- The Copper River, which is on the eastern shores of Iliamna Lake south of pipeline alternatives leading to Diamond Point port, and north of the alternatives leading to Amakdedori port, hosts an average of nearly 1,500 guided fishing days per year.
- The Gibraltar River, which would be crossed by the port access road leading to Amakdedori port in Alternative 1a and Alternative 1, hosts an average of fewer than 300 guided fishing days per year.
- The Newhalen River, which would be crossed by the, Iliamna spur road in Alternative 1 or the primary mine access road in Alternative 1a, Alternative 2, and Alternative 3, hosts fewer than 200 guided days per year and only appeared in 3 years’ worth of data out of a maximum of 4 years.
- Upper and Lower Talarik Creek hosted fewer than 200 guided angler days per year, combined. On average, Lower Talarik Creek is the more popular of the two waterbodies, hosting 75 percent of combined effort.
- The Koktuli River does not appear in the program data for these years.

### 3.6.3.2 Estimates of Economic Contribution

Sport fishing is a consistently important economic activity in the Bristol Bay region (EPA 2014). Anglers spend substantial amounts of money on transportation, lodging and meals, equipment, and guide services, amongst other expenditure categories. These expenditures help fuel local economies and generate local tax revenues for the City of Dillingham, the LPB, and the Bristol Bay Borough. Although annual estimates of sport fishing's economic contribution are not available, EPA (2014) and Duffield et al. (2007) provide estimates of annualized value based on 2005 sport fishing effort. The Duffield et al. (2007) estimates indicate that in 2005, per trip expenditures ranged from \$426 for watershed residents to \$7,933 for those staying at remote lodges. Watershed resident anglers averaged 11.54 trips per year, and ex-watershed Alaska residents and non-residents averaged 1.3 and 1.49 trips per year<sup>12</sup> (Table 3.6-14).

**Table 3.6-13: Comparative Estimates of Sport Fishing Effort, Days**

Waterbody	Average of 2011-2014 Data			
	Appear-ances in Data (Max=4)	Business Operating	Trips	Days
<b>Area N</b>				
Kamishak River	4	8	133	356
<b>Area P</b>				
Anchor River	4	7	52	115
<b>Area S</b>				
Copper River (Iliamna Lake Area)	4	11	613	1,466
Kvichak River	4	19	548	1,288
Iliamna River	4	7	185	430
Gibraltar River	4	9	123	289
Iliamna Lake	4	8	76	223
Newhalen River	3	9	58	174
Lower Talarik Creek	4	8	55	148
Upper Talarik Creek	3	5	16	48
Chekok Creek	2	7	19	46
<b>Area T</b>				
Nushagak River – Sonar Site to Outlet of Mulchatna	4	28	1,153	3,577
Nushagak River – Black Point upstream to Sonar Site	4	21	847	2,513
Mulchatna River	4	6	135	342

Sources: Sigurdsson and Powers 2012, 2013, 2014; Powers and Sigurdsson 2016

<sup>12</sup> Duffield et al. (2007) and EPA (2014) defined a trip as “a roundtrip visit from home and return.” Given the region’s remoteness, this definition means that most trips involve multiple days of activity. Remote fishing lodge packages typically range from 3 to 7 days.



**Table 3.6-14: Inflation-Adjusted Estimates of per Trip Expenditures**

Category	Watershed Residents	Alaska Ex-Watershed	Non-Residents	Remote Lodges
Estimated per Trip Expenditures	\$426	\$1,806	\$4,560	\$7,933
Average Trips per Year	11.54	1.30	1.49	N/A

Notes:

N/A = not applicable

Expenditures adjusted using Anchorage CPI.

Source: EPA 2014.

The inflation-adjusted collective expenditures in Duffield et al. (2007) associated with recreational fishing in the Bristol Bay region equal \$5.5 million by watershed residents, \$6.9 million by Alaska residents living outside the region, and \$54.1 million by non-residents, for a total of \$66.58 million (Table 3.6-15). The inflation-adjusted estimate of statewide expenditures from Duffield et al. (2007) is \$69.32 million; therefore, most angler expenditures occur in-region.

**Table 3.6-15: Inflation-Adjusted Estimates of In-Region Expenditures**

Category	Watershed Residents	Alaska Ex-Watershed	Non-Residents	Total
Estimated Bristol Bay Expenditures	\$5,564,568	\$6,910,211	\$54,108,115	\$66,582,894

Note: Expenditures adjusted using Anchorage CPI

Source: EPA 2014.

In 2005, the year used as the basis for the Duffield et al. (2007) expenditure estimates, the ADF&G SWHS estimated 75,083 angler days in SWHS areas S and T. In 2016, the same survey estimated 54,882 angler days in the region, a decline of 27 percent. For the 5-year periods of 2001 through 2005 and 2012 through 2016, effort was down 15 percent from the earlier period to the later period, as shown in Table 3.6-16. Presuming that angler expenditures have stayed the same adjusted for inflation, the decline in effort would result in a reduction in regional expenditures. A 27 percent adjustment applied to the Duffield et al. (2007) estimate of \$66.58 million results in an estimate of \$56.54 million in regional expenditures for 2016, presuming that the distribution of angler expenditures has remained constant.

**Table 3.6-16: Comparative Estimates of Sport Fishing Effort, Days**

SWHS Area	Annual Counts		Five-Year Averages	
	2005	2016	2001-2005	2012-2016
Nushagak	48,751	27,786	41,670	32,807
Kvichak	26,332	27,096	26,460	25,043
<b>Total</b>	<b>75,083</b>	<b>54,882</b>	<b>68,130</b>	<b>57,851</b>

Note:

SWHS = Statewide Harvest Survey

Source: ADF&G 2018d

### 3.6.3.3 Local Recreational Fishery Fiscal Contribution

Anglers can contribute to the fiscal resources of local governments through taxes such as sales (City of Dillingham) and lodging (LPB, City of Dillingham, Bristol Bay Borough). The LPB also raises revenue through a direct tax on guide services under which guides pay \$3 per angler day to the borough.

In fiscal year 2018, the LPB generated \$56,282 from 147 guides licensed to work in the borough and \$177,566 from 64 lodges in the borough. These amounts are equal to roughly 6.8 percent of all LPB tax revenue, and 4.6 percent of all fiscal year 2018 revenue (Table 3.6-17) (LPB 2018b).

The Bristol Bay Borough, which does not have a guide tax, does have transient occupancy (i.e., bed) tax revenues and real property tax revenues associated with lodges. It is very likely that these revenues are a small subset of the borough's \$4.9 million in annual property tax revenues, given that fish processing facilities likely make up the bulk of the borough's tax base (Table 3.6-17).

**Table 3.6-17: Lake and Peninsula Borough Recreational Fishing Revenues**

Fiscal Year	Annual Revenues	
	Guide Tax	Bed Tax
2015	39,716	262,831
2016	46,030	180,069
2017	30,948	108,895
2018	56,282	177, 566

Source: LPB 2018b

### 3.6.3.4 Saltwater Fishing in Cook Inlet

The EIS analysis area includes the saltwater fishing environment. ADF&G's SWHS estimates that, on average, anglers generate approximately 180,000 saltwater fishing days in Cook Inlet. A 2008 study by the ADF&G found that these anglers spend an average of approximately \$245 per angler day (both fresh and saltwater). The study estimated total direct saltwater expenditures at slightly more than \$99 million in 2007 (ADF&G 2018d).<sup>13</sup>

Fishing effort SWHS data break down into three large groups and one smaller group of anglers. These are:

- **Boat anglers inside of Kachemak Bay, as defined by a line running from Bluff Point to Seldovia**—Average efforts in this area, based on 2008 to 2017 data, equal just under 59,000 days per year, or 33.2 percent of the area total. Effort in this area is predominantly by non-charter anglers, with charter anglers accounting for 28 percent of days between 2008 and 2017.
- **Boat anglers fishing north of a line which runs from Bluff Point between Homer and Anchor Point and Chinitna Point in West Cook Inlet**—This area includes popular saltwater launch and fishing locations such as Anchor Point, Happy Valley, Deep Creek, and Ninilchik. Efforts in this area average 58,000 days between 2008 and 2017, or 32.3 percent of the area total. The ADF&G estimates that 47 percent of these days are by charter anglers.

<sup>13</sup> The study did not estimate an expenditure per day figure for saltwater angling in Cook Inlet.

- **Boat anglers south of the Bluff Point/Chinitna Point line and west of Gore Point on the outside of the Kenai Peninsula**—This area averages 44,600 days per year, or 25 percent of the area total; 58.6 percent of the angler days in this area are charter angler days. This area includes Kamishak Bay and much of the natural gas pipeline route through Cook Inlet.
- **Shore Anglers and Boat Day of Unspecified Location**—This category averaged 17,000 days per year between 2008 and 2017, or slightly less than 9.5 percent of total effort. More than 95 percent of this effort is shore-based, and nearly three-quarters of this category's effort occurred at the Homer Spit.

### 3.7 CULTURAL RESOURCES

This section focuses on the review of cultural resources, cultural values, and historic properties under the National Environmental Policy Act (NEPA) in the Environmental Impact Statement (EIS) analysis area (described below). Historic properties are a subset of cultural resources that have been determined eligible for listing in the National Register of Historic Places (National Register). This section combines the discussion of cultural resources with the discussion of historic properties that was presented in the Draft EIS (DEIS) as Section 3.8, Historic Properties. This was done in response to comments on the DEIS that historic properties are a type of cultural resource and should not be discussed in a separate section. Similarly, the discussion of potential environmental consequences in Section 4.8, Historic Properties, has been moved to and combined with Section 4.7, Cultural Resources.

The EIS analysis area for cultural resources consists of the following:

- At the mine site, the EIS analysis area is the project footprint for direct effects, and the area within 3 miles of the outer extent of the footprint for indirect effects.
- For other features outside the mine site, excluding the natural gas pipeline in Cook Inlet and Iliamna Lake, the EIS analysis area is the construction footprint for direct effects, and the area within 1 mile of the footprint for indirect effects. These features include the transportation corridors, ferry terminals, port facilities, mooring spreads, navigation aids, onshore portions of the natural gas pipeline, and the natural gas compressor station.
- For the natural gas pipeline in Cook Inlet and Iliamna Lake, the EIS analysis area is the construction footprint of the natural gas pipeline for direct effects, and the width of the anchor spread (the area where anchoring of the pipe laying barges may occur) for indirect effects. The width of the anchor spread would be variable; the maximum anchor spread width would be 4,101 feet on each side of the pipeline. The maximum total width of the anchor spread would be 8,225 feet.

This geographic area allows for the consideration of potential direct and indirect impacts on cultural resources and was informed by viewshed, night sky, noise, and dust analyses. This analysis also incorporates a regional perspective to take into account broader cultural values and the context of landscape uses. Refer to Section 4.11, Aesthetics; and Appendix K.11 for information on visual distance zones, project viewshed figures, and night-sky effects. Section 3.19, Noise; and Section 3.26, Vegetation, describe noise and dust zones of impact.

Although NEPA does not specifically define the term “cultural resources,” the regulations require that agencies consider the effects of their actions on all aspects of the “human environment,” which NEPA interprets to include the natural and physical environment and the relationship of people with that environment (40 Code of Federal Regulations [CFR] Part 1508.14). Humans relate to their environment through culture, requiring the consideration of effects on cultural aspects of the environment in NEPA analyses. NEPA defines effects as changes “on the quality of the human environment,” which includes alterations to the “aesthetic, historic, cultural, economic, [and] social” aspects of the environment. The lead federal agency should consider “the degree to which the action may adversely affect districts, sites, highways and other structures, or objects listed in or eligible for listing in the National Register or may cause loss or destruction of significant scientific, cultural, or historical resources.” In addition, 33 CFR Part 320.4(e) requires an evaluation of effects to historical, cultural, scenic, and recreational values during US Army Corps of Engineers (USACE) permit reviews.

This analysis considers such cultural resources as archaeological, historical, or architectural resources, and locations of traditional cultural or religious importance to specific social and/or cultural groups. This may include, but is not limited to, Traditional Cultural Properties (TCPs); Traditional Cultural Landscapes (TCLs); locations with indigenous place names; locations

connected with an event(s) in oral histories; sacred and/or ceremonial sites; resource gathering and subsistence areas; or other sites of cultural importance that contribute to the continued identity, spirituality, and lifeways of communities in or near the project area. TCPs and TCLs may include any one or more of these cultural elements.

### 3.7.1 Cultural Context

The Yup'ik and Dena'ina village cultures of the Nushagak and Kvichak River watersheds practice a subsistence lifestyle that developed over several thousand years of living in the area and depends primarily on salmon. This lifestyle has built strong, connected networks of extended families and a culture based on sharing, traditional knowledge, and respect for the environment.

The people in this region not only rely on highly nutritional salmon for a large proportion of their food resources, but salmon is also integral to the language, spirituality, and social relationships of the culture. The Yup'ik and Dena'ina populations of the Nushagak and Kvichak watersheds have an interdependent relationship ecologically, nutritionally, socially, spiritually, and possibly evolutionarily, with the local wild salmon populations. The Yup'ik and Dena'ina consider the land and waters to be their sacred homeland. They have traditionally considered the salmon as kin in the sacred web of life (Boraas and Knott 2013). For inland Dena'ina families, the arrival of the salmon is a time not only for harvesting a large part of the year's foodstuffs, but for celebration, sharing, and reunion with family and friends. Village residents, as well as those who have moved away, reconvene in the summer and sometimes the fall, not only to harvest and preserve salmon in quantities sufficient to sustain each family, but also to fulfill personal emotional, cultural, and social quotas (Deur et al. 2018).

"...Salmon more or less defines this area. It defines who we are. When you look at our art, you will see salmon.... It is who we are. When you listen to the stories and take a steam, even in the middle of winter, people talk about salmon. It is in our stories; it is in our art. It is who we are; it defines us."

"Salmon and fresh water has been the lifeline of the people here for thousands of years. If you look at the water, that is why fish and game has survived so well here, because we have such clean water."

"...from our ancestors, that is how we get all of our information to have fish. The way we put it; the way we store it for us to eat. That is where we learned it. It is passed on from generation to generation to have fresh fish."

Source: Boraas and Knott 2013

Salmon and other subsistence resources are interconnected culturally to the larger environment, centered around the availability of clean water. The spirituality of water is embedded in the language and in customs. The Dena'ina have 36 terms for streams, among those the primary word for 'water' is a special word reflecting special importance or sacredness. The spiritual connotation is reflected today in the Orthodox Great Blessing of the Water ceremony that occurs in some parts of the project area.

The cultural context provides a basis for understanding the broad and complex range of pre-contact traditions, ethnographic regions, land uses, historic-era themes, and contemporary cultural practices and land uses in the analysis area. In general, context conveys a continuation of cultures that are deeply tied to their environment, lands and waters, and fish and wildlife.

Boraas and Knott (2013) offer a detailed pre-contact cultural chronology based on known archaeological site data in the region (Table 3.7-1), and a discussion of modern cultural practices. Deur et al. (2018) describe the inland Dena'ina land and history, a project done in conjunction with the National Park Service (NPS).



**Table 3.7-1: Chronology of Dena'ina/Yup'ik Prehistory Identifying Ethnographic and Archaeological Cultures in the Iliamna and Cook Inlet Region**

	Nushagak River	Kvichak River	Iliamna Lake	Mulchatna River	Lake Clark
<b>AD 1800</b>	Historic Yup'ik	Historic Yup'ik	Historic Yup'ik/Den.	Historic Yup'ik/Den.	Hist. Dena'ina
	Pre-Contact Yup'ik	Pre-Contact Yup'ik	Pre-Contact Yup'ik & ■ Dena'ina ■	Sedentary Dena'ina	Sedentary ■ Dena'ina
<b>1000 BP (~A.D. 1000)</b>	■ Norton Tradition (interior)	Norton Tradition (interior) ■ ■	■ Norton Tradition (interior) ■		Norton Tradition (interior)
<b>2000 BP (~A.D. 0)</b>					
<b>3000 BP (~1000 B.C.)</b>		Arctic Small Tool Tradition ■ ■	Arctic Small Tool Tradition		Arctic Small Tool Tradition
<b>4000 BP (~2000 B.C.)</b>					
			Ocean Bay Tradition (interior) ■ ■ ■		Northern Archaic Tradition
<b>5000 BP (~3000 B.C.)</b>					
<b>6000 BP (~4000 B.C.)</b>		Paleoarctic Tradition	Paleoarctic Tradition		Paleoarctic Tradition
	Putu PaleoIndian/ Paleoarctic	↓ To 10,000 B.C.	↓ To 10,000 B.C.		↓ To 10,000 B.C.

Notes: ■ Salmon Cultures  
Source: Boraas and Knott 2013

■ Not Definitive or No Data

■ Select Radiocarbon Dates

← Probable

Archaeological artifacts analyzed from testing at known sites clearly demonstrate that the area has been continuously occupied as early as 10,000 years ago, with evidence of salmon fishing by Yup'ik or proto-Yup'ik people in the region for at least 4,000 years. A well-developed salmon-based culture emerged in the Norton tradition, dating from approximately 300 B.C. to A.D. 1000, as evidenced by the presence of sedentary villages and net-fishing artifacts. The contexts cover pre-contact archaeology traditions, ethnographic studies of the Dena'ina, Yup'ik, and Alutiiq peoples that occupy the region, and offer a chronology of the regional history from contact through the Russian, and then American, periods. Boraas and Knott (2013) also illustrate how traditions established in the prehistoric, proto-historic, and historic eras remain a central component of current lifeways and traditions of the subsistence-based cultural practices in the region.

Contemporary cultural practices manifest themselves in many ways. As noted in Deur et al. (2018), "Campsites, trails, burial sites, sacred sites, storied sites, named places, and many other kinds of culturally significant sites overlay the everyday subsistence geography. The distribution of culturally significant sites is especially dense along the riparian and lacustrine margins, as well as along major winter and summer trails, becoming more diffuse with distance from major pathways." The cultural practices incorporated into the cultural resources analysis include the following:

**Subsistence**—Subsistence harvest of resources, food processing, sharing harvested resources, and passing on cultural values and practices between generations is a foundation of cultural identity and values. Access to areas of traditional and contemporary subsistence harvest and maintaining sustainable subsistence resources is critical to maintaining culture. Salmon is one of the most important subsistence resources for communities in the region and depends on the waters and habitat that sustain them. Traditional and contemporary subsistence areas are reflected in the interview-identified cultural resources data collected by SRB&A in the category of harvest location/traditional use area. Information on contemporary subsistence use areas can be found in Section 3.9, Subsistence; and Appendix K3.9.

**Locations with Indigenous Place Names**—SRB&A 2019a states that indigenous place names "are the manifestation of a systematic approach to mapping a group's environment," "can provide information about natural and social environments as well as about human populations and their histories," "provide insights into a culture's worldview and its perceptions of features of the environments it inhabits," and "are a key component for identifying cultural resources in an area, as well as for establishing territorial range and means of travel through a traditional territory." Indigenous place names can help define the value or cultural significance of locations to local inhabitants and can help inform the identification of TCPs and TCLs. Locations with indigenous place names are shown in Appendix K3.9.

**Other Cultural Resource Types**—SRB&A documented several other cultural resource types through the interviews conducted in the seven project area villages during 2007, 2012, and 2013. These features include grave/burial sites; battlegrounds; past village locations; spiritually important places, places with legends or beings, and places to avoid (haunted or spooky); camps, cabins, and other historic structures; and travel routes, trails, portages, and traplines, among others.

**Cultural Camps**—In public meetings, comments submitted for scoping and on the DEIS, as well as Section 106 consultation, people referenced cultural camps that are used formally or informally to teach traditional practices to young people. Cultural camps have become an important venue for elders to pass knowledge, skills, and language to younger generations. Some of these camps include the Amakdedori area, Groundhog Mountain, Frying Pan Lake, Upper Talarik Creek, and the Koktuli River watershed.

**Native Allotments**—The Alaska Native Allotment Act of 1906 allowed the Department of Interior to convey up to 160 acres of land to individual Alaska Natives who could prove as heads of households “substantially continuous use and occupancy of that land for a period of five years.” Many Native Allotments were selected for their subsistence, cultural, and spiritual value. As land tenure has been formalized, these allotments remain as important campsites—by no means the only places used by tribal members, but as important footholds in traditional territory (Deur et al. 2018). The Bureau of Indian Affairs (BIA) records contain some information related to cultural resources associated with allotments.

**ANCSA Section 14(h)(1) Sites**—Under Section 14(h)(1) of the Alaska Native Claims Settlement Act (ANCSA), Alaska Native regional corporations were allowed to submit applications to obtain title to lands across the state containing Native historical places and cemetery sites. The program is administered by the BIA; program staff must verify the physical evidence and location of each site and gather sufficient information to fully evaluate the site’s significance in Alaska Native history. State and federal land status records were searched for ANCSA 14(h)(1) sites that have been conveyed or are still in the process of adjudication. In addition, information was solicited from ANCSA regional corporations regarding candidate sites.

**ANCSA Section 17(b) Easements**—Under Section 17(b) of ANCSA, the US reserves access easements to public land and water on lands that have been or will be conveyed to Alaska Native Village and Regional corporations. The Bureau of Land Management has management authority for the US for these easements unless that authority has been otherwise delegated. ANCSA 17(b) easements have specific allowable uses and cannot be reserved or retained for cultural purposes, but can provide access to culturally important places on publicly owned land. Section 3.2, Land Ownership, Management and Use, describes the ANCSA 17(b) easements in the project footprint.

### 3.7.2 National Historic Preservation Act Section 106

In addition to NEPA, Section 106 of the National Historic Preservation Act (NHPA) is relevant to identifying cultural resources and evaluating project impacts on cultural resources that are eligible for or listed in the National Register. The USACE complies with Section 106 and its implementing regulations, “Protection of Historic Properties” (36 CFR Part 800) and applies the Procedures for the Protection of Historic Properties (33 CFR Part 325, Appendix C), which were developed for Section 106 compliance for the USACE regulatory program. The term historic properties is formally defined in the statute itself (54 United States Code [USC] 300308) and in the Section 106 implementing regulations under 36 CFR Part 800.16(l) as “a property which has historical importance to any person or group.” This term includes the types of districts, sites, buildings, structures, or objects eligible for inclusion, but not necessarily listed, on the National Register” (33 CFR Part 325 [1][b]). Appendix C also defines “Designated Historic Properties” as “historic properties listed in the National Register or which have been determined eligible for listing in the National Register. A historic property that, in both the opinion of the State Historic Preservation Officer (SHPO) and the USACE district engineer, appears to meet the criteria for inclusion in the National Register will be treated as a designated historic property” (33 CFR Part 325 [1][a]). If the USACE authorizes the proposed actions under their authority, the permit decision must comply with Section 106, the Section 106 implementing regulations (36 CFR Part 800), and 33 CFR Part 325 Appendix C.

Under 36 CFR Part 800 and 33 CFR Part 325 Appendix C, the USACE must carry out all steps of the Section 106 review process in consultation with the Alaska SHPO and Advisory Council on Historic Preservation (ACHP), in addition to consulting parties that include Indian tribes, representatives of local governments, the permit applicant, and/or other individuals and organizations with a demonstrated interest in the project. For purposes of Section 106, the term “Indian tribes,” includes native villages, regional corporations, and/or village corporations as

defined in the ANCSA (36 CFR Part 800.16[m]). The scope of the historic property identification effort, determinations of National Register eligibility, analysis of effects, and steps to resolve adverse effects to historic properties must be informed by this consultation effort. See below for a discussion and definitions of the Area of Potential Effects (APE) and permit area, which help define the geographic extent of the identification effort. The USACE continues to consult with the SHPO, ACHP, and consulting parties to clarify the APE and permit area definitions for this undertaking.

The USACE is using a phased identification and evaluation of historic properties under 36 CFR Part 800.4(b)(2) through the execution of a Programmatic Agreement (PA) pursuant to 36 CFR Part 800.14(b). If a permit is issued, the PA will establish the process and actions necessary to meet the reasonable and good faith effort standard for identification or evaluation of historic properties, assessment of effects, treatment of potential adverse effects, and guide development of a Cultural Resources Management Plan. Appendix L includes a draft PA with an appendix that lists invited and participating federal and state agencies and consulting parties. The USACE intends to complete the PA prior to the Record of Decision for review of the permit application.

Meetings with federal and state agencies and consulting parties were initiated by the USACE on August 17, 2018; to date, the USACE has hosted consulting party meetings on October 30, 2018, December 11, 2018, January 15, 2019, February 5, 2019, May 22, 2019, July 11, 2019, September 6, 2019, November 1, 2019, and January 28, 2020 to review the Section 106 process and gather input on potential historic properties. Further consulting party meetings are planned throughout the Section 106 process and development of the PA. Meetings with individual tribes and consulting parties about potential historic properties took place with multiple groups in Dillingham, Aleknagik, Newhalen, and Iliamna in March/April of 2019, and again in January/February of 2020. Consultation has also occurred through numerous letters regarding determinations of eligibility, the APE, and identification efforts.

Other federal laws and Executive Orders (EOs) also require the consideration of effects or impacts on cultural resources, in coordination with NEPA and the NHPA. The USACE has incorporated consideration of these laws and EOs in their permit decision-making process. In addition, USACE has reviewed how these laws would apply to cultural resources found in the EIS analysis area, as follows:

- Antiquities Act of 1906 (16 USC 431-433)
- Historic Sites Act of 1935 (16 USC 461-467)
- Archaeology and Historic Preservation Act of 1974 (16 USC 469-469c)
- Archaeological Resources Protection Act of 1979 (16 USC 470aa-47011)
- American Indian Religious Freedom Act of 1978 (42 USC 1996)
- Religious Freedom Restoration Act (42 USC 21b)
- Abandoned Shipwreck Act of 1987 (43 USC 2101-2106)
- Native American Graves Protection and Repatriation Act of 1995 (20 USC 3001 et seq.)
- EO 13006, EO 13007, and EO 13175

The Alaska Historic Preservation Act of 1971 addresses the consideration of cultural resources on State lands or lands potentially affected by construction and requires review by the State. Appendix E describes all the federal laws and EOs applicable to the project.

### 3.7.2.1 Area of Potential Effects and Permit Area

As discussed above, for the purposes of fulfilling the requirements under Section 106, the USACE defined an APE and a permit area for the undertaking. Appendix C of 33 CFR Part 325 uses the term “permit area” to refer to the geographic extent of the USACE’s responsibility for considering effects on historic properties. Permit area is defined as “those areas comprising the waters of the US that will be directly affected by the project work or structures and uplands directly affected as a result of authorizing the work or structures” (33 CFR Part 325 [1][g]). The permit area for the project is defined as the direct footprint of all areas where fill or excavation would occur, where facilities or structures would be installed, and the areas used for construction of the project.

The APE is defined in 36 CFR Part 800.16(d) as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.” Modeled information on the potential extent of viewshed, noise, and dust effects was used to determine the size of the APE for portions of the undertaking that would not be submerged in navigable waters of the US. The portions of the APE that are outside of navigable waters of the US include the direct footprint of the project (i.e., the surface area that would be directly disturbed by construction activities); the area that is in the foreground and of strongest visual contrast; the distance where more than 10 weighed decibels above ambient noise would be expected; and areas that would be impacted by fugitive dust (see Appendix K4.11, Aesthetics, for viewshed figures, and Section 3.19, Noise, for information on ambient noise). For this project, the APE is the same as the EIS analysis area for both indirect and direct effects:

- At the mine site, the APE has been defined as the direct construction footprint and the area within 3 miles of the outer extent of the direct construction footprint of the mine site and its components.
- For all other linear and non-linear features outside the mine site, the APE is defined as the direct construction footprint and the area within 1 mile of the direct construction footprint of the linear features and non-linear features. The linear and non-linear features outside the mine site include the transportation corridor, the ferry terminals, the port facility, the two mooring spreads, navigation aids, the onshore portions of the natural gas pipeline, and the natural gas compressor station.
- For the natural gas pipeline in navigable waters of the US, which are Cook Inlet and Iliamna Lake, the APE is defined as the direct construction footprint of the natural gas pipeline, including the dredging, discharges of dredged material, and installation of structures, and the area where anchoring of the pipe laying barges may occur. The width of the anchor spread would be variable; the maximum anchor spread width would be 4,101 feet on each side of the pipeline. The maximum total width of the anchor spread would be 8,225 feet. The permit area and the APE for the natural gas pipeline in navigable waters of the US are the same area.

### 3.7.3 Cultural Resource Research and Field Studies

Prior to performing field surveys in the analysis area, SRB&A performed an archaeological file search, reviewed historical background information, and created a landform model to strategically inform archaeological field studies. The archaeological file search revealed that only two previous archaeological field surveys had been conducted in the Pebble Limited Partnership (PLP) mine claim lease area. SRB&A (2011a) detailed the results of the nearest cultural resources surveys in each direction from the claim boundary.



SRB&A's annual survey work for the project commenced in 2004 and involved yearly surveys until 2012. Initial fieldwork focused on the mine claim lease area and was limited to specific locations of expected ground disturbance in PLP's claim boundary. Additional survey work occurred in adjoining claim boundaries south of the mine site, and a brief survey in 2006 along a section of the Newhalen River for a bridge crossing. In 2005, SRB&A's first surveys in the area that became the Expanded Cook Inlet Baseline Study Area (ECIBSA) focused on the then-proposed port site locations in the Knoll Head area (SRB&A 2011a). SRB&A returned in 2007 to survey two proposed meteorological station locations near Iliamna Bay; and again in 2012, to survey areas near Y Valley and Sunday Creek.

Literature reviews provided in SRB&A 2011a and 2015a include references and a narrative of previous studies throughout the general region. SRB&A's annual reports primarily discuss archaeological compliance surveys completed during preliminary geotechnical and mineral exploration work, but also offer a summary of historic and ethnographic sources, including historic documents, ethnographic and linguistic studies, and interview-identified cultural resources. In addition, SRB&A 2011a contains information on the 2007 interview-identified cultural resources throughout the region, including both Bristol Bay and Cook Inlet drainages. SRB&A also completed reports providing the results of the 2013 interviews (PLP 2019a) that include tables and figures summarizing the results of these interview-identified cultural features. The geographic extent of the interview-identified cultural features covers each alternative and provides data on the types of cultural resources features identified in the EIS analysis area.

Ethnographic works about the Dena'ina, Yup'ik, and Alutiiq (see SRB&A 2011a for a list of select ethnographic and linguistic studies reviewed) contribute to understanding social structures, subsistence food storage practices, land use traditions, place names, and many other data with bearing on defining how humans have interacted with natural resources in the affected environment. For example, Boraas and Knott (2013) note that the Yup'ik and Dena'ina consider the land and waters to be their sacred homeland. Salmon, and the waters and habitat that support them, are crucial elements of this homeland, and therefore may be considered as part of the cultural resource landscape. Interrelated to salmon are the wild foods and harvest areas that support subsistence (e.g., upland subsistence areas, fishing and hunting camps) (Boraas and Knott 2013). Boraas and Knott (2013) also detail Yup'ik and Dena'ina spirituality and how this spirituality is found and reflected in the natural environment. Cultural relationships with wild animals and fish are of primary importance, while some discrete places have taken on special importance as sacred sites and landscapes, including known travel routes and traditional use areas. Boraas and Knott (2013) mention one travel route as being culturally and spiritually significant: the Dena'ina trail, which is partially in the EIS analysis area for Alternative 2—North Road and Ferry with Downstream Dams and Alternative 3—North Road Only, connecting Old Iliamna and Kamishak Bay on Cook Inlet (and locations along the route). The above reports, in conjunction with consultation, contribute more detail to the characterization of the affected environment beyond archaeological and historic-era sites. These reports indicate that the analysis area is in a region traditionally used for natural resource procurement, and that the analysis area contains landscape features, place names, material sources, and harvest areas that have a given cultural value.

Consistent with ACHP guidance (ACHP 2018), these field studies were lead, in part, by an SRB&A-created model that helped to establish areas of high or moderate to high potential for archaeological sites. The model used wetlands and slope data to determine areas where an archaeological site may or may not remain due to natural environmental changes and existing landform conditions. The model identified areas where additional archaeological surveys may be appropriate and informs the level of effort for cultural resource identification work. A deductive

survey model, informed by ongoing identification work, is being developed as part of the Section 106 process, which will help guide future field efforts as the project progresses.

The BIA manages restricted property (Native Allotments) throughout the state of Alaska. BIA records regarding Native Allotments potentially contain information related to cultural resources associated with the property. SRB&A conducted a review of the 123 BIA records of Native Allotments in and near the EIS analysis area from PLP (PLP 2019-RFI 114). Results of the Native Allotments that would be in the project footprint are described below (SRB&A 2019a). PLP retained ASRC Energy Services to complete a desktop study of the Alternative 1 transportation corridor (ASRC 2017). AECOM also conducted a similar study for this EIS. This desktop study was limited to a review of the Alaska Heritage Resources Survey (AHRs)<sup>1</sup> database and did not investigate other types of cultural resources beyond sites and historic-era buildings already identified in the AHRs. The results of the desktop AHRs studies are described below.

A desktop search was conducted of state and federal land status records for ANCSA 14(h)(1) sites for historical places and cemetery sites. No patented sites or sites currently under adjudication were found in the EIS analysis area. The nearest site found was approximately 30 miles away and outside of the EIS analysis area. Information was also collected from Bristol Bay Native Corporation regarding candidate sites. The nearest candidate site would be approximately 12 miles from the EIS analysis area; the rest would be more than 20 miles from the EIS analysis area. AECOM and SRB&A also reviewed two documents associated with collecting information on candidate sites for ANCSA 14(h)(1) applications; it was determined that resource information in the documents had been already been obtained through other sources (PLP 2019-RFI 156).

### 3.7.3.1 Cultural Resource Identification Efforts

Information in this section is primarily based on a review of data from the AHRs, BIA Native Allotment data, and the series of cultural resources survey reports prepared for the PLP between 2004 and 2013 by SRB&A, particularly the summary reports included in the Environmental (and Supplemental) Baseline Documents (EBDs) for cultural resources covering the Bristol Bay and Cook Inlet Regions (SRB&A 2011a, 2015a, b). Additional survey work has been performed during the 2018 and 2019 field seasons, and sources of cultural resource and ethnographic information were reviewed that include indigenous place name data, locations of interview-identified cultural resources, and mapping (HDR 2019e; SRB&A 2019b). Other reports relating to the region's cultural context have informed this document, including Boraas and Knott (2013), data sets from subsistence harvest areas (SRB&A 2011b), and reports prepared for NPS lands in the same cultural region (Deur et al. 2018).

- SRB&A's initial field work scope was focused on investigating lands within the "claim block boundary," although several surveys have been conducted outside the boundary. The claim block boundary was defined as mining claims owned or leased by PLP and Kaskanak, Inc., and represents an area larger than the current mine site footprint. The claim block analysis area covered lands from Iliamna Lake in the south, to the Nikabuna Lakes in the north, and west from the Newhalen River toward the Mulchatna River. Background and place names research covered the entirety of this area, whereas field work was targeted to areas where PLP had

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<sup>1</sup>The AHRs is a database of identified cultural resource features in Alaska and is maintained by the Office of Historic and Archaeology. Site significance is not a consideration when assigning AHRs numbers. It is intended to be an inclusive data set, and not all sites have been field-verified, nor are all sites in Alaska listed.

proposed ground-disturbing activities in support of geotechnical and mineral exploration activities.

- Field surveys have not covered the entire mine site or transportation corridors. To date, approximately 22 percent of the mine site footprint has been surveyed, and only portions of the Alternative 1a transportation corridor where other structures would be (ferry terminals, bridge crossings, and Amakdedori port) have been surveyed.
- In July 2018, HDR completed an archaeological survey of the Amakdedori port site on behalf of PLP. One new archaeological site was identified (ILI-00295) and was determined not eligible by the USACE on July 25, 2019, with the concurrence of the Alaska SHPO on July 26, 2019. HDR also updated the geographic location information of the Amakdedori Village site (AHRs No. ILI-00044). The village site is not in the port site footprint but is directly south of the port site along Amakdedori Creek (HDR 2019e) and would be in the EIS analysis area. Although human remains had been reported to occur in the Amakdedori area, no testing or investigation of human remains occurred.
- Through the summer of 2019, SRB&A completed archaeological surveys of the north, south, and Eagle Bay ferry terminals; the Gibraltar and Newhalen river crossings; and a number of potential drill locations at the mine site. SRB&A identified sites at the Gibraltar River crossing (ILI-00299 and ILI-00300), the Newhalen North River Crossing Variant (ILI-00302, ILI-00303, ILI-00304, ILI-00305 and ILI-00306), the Eagle Bay ferry terminal (ILI-00301), and at a temporary Newhalen River crossing (SRBA2-Site 3 and SRBA2-Site 4) (PLP 2019-RFI 117a). These are discussed further below.
- SRB&A collected and consolidated place name data and developed a place name database. The place name data covered only the mine claim lease area and the ECIBSA (which covers Alternative 2 and Alternative 3, but not areas south of Lake Iliamna). Public input and additional research may yield the identification of additional place names and contribute to better understanding the cultural significance of these places. A complete list of place names in the EIS analysis area can be found in Appendix K3.7.
- The ECIBSA spans a large section of western lower Cook Inlet and extends from the Kamishak Bay area in the south to the Chinitna Bay area in the north. In addition to place name research, this area was also subject to literature reviews in 2011 and 2012; limited field surveys occurred at Knoll Head near Iniskin Bay, Williamsport at the head of Iliamna Bay, Y Valley, and Sunday Creek (SRB&A 2014). None of the areas surveyed are in the EIS analysis area for any of the alternatives or variants.
- SRB&A completed interviews in Igiugig, Iliamna, Kokhanok, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, noting the location of approximately 220 interview-identified cultural resources in the EIS analysis area based on informant knowledge; however, limited field work has been completed to determine if there are physical manifestations of these interview-identified sites (SRB&A 2011a; 2019b; PLP 2018-RFI 097b; PLP 2019-RFI 117a). This analysis also acknowledges that not all cultural resources will have physical evidence. SRB&A conducted interviews in 2007 and again in 2013. The interview-identified cultural resources include historic structures or built features, travel routes (including traplines, trails, and portages), definable areas (e.g., burial grounds, battle sites, legend landscapes, and other areas of religious or traditional significance), and

names or storied locations (place names). While verification of these cultural resources is ongoing, the geographical span of interview-identified cultural resources covers the entire project area, including all alternatives and variants. A complete list of interview-identified cultural resources in the EIS analysis area can be found in Appendix K3.7.

- Interviews identified routes and trails, but field verification was limited in these early investigations to determine whether the reported routes and trails intersected the areas of ground disturbance for the geotechnical and mineral exploration activities in the mine claim lease area.
- No archaeological/pedestrian surveys have been completed for the transportation corridor for Alternative 2 and Alternative 3, including the pipeline route and the Diamond Point port components.
- Background research of the AHRS sites in the project footprint suggests that one AHRS location has been evaluated for inclusion in the National Register. This is the Williamsport-Pile Bay Road (AHRS No. ILI-00132) in the Alternative 2 and Alternative 3 transportation corridor. Of the remaining known AHRS locations, one (ILI-00251) was determined by SHPO in 2019 to be not eligible for inclusion. The transportation and pipeline corridors for each alternative and Diamond Point have not been systematically researched or surveyed for historic properties. These studies would be conducted in accordance with the Section 106 process, and the results will be incorporated into the ongoing analysis if one of those alternatives were selected. Results reported in this EIS are based on currently available information and will be revised as appropriate to incorporate additional findings. The need for and scope of additional research and survey work for the identification and evaluation of historic properties will be defined in the PA.
- Meetings with consulting parties were initiated by the USACE via letters distributed to potentially involved entities on August 17, 2018. While under way, the EIS and Section 106 processes have produced some additional information regarding the identification and evaluation of cultural resources and historic properties in the analysis area. Guidance for ongoing identification and evaluation of historic properties will be incorporated into the PA if a permit is issued.

For the purposes of this EIS, the analysis for historic properties (including the tables and information presented in Appendix K3.7, Cultural Resources), is based on known cultural resources listed in the AHRS database that are identified as being in the EIS analysis area. This reliance on AHRS data for defining potential historic properties will be addressed through ongoing research and consultation as part of the Section 106 process. Methods and approaches to completing determinations of eligibility will be provided in the PA.

The mine site, transportation corridor, and ECIBSA areas do contain interview-identified routes and trails, subsistence use areas, place names, and other cultural resources features that may be determined to be historic properties in the Section 106 review. It is expected that additional information gleaned through the Section 106 consultation process will further refine the extent and nature of other historic properties, and the consideration of effects on historic properties.

Currently, there would be no known National Register eligible sites in the Alternative 1a or the Alternative 1 project footprints, and one known historic property in the footprint of Alternative 2 and Alternative 3. There are numerous cultural resource features spread across the landscape that represent a wide range of site types. Many of these may warrant additional analysis as potential historic properties. Further identification efforts under Section 106 may also involve the

analysis of cultural landscapes, traditional cultural properties, and/or archaeological or historic districts in the permit area.

The USACE has considered additional cultural resources information collected throughout the Section 106 process, with public comments concerning cultural resources collected during public scoping and the DEIS meetings, government-to-government consultation between the USACE and tribes, consulting party meetings, consultation performed during the development of the Section 106 PA, and additional field surveys supplied by PLP. During consultation under Section 106, three traditional cultural landscapes were identified by consulting parties as potential historic properties: the Nondalton Tribal Council has identified the Qiyhi Qelahi Cultural Landscape (Cultural Alaska 2019) and the Newhalen River Traditional Cultural Landscape, and the United Tribes of Bristol Bay has identified the Nushagak River Traditional Cultural Landscape (Boraas 2019).

Identification efforts will continue following the Final EIS (FEIS), if the project is authorized. If the project is permitted, the Section 106 process would be concluded by the finalization of a PA signed by the USACE, ACHP, and the Alaska SHPO. Among other provisions, it is anticipated that the PA will require that additional identification efforts be completed by PLP to meet the Reasonable and Good Faith Standard (36 CFR Part 800.4[b][1]) (ACHP 2018). The identification methods, areas to be subject to field investigations, and associated consultation procedures for evaluating resources, assessing effects and resolving adverse effects will be outlined in the PA. A draft of the PA is included in Appendix L of this EIS.

### **3.7.4 Alternative 1a**

#### **3.7.4.1 Mine Site**

##### **Known AHRs Locations**

After completing additional field investigations and following project alignment modifications, it was determined that there would be 12 AHRs sites in the EIS analysis area for the mine site, including two that would be in the footprint. These sites include small prehistoric sites composed of lithic debitage; sites evidenced by cobble and/or rock features (e.g., tent or fire rings or stacks); and camping sites that include food wrappers, rifle cartridges, water/oil containers, antler, and bone, suggesting continued use as hunting locales. AHRs site number ILI-00251 has been determined not eligible for inclusion in the National Register by the USACE on October 30, 2019. The Alaska SHPO concurred with this determination on November 19, 2019. A comprehensive list of the AHRs sites in the EIS analysis area for the mine site are listed in Appendix K3.7.

Three AHRs sites in the mine site EIS analysis area were revisited in 2019: ILI-00196, ILI-00218, and ILI-00254. No new cultural resources were identified during those surveys (PLP 2019-RFI 117a). Following the application of the landscape model, approximately 2,083 acres of the mine site footprint would not need to be surveyed for cultural resources due to the minimal potential for resources to be present. To date, SRB&A has surveyed approximately 1,797 acres of the remaining 6,047 acres in the mine site footprint (approximately 30 percent). Roughly 4,250 acres (approximately 70 percent) of the areas with high or medium potential for cultural resources in the mine footprint have not been surveyed for cultural resources. Field investigations performed to date suggest a low density of cultural resources in the mine site footprint (amounting to approximately one site per 1,041.5 acres).



## **Place Names**

SRB&A reviewed place name data sources and compiled a place name database and corresponding map of known place names for the Bristol Bay and Cook Inlet areas based on these sources and SRB&A interviews: Evanoff 2010; Krieg et al. 2005; Kari, Kari, and Balluta 1986; and Kari and Kari 1982. Table 22-3 and Figure 22-20 through Figure 22-22 of the SRB&A 2011a report show the location of documented place names in the Bristol Bay drainages, PLP's mine study area, and the Cook Inlet drainages, which are also all listed in Appendix 22A of that report. Table 22-8 in the supplemental EBD (SRB&A 2015a) conveys related information about Dena'ina and Yup'ik place names in the PLP mine study area, and Figure 22-7 in that report shows Alaska Native place names in the vicinity of the claim block lease boundaries.

The place name database reveals five place names in the EIS analysis area for the mine site; of the five, only the place name for Frying Pan Lake (*Vak'ent'esi Vena*) would be in the project footprint, although the others, including the place names for Groundhog Mountain (*Qiyhi Qelahi*), and the Upper Talarik Creek (*Tuni Vetnu Tl'ughu*) would be in the EIS analysis area. Descriptions of place names in the EIS analysis area are provided in Appendix K3.7. Further analysis of these place name areas and consultation is in progress through the Section 106 process to investigate the location and significance of these place names.

## **Interview-Identified Cultural Resources**

The cultural resource features identified by SRB&A based on informant interviews are presented in PLP 2018-RFI 097b; PLP 2019-RFI 113a; PLP 2020-RFI 113b, and SRB&A 2019a; they are summarized in Appendix K3.7.

Interview-identified cultural resource features indicate a variety of cultural resources across the mine site EIS analysis area (and other project components). These features include camps, harvest locations, spiritually important places, routes, trails, and traplines. Frying Pan Lake is mentioned in the Nondalton interviews as traditionally used for fishing and hunting, and people used to camp there, although use has decreased since mining exploration began. Subsistence maps demonstrate overlap with the mine site area and harvest areas for resources such as, but not limited to, berries, upland game birds, waterfowl, caribou, and moose, supporting communities such as Newhalen, Nondalton, Iliamna, and Kokhanok. Additional information on contemporary subsistence harvests is presented in Section 3.9, Subsistence, and in Appendix K3.9.

In the mine site analysis area, SRB&A interviews resulted in the identification of 19 cultural resource features. Two of these features are classified as trails/routes, along with two traplines, five harvest locations/traditional use areas, 10 camps, and one spiritually important place. One feature was classified as both a camp and a harvest location/traditional use area. Of these features, six would be the project footprint, and the remainder intersect the 3-mile buffer that constitutes the mine site EIS analysis area.

No TCLs have been determined eligible for the National Register in the mine site area. However, informants have submitted Groundhog Mountain (*Qiyhi Qelahi* Cultural Landscape), the Nushagak River Traditional Landscape, and the Newhalen River Traditional Cultural Landscape as potential TCLs for consideration under Section 106 of the NHPA, based on their significance in local identity and subsistence (PLP 2018-RFI 097b; Cultural Alaska 2019; Boraas 2019). Various cultural activities associated with Groundhog Mountain, identified as important to local identity and subsistence, are documented in the individual interviews conducted by SRB&A in Nondalton. It has been historically used by village residents as a spring camp and a place for teaching young people traditional practices. It contains many trails and was used to keep reindeer in the past (SRB&A 2018a). Groundhog Mountain was also identified as a potential TCL in SRB&A's 2013 interviews.

SRB&A has not found any physical evidence of interview-identified routes and trails, but has only investigated areas where trails intersected areas where ground-disturbing actions were proposed. Evanoff (2010) also documents access routes and seasonal travel locations for subsistence use that inform an examination of routes and trails and their cultural significance. PLP 2018-RFI 088 shows several travel routes through the mine site area (see Section 3.12, Transportation and Navigation, for more information on travel routes).

### **Historic Properties**

No historic properties have been identified to date in the EIS analysis area for the mine site. The USACE is currently in consultation to verify the boundaries, characteristics, integrity, significance, and eligibility of the Qiyhi Qelahi Cultural Landscape and Nushagak River Traditional Landscape for the National Register. Additional consultation and investigations performed before and during implementation of the PA may identify historic properties in the mine site EIS analysis area.

#### **3.7.4.2 Transportation Corridor**

The Alternative 1a transportation corridor includes the port access road from Amakdedori port to the south ferry terminal near Kokhanok, and ferries across Iliamna Lake to a ferry terminal at Eagle Bay, with the corridor continuing along the mine access road from the lake to the mine site. The mine study area of analysis in the EBDs encompasses a portion of the transportation corridor north of Iliamna Lake as it enters into the mine site, and the discussion of cultural resources above for the mine site is applicable to this terminal section of the transportation corridor. This area remains in the homeland of the Dena'ina and Yup'ik, and the discussion above in the mine site section regarding the status of knowledge about cultural resources is applicable here. Additional work may be necessary to identify other undiscovered cultural resources along the mine and port access roads, because the field efforts by SRB&A focused primarily on the mine site, ferry terminals, and river crossings. However, the background research, including ethnographic and traditional knowledge reports (Evanoff 2010; Boraas and Knott 2013), place name data, and interview-identified cultural features (SRB&A 2011a, 2015a, b) cover the region that the mine access road crosses.

### **Known AHRs Locations**

Seventeen AHRs sites are known in the EIS analysis area for the Alternative 1a transportation corridor: 11 along the mine access road, and six along the port access road. These include three prehistoric/historic village sites: Old Kakhonak Village (ILI-00008), Amakdedori Village (ILI-00044), and Gibraltar Lake Village (ILI-00056). AHRs sites in the EIS analysis area for the transportation corridor are described in Appendix K3.7. One of the listed AHRs sites (ILI-00299) would be in the footprint of the port access road. In addition, the Kokhanok spur road would lead to AHRs sites, such as ILI-00008, Old Kakhonak, and historic buildings in Kokhanok (ILI-00025 Saint Peter and Paul Chapel). These sites also include a cluster of sites in and around Kokhanok Village near the south ferry terminal, and along the southern shore of Iliamna Lake. The other sites are more isolated.

Archaeological surveys were conducted in 2019 at the south and Eagle Bay ferry terminals, as well as the Newhalen and Gibraltar river crossings. No new cultural resources were found at the south ferry terminal. Surveys of the Eagle Bay ferry terminal resulted in the identification of site ILI-00301. Surveys of the Newhalen River crossing resulted in the identification of sites ILI-00302, ILI-00303, ILI-00304, ILI-00305, and ILI-00306; all of these sites would be in the EIS analysis area, but not in the project footprint. Surveys of the Gibraltar River crossing resulted in the identification of sites ILI-00299 and ILI-0300 (PLP 2019-RFI 117a). Further work is required to identify potential cultural resources sites in the transportation corridor, including more detailed

literature review, field survey, and consultation, which may result in the identification of additional archaeology sites, historic buildings, and cultural resources. This work may be addressed in the Section 106 PA, the PLP Cultural Resources Management Plan, and conditions of approval of state and federal permits associated with the project.

### **Place Names**

The area south of Iliamna Lake, where the port access road would be, has not been subject to specific place names research or more detailed ethnographic or traditional ecological knowledge investigations by PLP. This area is mostly outside of the study areas used to guide previous PLP surveys. Public input and data from other sources, such as that completed by Kugo (2017) and other studies cited above in the mine site section, contribute to understanding the location of native place names in this project component. The scope of investigation for place names is limited to north of Iliamna Lake, where the mine access road would be. Additional place name studies may be conducted as part of the Section 106 process.

The place name database lists 10 locations along the mine access road; four of these would intersect the project footprint. One place name for Amakdedori (*Amaktatuli*) was submitted in comments on the Draft EIS (IVC 2019) and would be in the project footprint. One additional place name for Iliamna Lake (*Nila Vena/Nanvarpak*) would be in the footprint of the ferry route and natural gas pipeline. Interview-identified cultural features and comments submitted on the Draft EIS include two place names that would intersect the port access road. Place names are listed and described in Appendix K3.7.

### **Interview-Identified Cultural Resources**

This area remains in the homeland of the Dena'ina and Yup'ik, and the discussion above in the mine site section regarding the status of knowledge about cultural resources is applicable here. There are 101 interview-identified cultural resource features in the transportation corridor analysis area (PLP 2019-RFI 113a), which are listed in Appendix K3.7. For the mine access road (43 features), these include: 16 trail/routes, 5 grave/burials, 8 camps, 6 harvest location/traditional use areas, 3 cabins, 2 traplines, 2 places with legends or beings, 2 places to avoid/spooky places, 1 spiritually important place, 2 battlegrounds, 1 historic object, and 3 other historic structures. Many features have more than one classification, and 22 out of 43 would be in the project footprint.

Along the port access road, interview-identified cultural resource features include: 1 battleground, 28 grave/burials, 6 cabins, 8 camps, 1 place name (see above), 3 material source sites, 1 place with legends or beings, 10 trails/routes, 5 traplines, 11 villages, 1 spiritually important place, 6 archaeological sites, 2 places to avoid/spooky places, and 5 other historic structures. Many features have more than one classification. Of the 58 cultural features in the port access road EIS analysis area, 16 would be in the project footprint (PLP 2019-RFI 113a).

The south and Eagle Bay ferry terminals overlap with the transportation corridor. At the south ferry terminal, there would be one interview-identified cultural resource; a trail/route that would not be in the project footprint. The Eagle Bay ferry terminal would have 9 interview-identified cultural resources: 1 historic object, 1 harvest location/traditional use area, 1 cabin, 2 places to avoid/spooky places, 3 trail/routes, 1 grave/burial, 1 place with legends or beings, and 1 other historic structure. Some features have more than one classification, and 1 out of 9 would be in the project footprint (PLP 2019-RFI 113a).

Traditional land use is further evidenced by current subsistence use throughout the area. Community subsistence data show harvest areas for plants, moose, caribou, brown bear, and other resources supporting the nearby villages, such as Iliamna, Kokhanok, Igiugig, and Newhalen. This land use, coupled with the location of known AHRs sites in the vicinity, such as

the Gibraltar Lake Village and Amakdedori Village (see below), and the interview-identified data, demonstrate a high likelihood of cultural resources throughout the transportation corridor, including the possibility of places of traditional religious and cultural significance, cultural landscapes, and TCLs. No TCLs have been determined eligible for the National Register in the transportation corridor. However, informants noted that a fish camp west of Kokhanok is a potential TCP (SRBA 2019a). Informants have also identified the Newhalen River as TCL for use in fish harvest.

### **Historic Properties**

No historic properties have been identified in the EIS analysis area for the transportation corridor. Additional consultation and investigations performed before and during implementation of the PA may identify historic properties in the transportation corridor EIS analysis area.

#### **3.7.4.3 Amakdedori Port**

The Amakdedori port is not in the ECIBSA used by SRB&A to frame the background research and characterize cultural resources in broader areas of interest for the initial project. The result is that a limited amount of data are available for characterizing the affected environment at Amakdedori port.

### **Known AHRs Locations**

There are only three known AHRs sites reported in EIS analysis area for Amakdedori port (see Appendix K3.7). Reger (1980) reported Amakdedori Village (ILI-00044) as dating to the turn of the twentieth century and composed of several house and cache pits at the mouth of Amakdedori Creek. Another site (ILI-00291) is the reported location of the AGRAM shipwreck dating to 1923. In addition to these known sites, PLP retained HDR in the summer of 2018 to complete a cultural resource survey of the port location. The report describes an additional prehistoric site (ILI-00295), a lithic surface scatter near the northern end of the port facilities where the transportation corridor enters the port. The report also corrected GPS data for ILI-00044 to farther north, within 2,000 feet of the footprint of the port facility (but not inside of the project footprint). The survey did not observe indications of grave sites during the investigation, and the report recommends that PLP continue to consult with local communities to determine the location of graves to ensure adequate site avoidance or minimization measures are implemented prior to ground-disturbing activities (HDR 2019e). Due to its proximity to the construction footprint of Amakdedori port, ILI-00292 was evaluated and determined to be not eligible for the National Register by the USACE on July 5, 2019. The Alaska SHPO concurred with this decision on July 26, 2019.

### **Place Names**

There are no listed indigenous place names in the Amakdedori port site in the place name database, although one place name for Amakdedori (*Amaktatuli*) was submitted in comments on the Draft EIS (IVC 2019) and would be in the project footprint. Additional research and consultation performed before and during the implementation of the PA may include the identification of indigenous place names in this area and contribute to understanding the cultural significance of these locations.

### **Interview-Identified Cultural Resources**

Comments received during the EIS scoping period and DEIS public comment period, as well as Section 106 consultation, suggest that there are known grave locations at Amakdedori, although

specific locational information has not yet been obtained. Nine interview-identified sites were recorded that would be in the port EIS analysis area, including: 2 traplines, 4 cabins, 3 trail/routes, 2 archaeological sites, 2 villages, and 1 grave/burial (PLP 2019-RFI 113a). Some features have more than one classification, and one would be in the project footprint. Residents of the Lake and Peninsula Borough also refer to “old cabins, trails, and [the] village” as having personal meaning to many who reside in the borough. Amakdedori is also the location of current cultural learning camps and school field trips for students in Kokhanok. This feedback suggests that there are more cultural resources near Amakdedori port and indicates that further consultation and field studies could result in the identification of more cultural resources in this area. Interview-identified sites also mention a village with graves/burials and house pits at Amakdedori, and one trail from the head of Sid Larson Bay to the Cook Inlet coast that crosses near Amakdedori (PLP 2018-RFI 097b).

The presence of graves, trails, cabins, and known prehistoric and historic resources indicates the potential for a broad range of resources to be at Amakdedori port. Coastal modeling (SRB&A 2015b) demarks the coastline near Amakdedori as favorable beach lands for the harvest of coastal subsistence resources, which suggests a generally higher potential for identifying cultural resources in the area (SRB&A 2015b). Additional research could result in the identification of more cultural resources, including routes and trails, and other land use areas significant to the local villages and others.

### **Historic Properties**

No historic properties have been identified in the EIS analysis area for Amakdedori port. Additional consultation and investigations performed before and during the implementation of the PA may identify historic properties in the Amakdedori port EIS analysis area.

#### **3.7.4.4 Natural Gas Pipeline Corridor**

The affected environment description of Alternative 1a applies to much of the land-based portions of the natural gas pipeline corridor, the exception being the segment from the north shore of Iliamna Lake to the mine access road, and the segments submerged in Iliamna Lake and Cook Inlet. Limited work has been done regarding marine archaeology or historic maritime archaeology for the Iliamna Lake crossing; therefore, little information is currently available regarding the affected environment for this portion of the natural gas pipeline route. Additional research and interdisciplinary research would characterize the affected cultural environment as it relates to coastal (Iliamna Lake and Cook Inlet) resource gathering and any associated traditional use areas or other marine cultural resources.

All of the AHRS locations listed for the transportation corridor port and access roads are also in the natural gas pipeline corridor for Alternative 1a.

Aside from those identified under the transportation corridor, the AHRS lists one offshore location near the Amakdedori port: the site of the AGRAM Shipwreck dating to 1923 (ILI-00291). This shipwreck site is in the EIS analysis area but would not be in the footprint of the lightering facilities. More recently, an archaeological assessment was conducted for the pipeline route across Cook Inlet in 2019, using geophysical systems like side-scan sonar data. The pipeline route was modified to avoid findings (PLP 2019-RFI 025b). There are no known AHRS locations or other cultural resources in the anchor spread of pipeline construction. There were no cultural resources identified in the EIS analysis area offshore.

There are nine AHRS sites in the Alternative 1a natural gas pipeline analysis area from the shore of Iliamna Lake to the mine access road. None of the nine AHRS sites would be in the facility footprint.



The AHRs lists three locations on the Kenai Peninsula side of Cook Inlet in the analysis area of the compressor station. These include a prehistoric midden site (SEL-00164: Clabo Midden Site), a prehistoric lithic site (SEL-00363: Whiskey Gulch Site 1), and the Sterling Highway (SEL-00379). AHRs sites in the EIS analysis area for the natural gas pipeline are listed in Appendix K3.7. There would be a total of 21 AHRs locations in the Alternative 1a natural gas pipeline corridor.

The natural gas pipeline would have the same place names for the mine site, port and access roads, south and Eagle Bay ferry terminals, and Amakdedori port.

The natural gas pipeline would share 12 interview-identified cultural resources with the port access road, 19 with the mine access road, and include an additional 7 graves/burials, 3 trails/routes, 1 material source, 1 trapline, 1 place to avoid/spooky place, 4 camps, 2 battlegrounds, 4 harvest locations/traditional use areas, 2 places with legends/beings, 2 archaeological sites, 5 villages, 2 cabins, 2 spiritually important places, and 2 classified as other historic structures. Some features have more than one classification, and 3 would be in the project footprint.

The EIS for Lease Sale 244 lists 100 whole or partial lease sale blocks that are areas of potential pre-contact resources in the lease sale area (which includes much of the upper Cook Inlet more than 3 miles offshore) (BOEM 2016a). This shows that there is the potential for pre-contact resources in the pipeline corridor. Historic properties have not been identified in the EIS analysis area for the natural gas pipeline corridor. Additional consultation and investigations performed before and during implementation of the Programmatic Agreement may identify historic properties in the natural gas pipeline EIS analysis area, both off- and onshore.

### 3.7.5 Alternative 1

Alternative 1 shares the same 12 AHRs sites as the Alternative 1a mine site, 6 sites with port access road, and 3 sites with the Amakdedori port. For the mine access road, there would be 4 AHRs sites; none would be in the project footprint. All AHRs sites are listed in Appendix K3.7. Archaeological surveys were conducted in 2019 at the north ferry terminal; no new cultural resources were found.

As with Alternative 1a, there are no place names in the database south of Iliamna Lake, where the port access road would be, although one place name for Amakdedori (*Amaktatuli*) was submitted in comments on the Draft EIS (IVC 2019), and would be in the project footprint. There is one place name for Iliamna Lake (*Nila Vena/Nanvarpak*) that would be intersected by the ferry route and the natural gas pipeline. The mine access road would intersect seven place names in the EIS analysis area, two of which would intersect the project footprint.

Alternative 1 would share the same interview-identified cultural resources as the port access road, south ferry terminal, and Amakdedori port as Alternative 1a. There would be 37 interview-identified cultural resource features in the mine access road: 1 battleground, 3 grave/burials, 7 cabins, 3 camps, 1 place name (see above), 5 harvest location/traditional use areas, 1 material source site, 1 place with legends or beings, 11 trails/routes, 1 trapline, 1 village, 1 archaeological site, 1 place to avoid/spooky place, 1 portage, and 2 other historic structures. Some features have more than one classification. Of the 37 cultural features in the mine access road EIS analysis area, 14 would be in the project footprint.

At the north ferry terminal, there would be 13 interview-identified cultural resources: 5 trails/routes, 2 harvest locations/traditional use areas, 4 cabins, 3 graves/burials, and 1 camp. Some features have more than one classification, and one would be in the project footprint.

Aside from those identified in the transportation corridor, there are two interview-identified cultural resources in the natural gas pipeline alignment: both are trail/routes, and both would be in the project footprint.

No historic properties have been identified in the EIS analysis area for the mine site, transportation corridor, Amakdedori port, or natural gas pipeline corridor. In addition, no historic properties have been identified in the EIS analysis area for the Alternative 1 Summer-Only Ferry Operations Variant, the Kokhanok East Ferry Terminal Variant, or the Pile-Supported Dock Variant. The USACE is currently in consultation to verify the boundaries, characteristics, integrity, significance, and eligibility of the Qiyhi Qelahi Cultural Landscape and Nushagak River Traditional Landscape for the National Register. Additional consultation and investigations performed before and during implementation of the PA may identify historic properties in the EIS analysis area for Alternative 1.

### **3.7.5.1 Alternative 1—Kokhanok East Ferry Terminal Variant**

The affected environment description for Alternative 1a applies to the Kokhanok East Ferry Terminal Variant. In addition to the cultural resources listed above, the analysis area for this variant encompasses four additional AHRS listed resources in the village of Kokhanok: Saint Peter and Paul Chapel (ILI-00025), The Henry Olympic Allotment Cemetery (ILI-00126), the Kokhanok BIA School (ILI-00262), and a site with pottery and beads (ILI-00127). None of those sites would be in the project footprint.

The port access road for the Kokhanok East Ferry Terminal Variant includes 56 interview-identified cultural resources in the EIS analysis area: 6 camps, 18 grave/burials, 8 traplines, 10 trail/routes, 8 villages, 3 places with legends or beings, 2 places to avoid/spooky places, 7 cabins, 1 material source site, 2 archaeological sites, and 4 other historic resources (PLP 2019-RFI 113a). Some features have more than one classification, and 10 features would be in the project footprint. The ferry terminal would overlap with the port access road and include 16 interview-identified cultural resources: 3 trails/routes, 5 graves/burials, 6 camps, 3 traplines, 2 villages, 2 cabins, 1 harvest location/traditional use area, and 3 other historic structures. Some features have more than one classification, and one site would be in the project footprint.

The place name database does not cover this area, so there are no additional place names recorded for this variant.

### **3.7.5.2 Alternative 1—Summer-Only Ferry Operations Variant**

This variant does not represent any changes from the affected environment as described for Alternative 1.

### **3.7.5.3 Alternative 1—Pile-Supported Dock Variant**

This variant does not represent any changes from the affected environment as described for Alternative 1.

## **3.7.6 Alternative 2—North Road and Ferry with Downstream Dams**

Cultural resources at the mine site would be the same as those described for Alternative 1a. This section covers the transportation corridor, including the pipeline-only segments of the natural gas pipeline corridor where it is not co-located with the transportation corridor, and Diamond Point port.

### **3.7.6.1 Transportation Corridor and Natural Gas Pipeline**

This alternative is in the northern portion of the ECIBSA; and as a result, represents an area that was subject to comparatively more background research for cultural resources by SRB&A than the Alternative 1a port access road.

The pipeline would cross Native Allotments AKA 063274A and AKAA 4592A. No cultural resources were found on AKA 063274A, and AKAA 4592A has had no pedestrian or aerial surveys. The transportation corridor would cross Native Allotments AKAA 006025B and AKAA 051014. AKAA 006025B contains the AHRS location ILI-057 (Hanak Site), but this site would not be in the EIS analysis area; no surveys have been done on AKAA 051014 (SRB&A 2019a).

Alternative 2 would cross an area that is also closer to Lake Clark National Park and Preserve than Alternative 1a and Alternative 1; there have been ethnographic/place name studies and cultural landscape analyses completed for the park that are generally applicable to Alternative 2 in terms of understanding broader regional land use patterns. Initial research indicates that the existing Williamsport-Pile Bay Road, the new portion of the port access road, and the mine access road have not all been surveyed for cultural resources. The area is in the original transportation corridor study area (SRB&A 2011a); therefore, background data have been gathered for place names and interview-identified cultural features, discussed below.

No side-scan sonar data have been collected for the pipeline route across Cook Inlet where the route would deviate from the Alternative 1a and Alternative 1 route. Therefore, it is unknown if additional cultural resources exist in those areas. The EIS for Lease Sale 244 lists 68 shipwrecks in the lease sale area (which includes much of the upper Cook Inlet more than 3 miles offshore) (BOEM 2016a). This shows that there is the potential for a shipwreck in the pipeline corridor; however, side-scan sonar data would be collected prior to pipeline construction, and the route modified as appropriate to avoid findings.

#### **Known AHRS Locations**

The AHRS lists 23 cultural resource sites in the EIS analysis area for the Alternative 2 transportation corridors; 11 in the mine access road and 12 in the port access road. These include isolated lithic scatters, prehistoric/historic village remains, historic buildings, and historic roads and bridges. Historic-era AHRS sites include the Pile Bay Townsite Historic District (ILI-000198) and associated cultural resources at Pile Bay, such as the O'Hara House (ILI-00197), The Vantrease Power Plant (ILI-00200), and the base of a radio antenna used by Carl Williams (ILI-00199). The Williamsport-Pile Bay Road itself is a historic linear feature (ILI-00132), and there is an Alaska Road Commission camp adjacent to the road (ILI-00244). Near the Cook Inlet shore near the current barge landing area is the Williamsport Historical Occupation/Land Use Area (ILI-00247). Of these 23 AHRS locations, one (ILI-00132) would be in the project footprint of the port access road. AHRS sites in the EIS analysis area are listed in Appendix K3.7. Five miles of the road from Diamond Point to Pile Bay would overlap with the existing Williamsport-Pile Bay Road, essentially resulting in new construction (including features such as material sites and staging areas).

Archaeological surveys were conducted in 2019 at the Eagle Bay ferry terminal and the Newhalen River crossing. Surveys of the Eagle Bay ferry terminal resulted in the identification of site ILI-00301. Surveys of the Newhalen River crossing resulted in the identification of sites ILI-00303, ILI-00304, ILI-00305, and ILI-00306; all would be in the EIS analysis area, but not the project footprint (PLP 2019-RFI 117a).

The pipeline corridor has a total of 24 AHRS known locations, many are also included in the transportation corridor. The Sterling Highway (SEL-0039) would cross the project footprint.

## **Place Names**

Consolidated place name data reveal 10 place names along the mine access road and the Eagle Bay ferry terminal in the EIS analysis area. Of those, four would intersect the project footprint. Along the port access road and the Pile Bay ferry terminal, there would be 31 place names in the EIS analysis area, with 12 of those intersecting the project footprint. An additional place name for Iliamna Lake would intersect the footprint of the ferry route. The natural gas pipeline would intersect an additional eight place names, three of which would intersect the project footprint. Interview-identified cultural features include three place names that would intersect the pipeline corridor. All place names are listed and described in Appendix K3.7.

## **Interview-Identified Cultural Resources**

The presence of archaeological sites, coupled with subsistence data and place names, suggest the potential for cultural resources throughout Alternative 2. Iliamna Lake and the coastal areas are used for marine resource harvests (e.g., freshwater seals, salmon), and the upland areas are used for hunting upland game birds, waterfowl, caribou, moose, and other small mammals, as well as harvesting berries, wood, and other plant resources (see Section 3.9, Subsistence). Boraas and Knott (2013) report on an important site, the Giant's Rock (Dzelggez) along the Williamsport-Pile Bay Road, which held spiritual significance and was later dynamited in 1955 as part of road construction (Boraas and Knott 2013). That report also indicates that the Williamsport-Pile Bay Road follows an old Dena'ina trail.

There are 54 interview-identified cultural resource features in the Alternative 2 transportation corridor EIS analysis area. For the mine access road, these include: 16 trail/routes, 5 grave/burials, 8 camps, 6 harvest location/traditional use areas, 3 cabins, 2 traplines, 2 places with legends or beings, 2 places to avoid/spooky places, 1 spiritually important place, 2 battlegrounds, 1 historic object, and 3 other historic structures. Many features have more than one classification, and 22 out of 43 would be in the project footprint. For the port access road, these include: 7 trail/routes, 2 grave/burials, 1 camp, and 1 village. Many features have more than one classification, and 4 out of 11 would be in the project footprint.

The Pile Bay and Eagle Bay ferry terminals overlap with the transportation corridor. The Pile Bay ferry terminal would have 3 interview-identified cultural resources: 2 trail/routes, and 1 grave/burial and village. None would be in the project footprint (PLP 2019-RFI 113a).

No TCLs have been determined eligible for the National Register in the Alternative 2 transportation corridor. However, informants noted that a fish camp on the eastern side of the Newhalen River near the mouth of Alexcy Creek is a potential TCP (PLP 2018-RFI 097b).

There would be 62 interview-identified cultural resources in the EIS analysis area for the natural gas pipeline. These include: 18 trails/routes, 3 traplines, 4 cabins, 9 villages, 1 historic object, 10 archaeological sites, 10 graves/burials, 8 harvest locations/traditional use areas, 2 battlegrounds, 1 place to avoid/spooky place, 1 place with legends or beings, 1 spiritually important place, 1 portage, 5 camps, 3 place names, and 3 other historic structures. Many features have more than one classification, and 21 would be in the project footprint (PLP 2019-RFI 113a).

## **Historic Properties**

The Alternative 2 transportation corridor includes construction of a road between Diamond Point and Pile Bay. This road intersects one historic property, the Williamsport-Pile Bay Road (ILI-00132). Per the description in the AHRs database, "This road follows a traditional portage that runs from Pile Bay on the NE end of Iliamna Lake SE across the Chigmit Mountains to

Williamsport at the head of Iliamna Bay, Kamishak Bay.” It is one lane, 15.5 miles, and is used seasonally, providing the shortest surface route to Cook Inlet for six communities around Iliamna Lake. No additional historic properties were identified in the EIS analysis area for Alternative 2.

### **3.7.6.2 Diamond Point Port**

The Diamond Point port site is in the ECIBSA used by SRB&A to frame the background research and characterize cultural resources in broader areas of interest in the lower Cook Inlet region (SRB&A 2015b). Much of the specific field work and research initially focused on the “original” Cook Inlet drainages study, which included the coast north of Ursus Cove to south of Tuxedni Bay, with an emphasis on the Knoll Head Offshore Area and Diamond Point Area. Field work was completed at Y Valley and along Sunday Creek in this region, and place name research also focused on this area, particularly along the existing overland route (Williamsport-Pile Bay Road) from the Diamond Point port site to Pile Bay.

SRB&A crews surveyed a proposed weather station and separate repeater tower near Diamond Point port but did not identify any new archaeological sites (SRB&A 2014). Specifically related to offshore cultural resources, SRB&A reviewed two online databases of shipwrecks, including the NOAA, Automated Wreck and Obstruction Information System database, and the Bureau of Ocean Energy Management, Alaskan Shipwreck Database.

There are no AHRS locations or historic properties listed in the EIS analysis area for the Diamond Point port, and one interview-identified feature (a harvest location/traditional use area) recorded that would not be in the port footprint. There would be seven place names that intersect the port, with three in the project footprint. The discussion above regarding place names for the transportation corridor applies here. Diamond Point was used as a place to camp and collect clams in the spring, and therefore the area has a high potential for additional cultural resources (SRB&A 2012b). There are also reports of a historic mineral claim in the area from the early 1900s (SRB&A 2012b). Diamond Point would be on Native Allotment AKAA 004225B; no pedestrian or aerial surveys were conducted (SRB&A 2019a).

PLP has gathered limited information regarding the potential for offshore marine archaeology near Diamond Point. In 2011, SRB&A reviewed two online databases of shipwrecks, including the NOAA Automated Wreck and Obstruction Information System database and the Bureau of Ocean Energy Management Alaskan Shipwreck Database (SRB&A 2015b). The database review identified three (and possibly a fourth) shipwrecks in the offshore vicinity of Knoll Head. These include the *Ferry Queen* (1953), the *Ema Marie* (1964), and the *Democrat* (date not listed, exact location not known). The possible fourth shipwreck is the location of the *S.S. Farallon* (1910). As part of the 2012 literature review, SRB&A further researched the history and possible locations of the *S.S. Farallon*’s shipwreck and the survivor’s on-shore campsite. The campsite location was identified in 2012 and is listed in the AHRS (ILI-00267). These sites demonstrate the potential for offshore cultural features in the area, but none of the listed AHRS locations are in the EIS analysis area.

### **3.7.6.3 Alternative 2—Summer-Only Ferry Operations Variant**

This variant does not represent any changes from the affected environment as described for Alternative 2.

### **3.7.6.4 Alternative 2—Pile-Supported Dock Variant**

This variant does not represent any changes from the affected environment as described for Alternative 2.



### **3.7.6.5 Alternative 2—North Newhalen River Crossing Variant**

The mine access road under the Newhalen River North Crossing Variant would have the same AHRS locations as in the mine access road of Alternative 2 analysis area, plus one site that would be in the footprint: ILI-00302, a multicomponent subsurface and surface site discovered during 2019 surveys. Historic properties, place names, and interview-identified cultural resources would be the same as those for Alternative 2.

### **3.7.7 Alternative 3—North Road Only**

Alternative 3 would share the same known AHRS locations, place names, and interview-identified cultural resources at the mine site as Alternative 2.

#### **3.7.7.1 Transportation Corridor and Natural Gas Pipeline**

The transportation corridor would cross Native Allotments AKA 063274A and AKAA 051014. No cultural resources were found on AKA 063274A; AKAA 051014 has had no pedestrian or aerial surveys.

There are 32 known AHRS locations in the Alternative 3 transportation corridor, and an additional four in the natural gas pipeline corridor. One site, ILI-00132, would be in the project footprint. AHRS sites are listed in Appendix K3.7.

There are 90 interview-identified cultural resources in the Alternative 3 transportation corridor. These include: 29 trail/routes, 12 grave/burials, 11 harvest location/traditional use areas, 11 archaeological sites, 14 camps, 9 villages, 6 cabins, 4 traplines, 3 battlegrounds, 3 place names, 1 portage, 2 historic objects, 2 places to avoid/spooky places, 1 place with legends or beings, 3 spiritually important place, and 4 other historic structures. Of those, 36 would be in the project footprint. (PLP 2020-RFI 113b).

There is one historic property in the Alternative 3 transportation corridor, the Williamsport-Pile Bay Road (ILI-00132). This historic property intersects the road between Diamond Point and Pile Bay. Per the description in the AHRS database, "This road follows a traditional portage that runs from Pile Bay on the NE end of Iliamna Lake SE across the Chigmit Mountains to Williamsport at the head of Iliamna Bay, Kamishak Bay." It is one lane, 15.5 miles, and is used seasonally to provide the shortest surface route for six communities around Iliamna Lake.

The natural gas pipeline would share interview-identified cultural resources with the transportation corridor and would also include one harvest location/traditional use area, which would be in the project footprint.

The transportation corridor would intersect 43 place names, of which 15 would intersect the footprint. The pipeline would intersect an additional 2 places names that would be in the project footprint.

#### **3.7.7.2 Alternative 3—Concentrate Pipeline Variant**

This variant does not represent any changes from the affected environment as described for Alternative 3.

### **3.8 HISTORIC PROPERTIES**

The substance of Section 3.8, Historic Properties, has been moved to Section 3.7, Cultural Resources, and the information has been combined. This was done in response to comments that historic properties are a type of cultural resource and should not be discussed in a separate section.

Similarly, the substance of Section 4.8, Historic Properties, has been moved to and combined with Section 4.7, Cultural Resources.

### 3.9 SUBSISTENCE

Subsistence is the way of life for many cultural groups in Alaska, including the Dena'ina Athabascan of Southcentral Alaska, the Central Yup'ik of Southwest Alaska, and the Sugpiaq-Alutiiq of lower Cook Inlet and Alaska Peninsula. Subsistence encompasses hunting, fishing, trapping, gathering, camping, and ceremonial activities, as well as the processing, sharing, use, consumption, trade, and barter of wild resources. Subsistence resources include fish, mammals, birds, marine invertebrates, edible and medicinal plants, mushrooms, and firewood. These renewable resources provide food, fuel, and materials to make clothing, shelter, tools, and art.

The Environmental Impact Statement (EIS) analysis area for subsistence includes the resources that could be affected by the mine site, port, transportation corridor, and natural gas pipeline corridor for each alternative. This includes habitat and migration routes for subsistence resources, community subsistence search and harvest areas, and areas used by harvesters to access resources.

For indigenous people, subsistence activities are rooted in traditional cultural values, spirituality, and a sense of community. The harvesting and processing of subsistence resources is meaningful community- and family-based multi-generational work. Subsistence activities help transmit language and cultural knowledge between generations, maintain the connection of people to their land and environment, and are a source of pride and identity (Boraas and Knott 2013; SRB&A 2011b). In addition to its inextricable roots in traditional Alaska Native culture, subsistence is integral to the contemporary mixed economic system in rural Alaska. For many, subsistence is a way of life. Wage employment opportunities are scarce in rural Alaska, and residents face high prices for store-bought goods; some may have to travel to other communities to visit a store. Cash incomes typically supplement and support subsistence activities, which have provided considerable nutritional and economic value for rural households for generations (SRB&A 2011b). Part-time work or commercial fishing can provide enough income to purchase tools for support of subsistence activities: boats, all-terrain vehicles, snowmachines, guns, ammunition, fishing nets, and other gear; as well as provide fuel for home and engines (see Section 3.3, Needs and Welfare of the People—Socioeconomics, for more information on cash incomes and socioeconomic conditions). Assigning a monetary valuation to subsistence harvests is difficult because most of the wild foods and resources are not for sale, and few store-bought items can match the nutritional and cultural values of wild fish, game, and plants. However, if families did not have subsistence resources, substitutes would need to be purchased (Fall and Kostick 2018).

The sharing of resources is a fundamental characteristic of the subsistence way of life. Sharing of subsistence foods in and between communities reinforces social bonds and helps recipients meet economic, material, and nutritional needs. For example, communities on the Nushagak River that harvest a lot of Chinook salmon might share or trade with relatives on the upper Kvichak River or Iliamna Lake who catch fewer Chinook salmon. Much of the sharing is generalized reciprocity, where food items are gifted without direct expectation for reciprocal returns. This is culturally fundamental among subsistence communities, because of the unpredictable prospects of relying on wild foods. Sharing is one method of adaptation for reducing risk among subsistence users (Hutchinson-Scarborough et al. 2020). The percentage of households giving and receiving subsistence resources for Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, and Kokhanok is provided below. Information on other communities in the EIS analysis area is provided in Appendix K3.9. Sharing is an indicator of resilience of the culture to variations in household abilities to harvest and process wild foods (SRB&A 2011b).

A further indication of the importance of sharing practices in integrating communities is seen in the fact that some households are especially highly productive in their subsistence pursuits and

provide a particularly large proportion of all subsistence harvest in a community. Studies conducted by the Alaska Department of Fish and Game (ADF&G) Division of Subsistence have documented a pattern in Alaska Native communities where 30 percent of a community's households produce 70 percent of the community's total subsistence harvest in terms of edible weight (known as the 30-70 rule) (Wolfe et al. 2010). This pattern is consistent despite wide variation in community and household harvest profiles. The households that produce at a high level tend to be those with several older adult members who have access to cash and the necessary equipment; these households are typically successful in both the subsistence and cash sectors of the mixed economy. The extra subsistence foods produced by high-harvesting households are usually shared with elders, single mothers with young children, young couples, and other segments of the community, including vulnerable populations (ADF&G no date). Resources are shared widely through kinship and friendship relationships, among households in the community, and in other communities in Alaska, including Anchorage and other urban centers. The 30-70 rule also illustrates the specialization in production of wild foods in the subsistence sector; particular individuals or individual households may benefit from technological ability, financial resources, or traditional knowledge. For example, although nearly all households participate in the harvest of salmon in the study area communities, there are a smaller number of individuals who have the equipment, expertise, and time necessary to harvest certain resources (e.g., moose). Therefore, a relatively small group of hunters meet the community need for moose meat through long-established sharing patterns.

Subsistence activities take place on federal, state, and private land, including Native Allotments and lands owned by Alaska Native corporations. Native Allotments are owned by individuals; many were originally selected by Alaska Native people for their importance to subsistence activities (e.g., fish camp sites) (BIA 2019). Subsistence activities in Alaska are regulated by both the federal and state governments. The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, gives "rural" Alaskans priority for subsistence harvest of fish and wildlife on federal public lands and waters. The multi-agency Federal Subsistence Board is the decision-making body that regulates subsistence hunting and fishing on federal lands and waters, with technical support from the US Fish and Wildlife Service (USFWS) Office of Subsistence Management. There would be no project components on federal lands where the subsistence management provisions of ANILCA would apply (see Section 3.2, Land Ownership, Management, and Use); however, federal fisheries regulations do apply in the Kvichak/Iliamna-Lake Clark drainage, and federal hunting regulations apply on lands managed by the National Park Service and the Bureau of Land Management. Although project activities would take place primarily on State and Native corporation lands, fish and wildlife in other jurisdictions may be impacted.

On state and private lands and waters, including those affected by the project, all Alaskans are qualified to harvest subsistence resources since the 1989 Alaska Supreme Court *McDowell* decision. With technical support of the ADF&G, the Alaska Board of Fisheries and the Board of Game have ultimate decision-making responsibility for hunting and fishing on lands in the state jurisdiction.

Harvest of certain species is also regulated by additional laws such as the Marine Mammal Protection Act (MMPA) and the Migratory Bird Treaty Act (MBTA); therefore, these species are managed by different federal agencies. Pacific halibut and most marine mammals are managed by the National Marine Fisheries Service (NMFS). Sea otter and walrus are managed by the USFWS. Migratory birds are jointly managed by state and federal governments and a co-management body representing eligible Alaska Native tribes.

This section focuses primarily on the communities of Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, and Kokhanok, and are referred to in this section as the six communities closest to project

infrastructure. Additional information related to these six communities, as well as information on another 13 communities in the EIS analysis area, can be found in Appendix K3.9.

### 3.9.1 Traditional Ecological Knowledge

The detailed results of a study done by Stephen R. Braund & Associates (SRB&A), in coordination with the ADF&G, are documented in SRB&A (2011b). Methods included conducting systematic household surveys and mapping interviews to update harvest data and subsistence use area maps. The study also documented traditional knowledge on “changes in resource use, abundance, quality, distribution, and migration,” as well as other factors like climate change and development projects (SRB&A 2011b). The data (tables, charts, and maps) used to determine the environmental baseline for this section reflect the findings of this study, and a subsequent data review of the six communities closest to project infrastructure, performed by SRB&A in 2018. Traditional ecological knowledge (TEK) and the cultural value of subsistence as a lifestyle, as described by Boraas and Knott (2013), were also reviewed during development of this section. Boraas and Knott concluded, based on elder and culture-bearer interviews, that this lifestyle has built strong networks of connected extended families in the Nushagak and Kvichak drainages based on sharing, traditional knowledge, and a respect for the environment, with salmon and clean water as the foundation of culture. A summary of specific TEK comments from Boraas and Knott (2013) is provided in Appendix K3.1. TEK regarding areas of subsistence use and harvest data, processing and sharing, and how information is transmitted over generations are incorporated into the analysis of Section 4.9, Subsistence. Scoping comments related to TEK were also considered in the analysis of impacts in Section 4.9, Subsistence, and are summarized in Appendix K3.1.

### 3.9.2 Seasonal Round

Subsistence users harvest a wide variety of resources throughout the year, and they often target specific species during certain seasons of the year, following a cyclical harvest pattern called the “seasonal round.” In general, communities in southwest Alaska share a similar seasonal round, with some variations depending on the area, available resources, and applicable hunting and fishing regulations. For example, coastal, lakeside, and riverside communities each rely on a somewhat different mixture of subsistence resources. Non-salmon fish are harvested throughout the year. Freshwater seals are also available throughout the year; however, many subsistence users prefer to harvest freshwater seals at pressure cracks in the lake ice from March through May. In the spring, migratory birds, gull and waterfowl eggs, and Chinook salmon are harvested. Sockeye salmon are targeted in the spring or summer, depending on the run timing in different areas. Other salmon species, marine invertebrates, and green plants are harvested in summer. In late summer and into fall, spawning sockeye salmon and berries are harvested. During fall, subsistence users harvest migratory birds and upland game birds (grouse and ptarmigan); however, ptarmigan are harvested year-round in Dillingham. Some hunters also like to hunt freshwater seals in the fall, which is when hunters said seals appear most often in the Kvichak River. Moose and caribou hunting typically occur in fall and/or winter. Caribou hunting during August through October is mostly done opportunistically in conjunction with moose hunting along the rivers traveled by subsistence users searching for moose. The coldest part of winter is the best time to harvest small, furbearing mammals. Hunting efforts targeting caribou specifically usually occur in February through April, when snow conditions are good for overland travel by snowmachines and daylight hours are longer; however, recent warmer winters and earlier spring thaws have made the annual timing of spring caribou hunts more unpredictable, and access to caribou hunting more challenging (Fall et al. 2006; Krieg et al. 2009; Holen et al. 2011, 2012; Evans et al. 2013; Burns et al. 2016; Van Lanen et al. 2018). The general gathering cycle of when harvests occur in the six communities closest to project infrastructure is shown in Table 3.9-1.



**Table 3.9-1: Generalized Seasonal Round of Subsistence Activities, Project Area Communities**

Resource	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Sockeye (red) salmon												
Chinook (King) salmon												
Dolly Varden												
Grayling												
Lake trout												
Whitefish												
Northern pike												
Seal												
Moose												
Caribou												
Black bear												
Brown bear												
Dall sheep												
Hare												
Porcupine												
River Otter												
Red fox												
Lynx												
Beaver												
Ptarmigan												
Spruce Grouse												
Ducks/ Geese												
Bird Eggs												
Clams												
Berries												
Other green plants												

Notes:

gray = occasional harvest; black = usual harvest

Seasonal harvest is generalized for these communities, and patterns may differ slightly from community to community

Source: SRB&A 2011b

Residents of Cook Inlet communities (i.e., Ninilchik and Seldovia) harvest many of the same resources at the same times of year as southwest Alaska communities, with some variations. In spring, green plants, mushrooms, and kelp are harvested. In summer, subsistence users gather berries, greens, marine invertebrates, and seaweed. The moose-hunting season occurs in late summer to early fall. During fall and winter, the residents hunt for upland game birds. Winter is the typical time for gathering firewood (Jones and Kostick 2016).

Subsistence hunters have observed that habitat change in southwest Alaska is affecting the Mulchatna caribou herd harvest in the Iliamna Lake and Bristol Bay areas (Van Lanen 2018). Many respondents said that the herd has moved away from these areas, and caribou hunting often requires traveling too far to make harvest worthwhile; moose are closer and more easily accessible. Hunters have adapted to changes in species availability by switching to greater reliance on increasing numbers of moose, rather than the more difficult to access caribou. Moose harvest data have verified local knowledge observations that habitat change is occurring, which benefits moose. It was reported that since the late 1990s, moose harvests by local residents have increased significantly in the southern portion of game management units (GMUs) 9B, 9C, and 17; and during the current decade, in the western portion of GMU 18. Increasing range expansion of moose in Alaska's tundra areas has been linked to warming, and has increased the shrub habitat (willows) that moose prefer (Tape et al. 2016). Changing winter conditions and more recent low snow and ice conditions are creating challenges in terms of access via snowmachine travel for winter caribou and moose hunting, and efforts focus on the fall season instead of the winter season.

### **3.9.3 Subsistence Harvest Patterns by Community**

Construction and operations would primarily affect the subsistence areas of six Iliamna Lake communities near the mine site, transportation corridor, and port site. This section summarizes the most recent available comprehensive subsistence harvest surveys for the six communities near Iliamna Lake that would be most likely to be impacted by the project. Most of these surveys were conducted more than 10 years ago, and each covers a single calendar year; however, they are high-quality studies with consistent methods across all communities, and offer a good basis for comparison among different communities. The age of the data does introduce uncertainties, and there may be some instances of change in harvest areas in the subsequent years. For information on traditional use areas, refer to Section 3.7, Cultural Resources. Subsistence use areas vary somewhat from year to year based on environmental conditions and the availability of resources. Subsistence information collected from previous years has been compiled by SRB&A (2011b) and incorporated to supplement the 1-year comprehensive harvest data. Harvest area maps for each of the six Iliamna Lake communities are provided. Supplementary harvest area maps for these six communities by subsistence resource category (e.g., salmon, non-salmon fish, large land mammals) are provided in Appendix K3.9. A summary of the subsistence harvest surveys for other communities in the project area and nearby watersheds is provided in Appendix K3.9. The results are organized geographically from the communities closest to the project around Iliamna Lake, followed by more distant communities down the Kvichak River drainage, across to the Nushagak River drainage, and two Cook Inlet communities. Study years range from 1998 to 2014, depending on the community. Communities with older (e.g., Homer with a study year of 1982) or unavailable (e.g., Happy Valley, Anchor Point) comprehensive harvest data were not included. Data available through ADF&G technical papers and the ADF&G Community Subsistence Information System were reviewed and incorporated into this analysis.

Table 3.9-2 shows subsistence harvest amounts by community for eight subsistence resource categories. These eight categories (i.e., salmon, non-salmon fish, large land mammals, small land mammals, marine mammals, birds and eggs, marine invertebrates, and plants and fungi) are the same categories used by the ADF&G in their comprehensive subsistence surveys reports. The six Iliamna Lake communities show a particularly high level of reliance on salmon. Annual per-capita (i.e., per year-round resident) harvests of salmon ranged from 205 pounds in Igiugig to 513 pounds in Kokhanok. In another indicator of high reliance, for example, salmon represent 79 percent of total subsistence harvest for Iliamna, and 73 percent for Newhalen. Additional information is shown on species diversity and proportions of total harvest in subsequent community accounts.

Sockeye salmon is the most important subsistence species for Kvichak watershed residents. Table 3.9-3 shows the subsistence harvest of sockeye salmon for communities in the Kvichak River drainage from 1997 to 2016. In that timeframe, the largest subsistence harvest of sockeye salmon in terms of the total number of fish was in 1997, and the smallest harvest was in 2016. The subsistence harvest of sockeye salmon has decreased over the past 20 years. The most recent 10-year average (2007-2016) was lower than the previous 10-year average by 6 percent (ADF&G 2018m).

Fish camps have deep cultural and social significance; often considered the peak social gathering of the year, fish camps are where many families pass on traditional skills and values, and where individual and community identity is reaffirmed (Deur et al. 2018). Salmon harvesting also provides an important cultural context for applying, sharing, and learning traditional skills and knowledge. Whether based in fish camps, as in Nondalton, or at processing sites near people's homes, as in Newhalen and Iliamna, subsistence fishing and processing promotes the health and well-being of the community through cooperation and interdependence (Fall et al. 2010).

Compared to salmon, EIS analysis area communities have smaller harvest amounts for non-salmon fish; although it is important to note that these fish are often taken throughout the year, providing a fresh food resource during winter months. Harvest levels of large land mammals, such as moose and caribou, are also smaller, although they too play an important role in subsistence food diversity.

Subsistence use areas represent another important dimension of subsistence activities. Communities have subsistence use areas that have been harvested on for generations, and represent a sophisticated cumulative body of knowledge about where animals in prime condition are likely to be available throughout the year. Subsistence search and harvest areas for some species are relatively constant, such as salmon fishing areas; while use areas for other species, such as moose, caribou, and furbearers, would vary with changes in abundance and distribution. Harvest patterns are dynamic and strategic, because subsistence users concentrate their efforts in areas with current abundance and distribution of resources that are likely to be productive. In addition, traditional place names identify significant locations and further indicate the long-term use patterns (see Section 3.7, Cultural Resources). Figure 3.9-1 shows the combined subsistence use areas from 1996/1997 through 2005/2006 for 12 communities in the EIS analysis area (Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, Kokhanok, Port Alsworth, Koliganek, Levelock, New Stuyahok, Ekwok, and Portage Creek) in relation to project infrastructure. Subsistence users search for and harvest resources over broad areas, and may travel great distances via snowmachine, all-terrain vehicle, and boat.

**Table 3.9-2: Estimated Per Capita Subsistence Harvests in Edible Weight (lbs.) by Community for the Most Recent Study Years**

Community	Year	All Resources	Salmon	Non-Salmon Fish	Large Land Mammals	Small Land Mammals	Marine Mammals	Birds and Eggs	Marine Invertebrates	Plants and Fungi
Iliamna	2004	469.4	370.1	34.1	32.1	0.6	6.5	4.4	1.6	20.0
Newhalen	2004	691.5	502.2	31.8	101.3	3.1	4.4	16.2	2.5	30.0
Pedro Bay	2004	305.5	250.3	15.3	30.0	0.0	0.0	2.9	0.0	6.9
Nondalton	2004	357.7	219.4	33.9	74.4	7.4	0.0	3.8	0.4	18.4
Igiugig	2005	542.0	205.2	59.4	202.9	4.9	29.2	11.8	0.0	28.5
Kokhanok	2005	679.6	512.8	36.3	94.4	1.5	1.7	7.8	0.5	24.6
Port Alsworth	2004	132.8	89.0	12.0	23.4	1.3	0.0	1.6	1.1	4.4
Koliganek	2005	898.5	564.7	90.4	177.9	8.3	0.0	9.1	0.0	48.1
Levelock	2005	526.7	151.8	39.9	251.9	5.5	37.7	14.7	2.9	22.3
New Stuyahok	2005	389.2	188.3	28.0	138.8	4.6	0.0	6.2	0.2	23.0
King Salmon	2007	313.0	255.7	5.3	34.5	2.1	0.4	6.7	3.9	4.3
Naknek	2007	264.2	177.4	18.1	32.0	0.6	12.9	3.4	4.6	15.1
South Naknek	2007	267.5	200.8	8.1	7.1	0.6	21.1	1.2	3.6	25.0
Aleknagik	2008	296.0	143.4	25.6	63.5	2.6	9.5	12.6	0.3	38.5
Clark's Point	2008	1,210.1	637.2	33.8	209.1	15.4	127.1	53.0	2.3	132.1
Manokotak	2008	298.4	135.0	43.7	44.5	3.1	14.7	17.3	4.7	35.4
Dillingham	2010	212.1	130.6	7.3	49.4	2.2	4.4	5.7	1.1	11.4
Ninilchik	1998	163.8	42.5	38.3	65.6	0.5	0.0	1.43	11.0	1.0
Seldovia	2014	138.3	47.5	36.0	17.2	<0.1	1.1	0.9	5.5	30.0

Note:

The first six communities listed are those closest to the project. Small mammals harvested but not typically eaten are excluded from edible weight estimates. The marine mammals category includes saltwater and freshwater seals.

Sources: Fall et al. 2006; Krieg et al. 2009; Holen et al. 2011, 2012; Evans et al. 2013; Jones and Kostick 2016

**Table 3.9-3: Subsistence Harvest of Sockeye Salmon by Community, in Number of Fish, Kvichak River Drainage, 1997-2016**

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna-Newhalen <sup>1</sup>	Nondalton	Port Alsworth	Other <sup>2</sup>	Total
1997	1,062	2,067	5,501	8,722	19,513	17,194	2,348	3,101	59,508
1998	2,454	1,659	3,511	10,418	16,165	13,136	2,678	3,635	53,656
1999	1,276	1,608	5,005	10,725	14,129	17,864	4,282	2,834	57,723
2000	1,467	1,981	1,815	7,175	6,679	11,953	3,200	2,720	36,990
2001	908	779	2,118	9,447	8,132	7,566	1,958	1,901	32,808
2002	625	2,138	2,687	9,847	9,417	5,508	1,201	1,578	33,001
2003	737	1,081	2,135	9,771	13,824	8,016	1,370	1,591	38,495
2004	1,000	1,026	4,803	11,869	21,652	8,789	2,455	1,631	53,225
2005	914	1,017	4,162	16,801	12,010	8,824	2,457	2,078	48,263
2006	0	1,252	4,319	19,028	11,487	8,885	2,418	2,461	49,850
2007	102	1,803	5,487	15,105	11,453	7,902	3,211	2,410	47,473
2008	30	1,558	4,884	14,755	13,569	8,916	3,307	2,544	49,563
2009	759	1,457	7,802	15,759	9,871	5,709	3,155	2,260	46,772
2010	940	2,901	5,609	13,973	8,815	3,185	3,250	2,015	40,688
2011	933	1,931	3,898	9,895	15,433	7,947	4,026	1,163	45,226
2012	750	2,608	4,028	16,530	12,933	9,247	4,420	1,855	52,370
2013	984	345	3,971	13,392	7,632	10,550	3,377	2,305	42,556
2014	1,170	513	3,999	6,440	11,388	9,004	4,296	4,206	41,016
2015	398	1,153	2,519	8,098	9,691	8,722	6,588	2,207	39,377
2016	1,265	297	2,036	7,087	9,900	2,320	4,196	3,548	30,649
20-Year Average	881	1,459	4,014	11,742	12,185	9,062	3,210	2,402	44,960
1997-2006 Average	1,044	1,461	3,606	11,380	13,301	10,774	2,437	2,353	46,352
2007-2016 Average	733	1,457	4,423	12,103	11,069	7,350	3,983	2,451	43,569
2012-2016 Average	913	983	3,311	10,309	10,309	7,969	4,575	2,824	41,194

Notes:

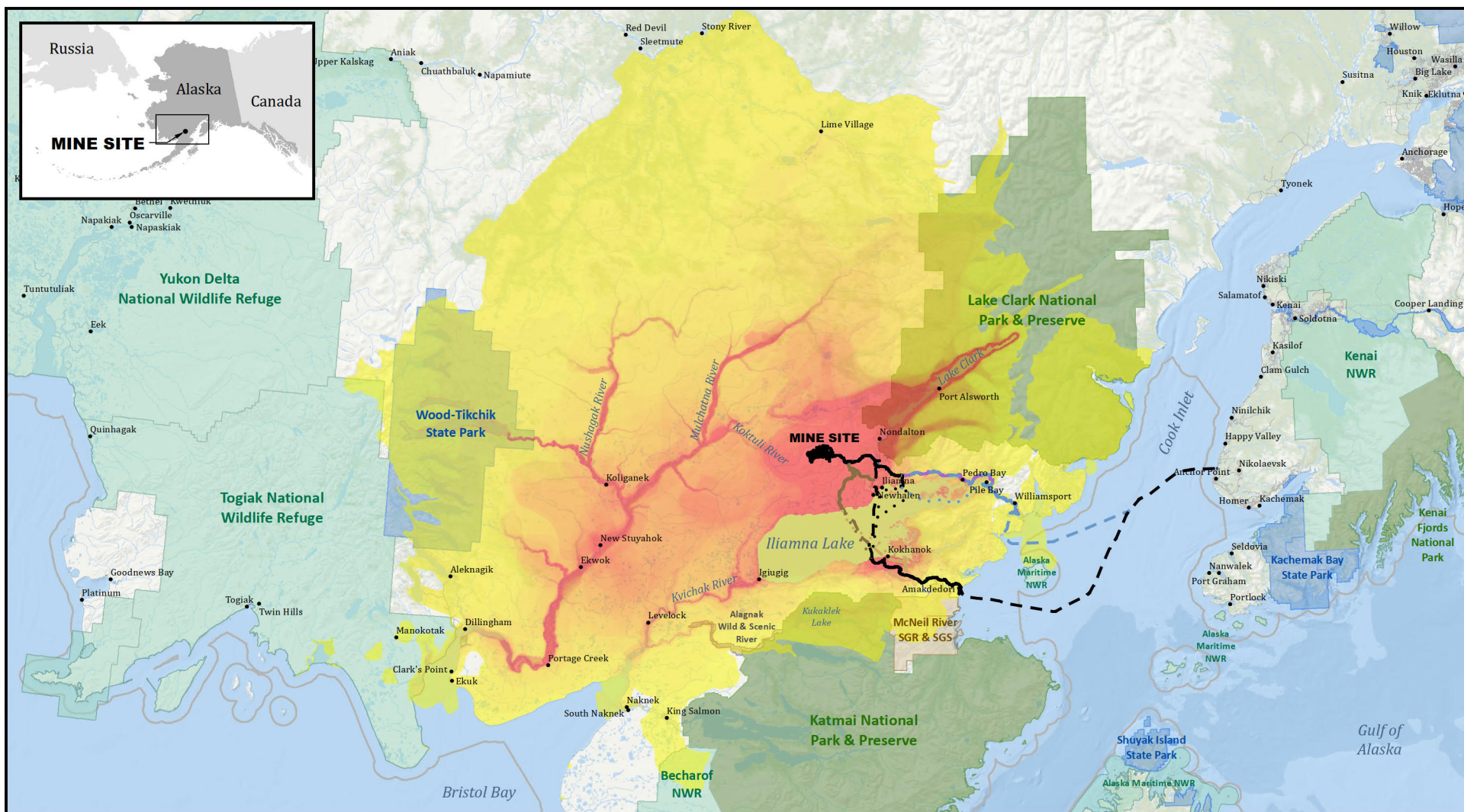
Harvests are extrapolated over areas for all permits issued, based on those returned. Harvest estimates are based on community of residence and include fish caught only in the Naknek-Kvichak District

<sup>1</sup> Includes Chekok

<sup>2</sup> Subsistence harvests by non-Kvichak River watershed residents

Source: ADF&G 2018m





Sources: PLP 2020; ADNRC  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

Overlapping Subsistence Use Areas  
All Resources  
12 Communities\*  
1996/97 - 2005/06  
(SRB&A 2018)

\*The 12 communities are Ekwok, Igiugig, Iliamna, Kokhanok, Koliganek, Levelock, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, and Portage Creek.

## SUBSISTENCE USE AREAS

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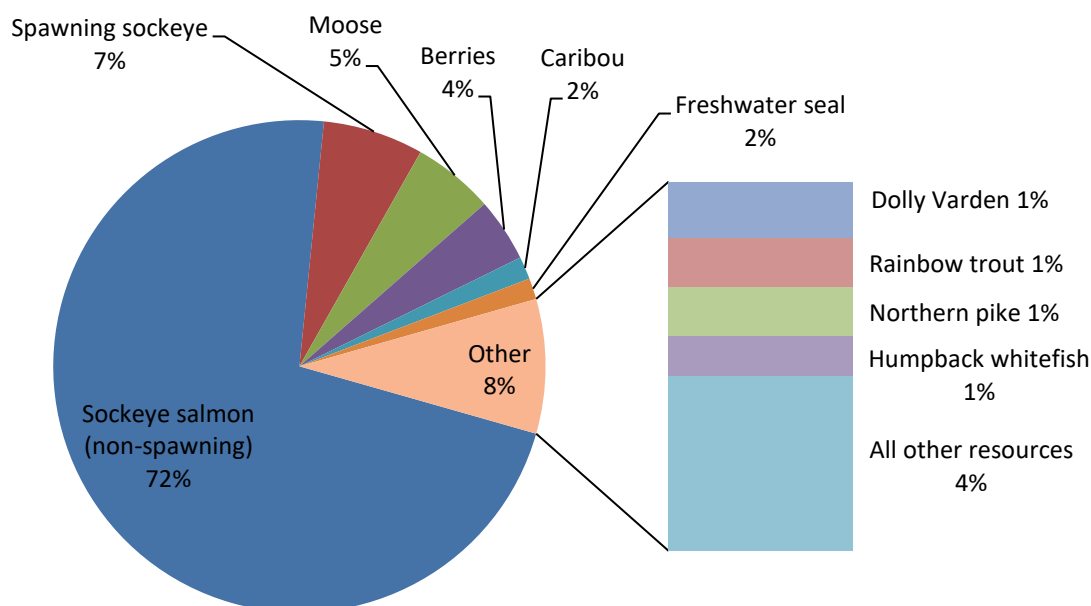
FIGURE 3.9-1

### 3.9.3.1 Iliamna

Iliamna was established at its current location on the northern shore of Iliamna Lake when the Dena'ina Athabascan community of Old Iliamna moved from the mouth of Iliamna River in 1935. Today, this majority Alaska Native community is a cultural mosaic of Dena'ina, Yupik, Alutiiq, and Euro-American peoples. In 2004, Iliamna had an estimated year-round population of 73 people in 22 households. Fall et al. (2006) surveyed households about their 2004 subsistence activities and found that Iliamna residents harvested an estimated total of 34,160 pounds (469 pounds per capita) of wild foods. Salmon dominated the subsistence production of Iliamna residents, as seen in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Iliamna residents in 2004 in terms of edible weight are shown in Figure 3.9-2.

In addition to pounds harvested per capita, another measure of a resource's importance is the percentage of households in the community that used the resource. In 2004, salmon was the most widely used resource category (100 percent of households), followed by non-salmon fish (92 percent), plants and fungi (85 percent), large land mammals (77 percent), birds and eggs (69 percent), and marine invertebrates (46 percent) (Fall et al. 2006). Sharing and distribution of subsistence foods extend widely across households. In 2004, 77 percent of Iliamna households received wild resources, and 54 percent of households gave resources away (Fall et al. 2006). Table 3.9-4 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested salmon, non-salmon fish, plants and fungi, and birds and eggs.

**Figure 3.9-2: Composition of Iliamna Subsistence Harvest by Estimated Edible Weight, 2004**



Note: The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.  
Source: Fall et al. 2006

**Table 3.9-4: Iliamna Subsistence Harvest Estimates by Resource Category, 2004**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	54	77	34,160	1,553	469	100.0
Salmon	100	100	100	31	39	26,935	1,224	370	78.8
Non-Salmon Fish	92	77	77	31	39	2,478	113	34	7.3
Large Land Mammals	77	54	15	31	69	2,335	106	32	6.8
Small Land Mammals	31	31	23	8	15	44	2	1	0.1
Marine Mammals <sup>2</sup>	31	31	23	23	8	474	22	7	1.4
Birds and Eggs	69	62	62	39	23	317	14	4	0.9
Marine Invertebrates	46	23	23	15	39	118	5	2	0.3
Plants and Fungi	85	85	85	23	31	1,459	66	20	4.3

Notes:

<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

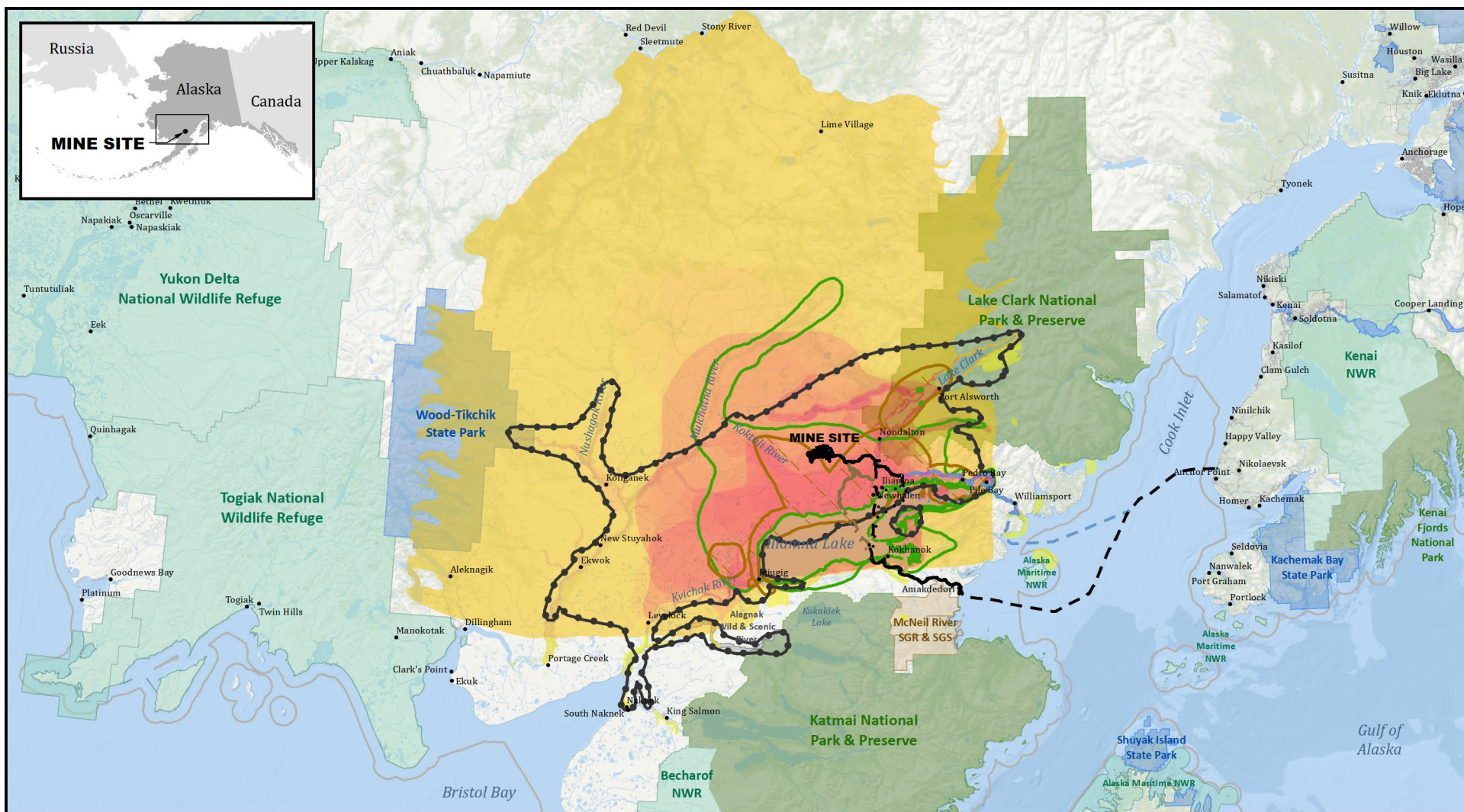
<sup>2</sup>The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Trends in Iliamna subsistence harvest over time indicate that recent overall harvests and uses in 2004 were the same as the recent past, with some notable variations among uses of specific resources (Fall et al. 2006; SRB&A 2011b). Households reported changes in the uses of individual resources, with 46 percent reporting that their use of salmon had increased, while another 46 percent of households said their use of salmon stayed the same. Forty-two percent of households said they used fewer large land mammals in 2004 compared to recent years, while 50 percent said they used about the same (Fall et al. 2006). Survey respondents noted competition, weather, animal population changes, and personal reasons as explanations for changes in their use of these resources (Fall et al. 2006; SRB&A 2011b). Iliamna residents expressed concern that non-local hunters were overharvesting caribou from the Mulchatna caribou herd. They also observed that lichen had become too thin to support the formerly large herd near the Mulchatna River, and it may be a decade before they can return to this area (Fall et al. 2006).

Figure 3.9-3 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Iliamna in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals, and all resources for other time periods. The primary areas used are north and west of Iliamna Lake, extending around to Lake Clark and to the Koktuli and Stuyahok rivers, and over the flats to the Kvichak River. The Chulitna River (north of the mine site) and the islands in Iliamna Lake (near and to the east of the ferry routes) are high use areas. Hunting and harvesting occur along the Nushagak, Mulchatna, and Kvichak rivers. Iliamna residents travel along the lakeshore and rivers to harvest moose, caribou, waterfowl, and plants and berries. During the winter, inland use occurs for hunting and trapping small land mammals and furbearers, along with caribou, moose, and ptarmigan. Egg harvest, berry picking, and plant harvest occurs on the islands in Iliamna Lake (SRB&A 2018). Hunters from Iliamna harvest freshwater seals in the northeastern portion of Iliamna Lake in the waters around Rabbit Island, Eagle Bay, Triangle Island, Flat Island, Knutson Bay, the mouth of Chekok Creek, Porcupine Island, and two different islands referred to as “seal island” (Burns et al. 2016). Boats, snowmachines, and all-terrain vehicles (ATV) were the most common method of travel; there is a direct snowmachine route across Iliamna Lake between Iliamna and Kokhanok (PLP 2018-RFI 088). Although whitefishes are not widely abundant in the vicinity of Iliamna, residents reported receiving whitefishes from family and friends, or traveling to harvest (Hazell et al. 2015).





Sources: PLP 2020; ADNRC  
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#### Action Alternatives

..... Ferry Routes

— Natural Gas Pipelines

Alternative 1a

Alternative 1

Alternative 1 Kokhanok East  
Ferry Terminal Variant

Alternative 2

Alternative 2 Newhalen River  
North Crossing Variant

Alternative 3

#### Other Features

Local Roads

Three Nautical Mile Line

National Park

National Wildlife Refuge

Alaska State Park

Wild and Scenic River

State Game Refuge/Sanctuary

Large Land Mammals, 1980-2002  
(Holen et al., 2005)

All Resources, 2004  
(Fall et al., 2006)

All Resources, 1960-82  
(Wright, Morris, and Schroeder, 1985)

Overlapping Subsistence Use Areas  
All Resources  
1996/97 - 2005/06  
(SRB&A 2018)

**SUBSISTENCE USE AREAS, ALL RESOURCES - ILIAMNA**

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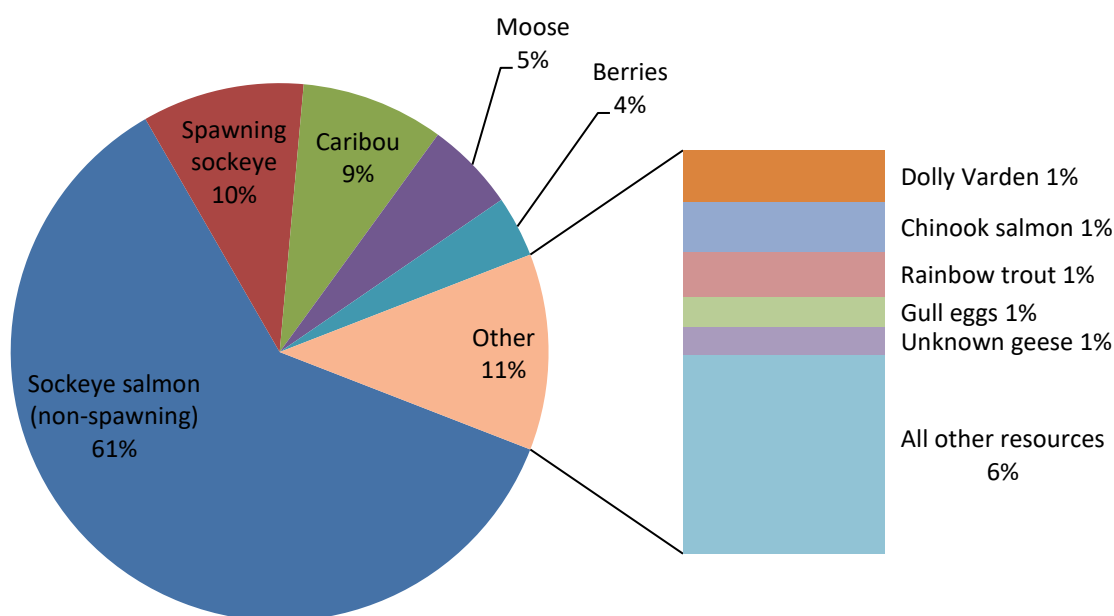
FIGURE 3.9-3

### 3.9.3.2 Newhalen

The Yup'ik village of Noghelingamiut was listed on the 1890 census in the location of present-day Newhalen at the mouth of Newhalen River on Iliamna Lake. Today, Newhalen is a predominantly Yup'ik community, but is also home to Alutiiq, Dena'ina, and Euro-American peoples. In 2004, Newhalen had an estimated year-round population of 125 people in 39 households. Newhalen residents were highly productive in subsistence activities, harvesting an estimated total of 86,607 pounds (692 pounds per capita) of wild foods in 2004. Salmon dominated the subsistence harvests, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Newhalen residents in 2004 in terms of edible weight are shown in Figure 3.9-4.

Household participation in subsistence activities was very high. Salmon was the most widely used resource category (100 percent of households), followed by plants and fungi (92 percent), birds and eggs (92 percent), large land mammals (92 percent), non-salmon fish (88 percent), marine invertebrates (56 percent), and marine mammals (52 percent). Sharing and distribution of subsistence foods extend widely across households. In 2004, 96 percent of Newhalen households received wild resources, and 80 percent of households gave resources away (Fall et al. 2006). Table 3.9-5 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested salmon, plants and fungi, non-salmon fish, and birds and eggs.

**Figure 3.9-4: Composition of Newhalen Subsistence Harvest by Estimated Edible Weight, 2004**



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.

Source: Fall et al. 2006



**Table 3.9-5: Newhalen Subsistence Harvest Estimates by Resource Category, 2004**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	80	96	86,607	2,794	692	100.0
Salmon	100	92	92	64	32	62,890	2,029	502	72.6
Non-Salmon Fish	88	88	88	52	56	3,980	128	32	4.6
Large Land Mammals	92	52	44	60	76	12,693	409	101	14.7
Small Land Mammals	32	28	28	20	20	392	13	3	0.5
Marine Mammals <sup>2</sup>	52	32	24	36	32	556	18	4	0.6
Birds and Eggs	92	84	84	52	56	2,032	66	16	2.3
Marine Invertebrates	56	36	36	16	20	313	10	3	0.4
Plants and fungi	92	92	92	60	28	3,752	121	30	4.3

Notes:

<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

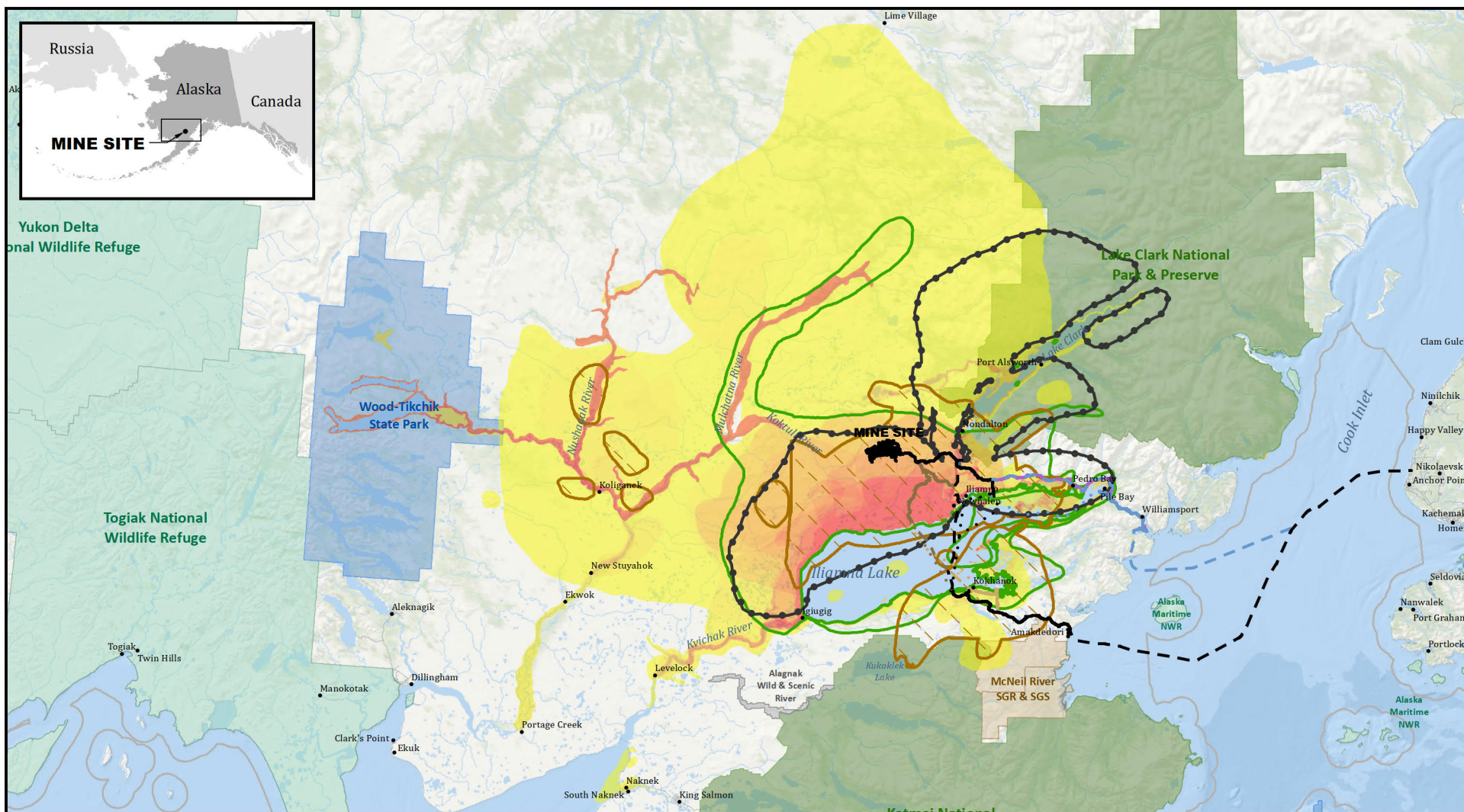
<sup>2</sup>The marine mammals category includes saltwater and freshwater seals.

Source: Fall et al. 2006

Trends in Newhalen subsistence harvest over time indicate that overall harvests were similar across all study years. Sockeye salmon, spawning sockeye salmon, and caribou were the top three harvested resources. Most Newhalen households reported that their harvest and use of wild resources in 2004 was about the same as in the preceding 5 years, although many households said they used fewer furbearers and large land mammals in recent years (Fall et al. 2006). Changes in resource populations have caused lower harvests in 2004, especially for large land mammals. A majority (61 percent) of respondents that reported reduced uses of at least one subsistence resource category cited personal reasons (such as having more cash employment, which reduced time available to participate in subsistence activities) as the cause. Newhalen residents expressed similar concerns as Iliamna residents that overharvesting from non-local hunters and thinning lichen are reducing the Mulchatna caribou herd (Fall et al. 2006).

Despite whitefishes not being widely available locally, 85 percent of households noted that they typically use whitefishes (Hazell et al. 2015).

Figure 3.9-5 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest areas for Newhalen in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals, and all resources for other time periods. Harvest areas extend from Lime Village to Naknek, and from Tikchik Lakes to the eastern edges of Lake Clark and Iliamna Lake, with some use in Cook Inlet. The primary areas of overlapping use are near the Newhalen, Kvichak, Nushagak, and Mulchatna river drainages for hunting of caribou, moose, waterfowl, and other game; and also for fish, berries, and plants in the summer and fall. Overlapping use areas occur inland, close to the community, along the northwestern shore of Iliamna Lake across the mine access road and north ferry terminal, and toward Nondalton and the eastern shoreline (SRB&A 2018). The primary means of travel are via snowmachine, boat, ATV, and truck. Hunters from Newhalen harvest freshwater seals in the northeastern portion of Iliamna Lake in waters west of Porcupine Island and the waters surrounding Flat Island, Triangle Island, two different islands referred to as "seal island," Rabbit Island, Eagle Bay, Eagle Bay Island, Tommy Point, Tommy Islands, Squirrel Point, and Knutson Bay (Burns et al. 2016). Travel routes to access resources were close to the Iliamna Lake shoreline, and there is a direct route across Iliamna Lake between Newhalen and Big Mountain, and a similar direct route from Newhalen to Kokhanok (PLP 2018-RFI 088).



Sources: PLP 2020; ADNRC  
Subsistence Use Areas by  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

■ Large Land Mammals, 1980-2002  
(Holen et al., 2005)

■ All Resources, 2004  
(Fall et al., 2006)

■ All Resources, 1960-82  
(Wright, Morris, and Schroeder, 1985)

■ Overlapping Subsistence Use Areas  
All Resources  
1996/97 - 2005/06  
(SRB&A 2018)

**SUBSISTENCE USE AREAS, ALL RESOURCES - NEWHALEN**

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FIGURE 3.9-5

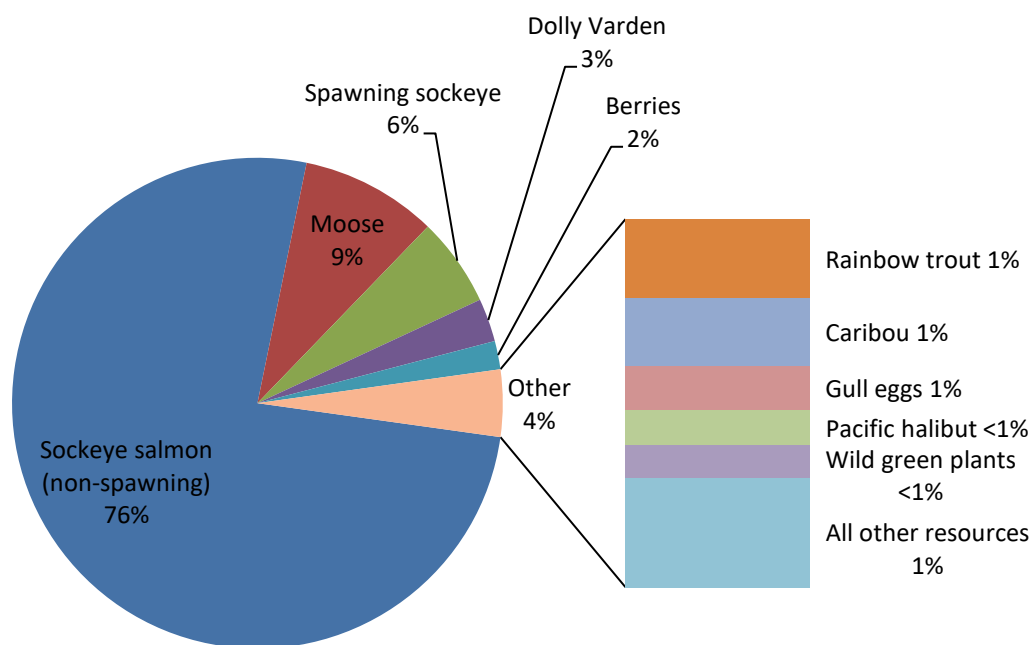
### 3.9.3.3 Pedro Bay

Pedro Bay is a Dena'ina Athabascan community at the eastern end of Iliamna Lake. In 2004, Pedro Bay had an estimated year-round population of 69 in 21 households. Pedro Bay residents harvested an estimated total of 21,026 pounds (306 pounds per capita) of wild food in 2004. Salmon dominated the subsistence production of Pedro Bay residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Pedro Bay residents in 2004 in terms of edible weight are shown in Figure 3.9-6.

Salmon, as well as plants and fungi, were the most widely used resource categories (100 percent of households), followed by birds and eggs (94 percent), non-salmon fish (89 percent), and large land mammals (78 percent). Sharing and distribution of subsistence foods was widespread. In 2004, all Pedro Bay households received wild resources and almost all (89 percent) households gave resources away (Fall et al. 2006). Table 3.9-6 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested plants and fungi, salmon, birds and eggs, and non-salmon fish.

Trends in Pedro Bay's overall subsistence harvest over time indicate that they remained relatively unchanged over the study years. Salmon accounted for the majority of the total harvest, and large land mammals and non-salmon fish contribute to the yearly subsistence harvest. Pedro Bay residents described sociocultural changes that were affecting harvest patterns. People have stopped harvesting smaller land mammals (e.g., beaver, snowshoe, and porcupine) as a food source as the community loses elders and there is less demand. Additionally, people were not spending as much time on subsistence activities because wage labor increased and caused people to spend less time hunting and fishing for subsistence. Residents reported that Dolly Varden in the Iliamna River were being overharvested by the sport fishery and that motorized boats were disturbing stream habitat. They observed that moose were being adversely affected by increased populations of wolves and bears (Fall et al. 2006).

**Figure 3.9-6: Composition of Pedro Bay Subsistence Harvest by Estimated Edible Weight, 2004**



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.  
Source: Fall et al. 2006



**Table 3.9-6: Pedro Bay Subsistence Harvest Estimates by Resource Category, 2004**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	89	100	21,026	1,001	306	100.0
Salmon	100	89	83	72	78	17,232	821	250	82.0
Non-Salmon Fish	89	61	61	39	83	1,053	50	15	5.0
Large Land Mammals	78	72	22	22	61	2,065	98	30	9.8
Small Land Mammals	11	6	6	6	6	0	0	0	0.0
Marine Mammals <sup>2</sup>	0	11	0	0	0	0	0	0	0.0
Birds and Eggs	94	72	67	44	61	198	9	3	0.9
Marine Invertebrates	28	0	0	11	28	0	0	0	0.0
Plants and Fungi	100	100	100	56	50	478	23	7	2.3

Notes:

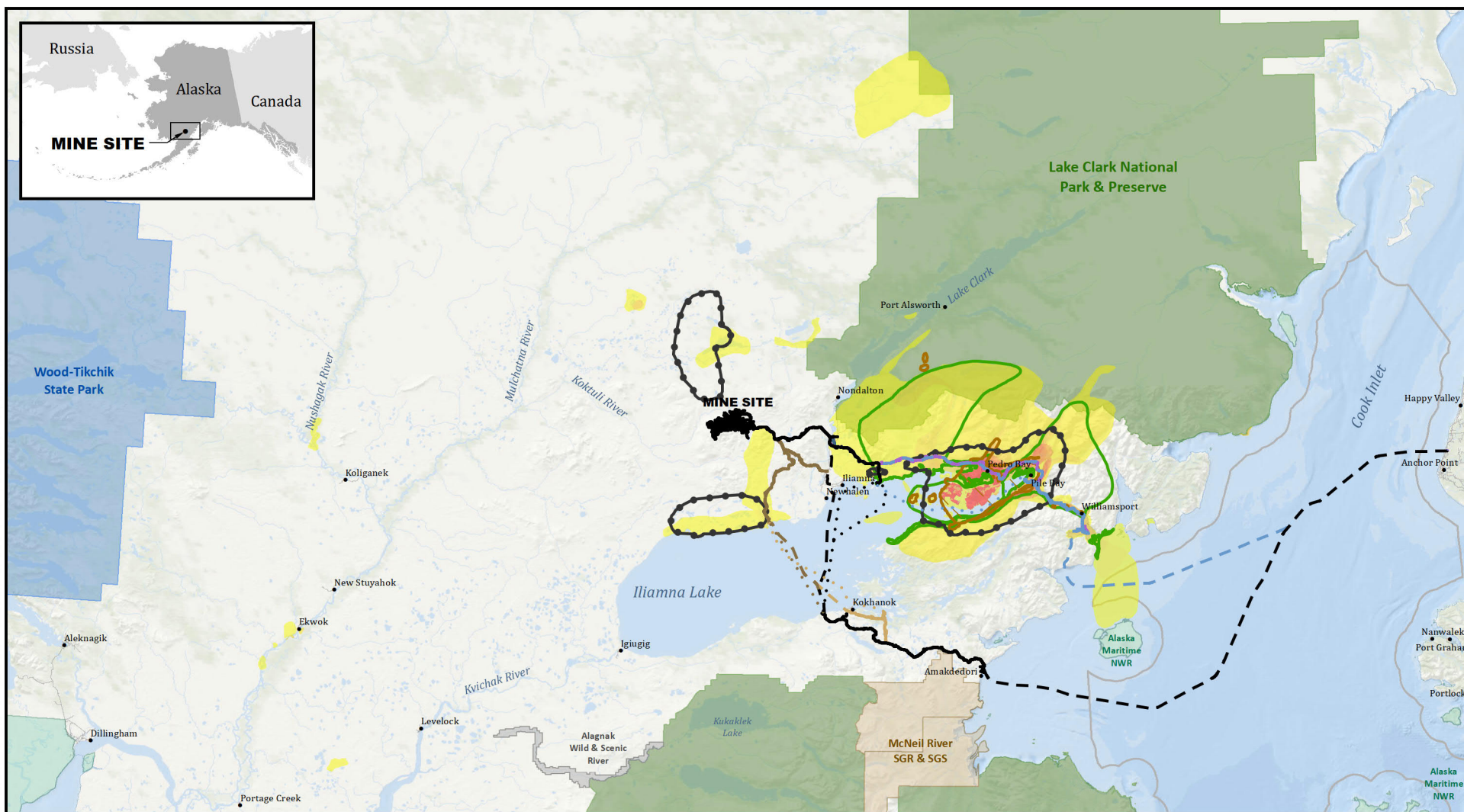
<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

<sup>2</sup>The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Changes have also occurred in the years since the 2004 subsistence survey that may be impacting the subsistence harvest patterns in Pedro Bay. In 2010, the public school in Pedro Bay closed due to the loss of State funding as a result of low enrollment. School closures can lead to declining services and declining economic opportunities, which can lead to population declines (LPB 2012). Declines in population could result in a reduction in the overall subsistence harvest for the community, while the loss of the jobs at the school could have resulted in an increase in time to participate in subsistence activities, as well as a reduction in cash income to spend on fuel and equipment.

Figure 3.9-7 illustrates the 1996 to 2005 overlapping subsistence search and harvest area for Pedro Bay in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. Pedro Bay subsistence use areas are concentrated on the eastern end of Iliamna Lake and across the transportation and pipeline corridors for Alternative 2—North Road and Ferry with Downstream Dams, and Alternative 3—North Road Only. Lower-use areas extended to near Upper and Lower Talarik creeks and along the Chulitna, Mulchatna, and Nushagak rivers. Use areas extend toward Iliamna near Tazimina Lakes and east to Cook Inlet. The highest numbers of overlapping use areas are close to Pedro Bay and along the coast to the Iliamna River for moose, other large land mammals, furbearers, small land mammals, waterfowl upland birds, berries, and plants (SRB&A 2018). Flat and Porcupine islands were the prime harvesting locations for moose, seal, waterfowl, berries, and plants (Fall et al. 2006). In addition, hunters from Pedro Bay harvest freshwater seals in the waters and ice pressure cracks around Pedro Bay, the Little Chutes and Big Chutes near Pedro Bay, and Lonesome Bay (Burns et al. 2016). Salmon and trout are taken in overlapping use areas near the community and near Pile Bay. Pedro Bay residents do not travel far to harvest sockeye salmon; they harvest “bright” or non-spawning sockeye in the bays of Iliamna Lake, and spawning sockeye in the rivers, streams, and fish ponds above the lake (Fall et al. 2006). Travel routes to access subsistence areas were reported to extend west along the lake to Dillingham, and east to Pile Bay and to Williamsport (PLP 2018-RFI 088).



Sources: PLP 2020; ADNRS  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

- Local Roads
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- Wild and Scenic River
- State Game Refuge/Sanctuary

■ Large Land Mammals, 1980-2002  
(Holen et al., 2005)

■ All Resources, 2004  
(Fall et al., 2006)

■ All Resources, 1960-82  
(Wright, Morris, and Schroeder, 1985)

■ Overlapping Subsistence Use Areas  
All Resources  
1996-2005  
(SRB&A 2018)

**SUBSISTENCE USE AREAS, ALL RESOURCES - PEDRO BAY**

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FIGURE 3.9-7



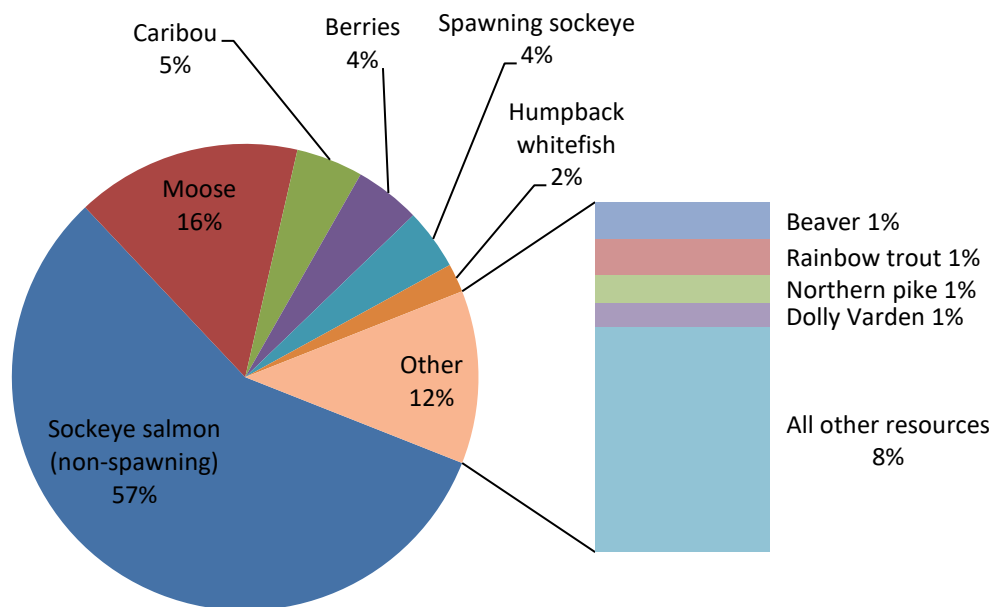
### 3.9.3.4 Nondalton

Nondalton is a primarily Dena'ina community on Sixmile Lake. In 2004, Nondalton had an estimated year-round population of 164 people in 43 households. In 2004, Nondalton residents pursued a diverse range of productive subsistence activities, and harvested a total of 58,686 pounds (358 pounds per capita) of wild food (Fall et al. 2006). Salmon dominated the subsistence production of Nondalton residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Nondalton residents in 2004 in terms of edible weight are shown in Figure 3.9-8.

Plants and fungi was the most widely used resource category (97 percent of households) followed by salmon (92 percent), large land mammals (84 percent), non-salmon fish (82 percent), small land mammals (58 percent), and birds and eggs (50 percent). Sharing and distribution of subsistence foods was widespread. In 2004, 97 percent of Nondalton households received wild resources, and 92 percent of households gave resources away (Fall et al. 2006). Table 3.9-7 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested plants and fungi, salmon, non-salmon fish, and small land mammals.

Trends in Nondalton subsistence harvest over time indicate that the estimated harvest in 2004 was lower than in previous study years. Nondalton residents cited changes in animal populations as the primary explanation for reduced harvests in at least one resource category. Other factors for harvesting less were personal reasons and poor or unusual weather. Survey participants commented that caribou numbers have declined, affecting subsistence resources, and that locals could not compete with non-local hunters. They also noticed that disturbance from helicopter traffic causes the caribou herd to move farther away, and they were seeing a trend of overharvest of caribou and moose by non-locals (Fall et al. 2006).

**Figure 3.9-8: Composition of Nondalton Subsistence Harvest by Estimated Edible Weight, 2004**



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall  
Source: Fall et al. 2006

**Table 3.9-7: Nondalton Subsistence Harvest Estimates by Resource Category, 2004**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Try to Harvest	Harvest	Give	Receive	Total Pounds	Average Household Pounds	Per Capita Pounds	
All Resources	100	97	97	92	97	58,686	1,365	358	100.0
Salmon	92	87	87	55	63	36,005	837	219	61.4
Non-Salmon Fish	82	76	76	53	45	5,562	129	34	9.5
Large Land Mammals	84	45	26	47	79	12,210	284	74	20.8
Small Land Mammals	58	50	50	45	21	1,207	28	7	2.1
Marine Mammals <sup>2</sup>	8	3	0	0	8	0	0	0	0.0
Birds and Eggs	50	47	47	40	24	624	15	4	1.1
Marine Invertebrates	13	8	8	3	13	66	1.5	0.4	0.1
Plants and Fungi	97	92	92	55	40	3,012	70	18	5.1

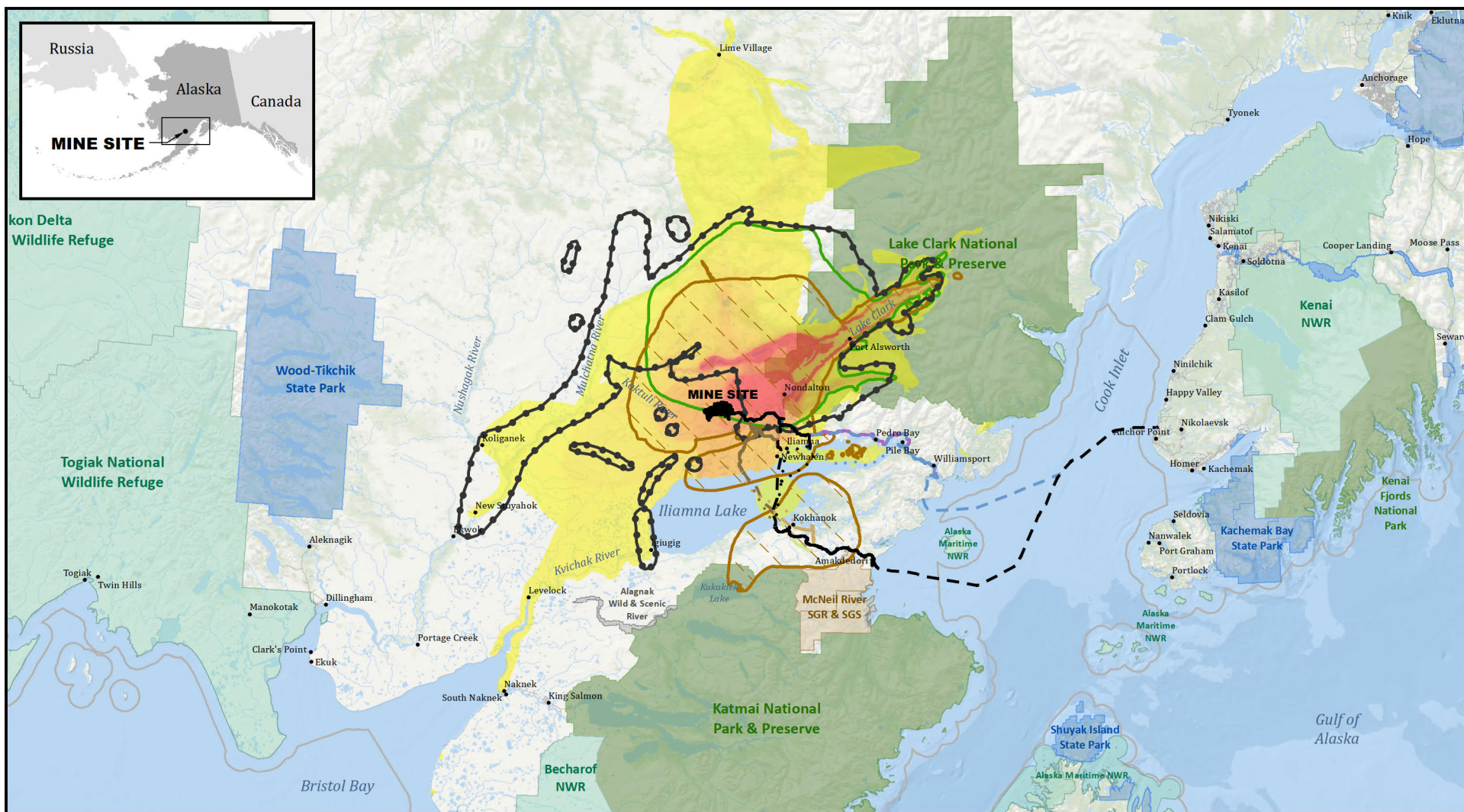
Notes:

<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

<sup>2</sup>The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Figure 3.9-9 illustrates 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Nondalton in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. Use areas for caribou, moose, black bear, and brown bear hunting were from the headwaters of the Mulchatna River and toward the Koktuli River system (Fall et al. 2006). Residents traveled south to Iliamna, to the headwaters of Upper Talarik Creek, and to the eastern end of Little Lake Clark (Fall et al. 2006). Fishing for salmon and freshwater fish occurred primarily at fish camps south of Nondalton at the outlet of Sixmile Lake. Fish camps have deep cultural and social significance; often considered the peak social gathering of the year, fish camps are where many families pass on traditional skills and values, and where individual and community identity is reaffirmed (Deur et al. 2018). Trapping of small game and furbearers occurred near Nondalton, close to the headwaters of Upper Talarik Creek, and in the Chulitna River valley. Waterfowl and upland bird hunting occurred in these same areas. Fishing also occurred in the Newhalen River near Petrof Falls, and on Lake Clark in Chulitna Bay. The area around the northern and southern shores of Iliamna Lake, into the headwaters of the Koktuli River near Groundhog Mountain and Frying Pan Lake, was used for berry picking. Wild plant harvest occurred in the area immediately around Nondalton and on islands in Iliamna Lake, including Flat Island (Fall et al. 2006). Nondalton has strong cultural and kinship ties to Lime Village (a community outside the EIS analysis area) that influence sharing networks. For example, residents of the two communities share caribou meat with one another, and residents of Nondalton travel to the Lime Village area to hunt when caribou are scarce closer to home (Holen and Lemons 2010; Deur et al. 2018). The community of Nondalton is also recorded as sharing salmon with the Bristol Bay community of Perryville (Hutchinson-Scarborough et al. 2020).



Sources: PLP 2020; ADNIR  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

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- National Park
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- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

■ Large Land Mammals, 1980-2002  
(Holen et al., 2005)

■ All Resources, 2004  
(Fall et al., 2006)

■ All Resources, 1960-82  
(Wright, Morris, and Schroeder, 1985)

■ Overlapping Subsistence Use Areas  
All Resources  
1996/97 - 2005/06  
(SRB&A 2018)

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**SUBSISTENCE USE AREAS, ALL RESOURCES - NONDALTON**

**FIGURE 3.9-9**

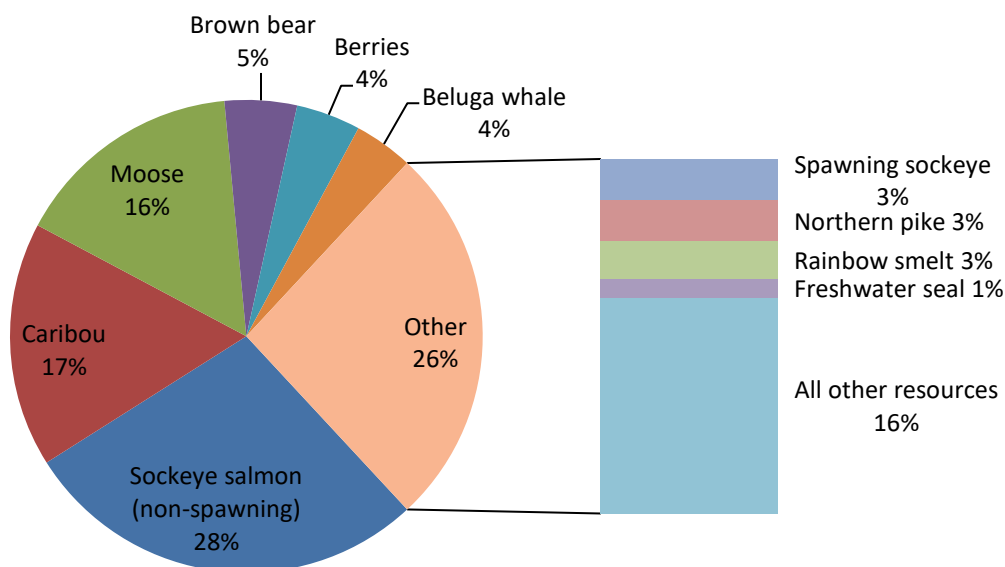


### 3.9.3.5 Igiugig

Igiugig is on the southeastern side of Iliamna Lake at the mouth of the Kvichak River, and was formerly a portage point for a reindeer station established at Kukaklek Lake in the early 1900s (Deur 2008). It was historically a Yup'ik village, and is now home to primarily Alutiiq, Yup'ik, and Dena'ina peoples. In 2005, Igiugig had an estimated year-round population of 41 people in 13 households. Residents pursue a wide array of productive subsistence activities. Krieg et al. (2009) surveyed residents about their 2005 subsistence activities, and found that Igiugig households harvested an estimated total of 22,310 pounds (542 pounds per capita) of wild foods. Although salmon dominate the subsistence food production of residents, moose and caribou provide a larger portion of total subsistence food when compared to the other Iliamna Lake communities for per-capita harvests, as shown in Table 3.9-2. The top 10 resources harvested in 2005 in terms of edible weight are shown in Figure 3.9-10.

In 2005, salmon, non-salmon fish, plants and fungi, and large land mammals were the most widely used resource categories in Igiugig (100 percent of households). Other widely used resource categories included birds and eggs (92 percent of households), marine mammals (67 percent), and small land mammals (50 percent). Sharing and distribution of subsistence foods is widespread. All households received and gave away at least one subsistence resource in 2005 (Krieg et al. 2009). Table 3.9-8 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2005. Most households tried for and harvested salmon, non-salmon fish, large land mammals, small land mammals, birds and eggs, and plants and fungi. In addition to relying heavily on subsistence hunting and fishing, the community relies on commercial fishing for cash income, with some families holding commercial fishing permits, and other working in the canneries (Deur 2008).

**Figure 3.9-10: Composition of Igiugig Subsistence Harvest by Estimated Edible Weight, 2005**



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall

Source: Krieg et al. 2009

**Table 3.9-8: Igiugig Subsistence Harvest Estimates by Resource Category, 2005**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	100	100	22,310	1,716	542	100.0
Salmon	100	92	92	83	83	8,447	650	205	37.9
Non-Salmon Fish	100	83	83	58	92	2,445	188	59	11.0
Large Land Mammals	100	75	58	83	92	8,353	643	203	37.4
Small Land Mammals	50	42	33	42	17	203	16	5	0.9
Marine Mammals <sup>2</sup>	67	33	33	42	58	1,204	93	29	5.4
Birds and Eggs	92	83	83	67	50	487	38	12	2.2
Marine Invertebrates	17	0	0	0	17	0	0	0	0.0
Plants and Fungi	100	100	100	83	67	1,172	90	29	5.3

Notes:

<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

<sup>2</sup>The marine mammals category includes saltwater and freshwater seals

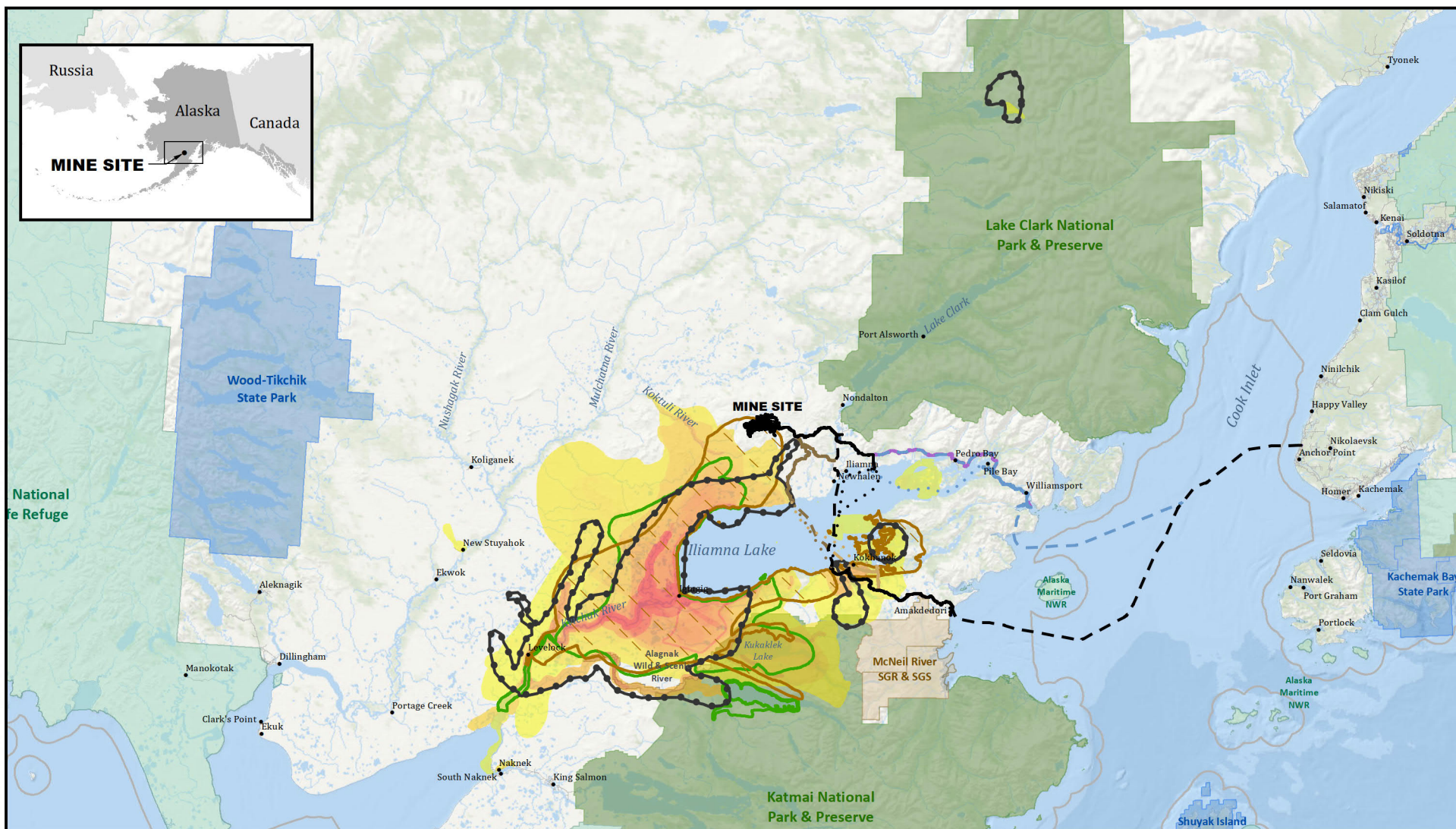
Source: Krieg et al. 2009

Trends in Igiugig subsistence harvest over time indicate that overall harvests remained relatively unchanged over the study years. Salmon use decreased, and harvest of large land mammals increased (SRB&A 2011b). Reasons residents cited for changes were personal reasons and change in animal populations. It was noted that personal reasons accounted for 75 percent of households using less salmon, and 50 percent of households using fewer non-salmon fish, birds and eggs, and wild plants. Residents noted that these declines were from a need for fewer resources due to smaller families. All households reported that they were using fewer furbearers due to lower fur prices and higher costs of transportation (fuel) (Krieg et al. 2009).

Figure 3.9-11 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Igiugig in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. The Igiugig subsistence use area encompasses a large area that extends around much of Iliamna Lake, and along the entire Kvichak River to Naknek. Travel for subsistence extends into Katmai National Park and Preserve and to the Mulchatna River. The majority of Igiugig's high-use areas are close to the community along the western shore of the lake, and along Kaskanak Creek, and the Kvichak and Alagnak river corridors. Medium- to low-use areas for overlapping resources for waterfowl, upland birds, berries, and plants in the summer and fall are in the vicinity of the northern mine access roads and ferry terminals. Igiugig residents harvest beluga whales near the mouth of the Kvichak River near the community of Levelock, and harvest freshwater seals in the Kvichak River (SRB&A 2018). In addition, hunters from Igiugig harvest freshwater seals in the northeastern portion of Iliamna Lake on two different islands known as "seal island," and in the waters surrounding Flat Island, Knutson Bay, and around the mouth of the Newhalen River (Burns et al. 2016). Travel routes were across the same areas as harvest areas, with a lake route crossing occurring close to the shorelines (PLP 2018-RFI 088).

Igiugig has ties to Port Heiden (a community outside the EIS analysis area, in the Bristol Bay), and is recorded as sharing salmon with Port Heiden (Hutchinson-Scarborough et al. 2020).





Sources: PLP 2020; ADNIR  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

#### Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
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- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

- Large Land Mammals, 1980-2002 (Holen et al., 2005)
- All Resources, 2004 (Fall et al., 2006)
- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996/97 - 2005/06 (SRB&A 2018)

**SUBSISTENCE USE AREAS, ALL RESOURCES - IGIUGIG**

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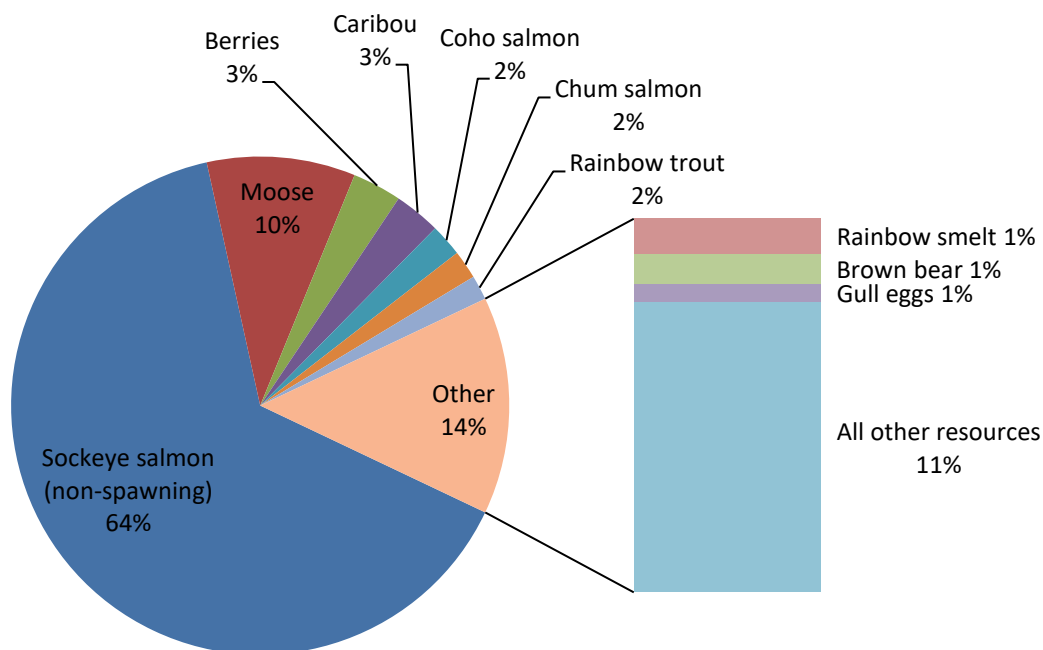
FIGURE 3.9-11

### 3.9.3.6 Kokhanok

Kokhanok is a predominantly Alaska Native community on the southern shore of Iliamna Lake. The Alaska Native population is a mix of Alutiiq, Yup'ik, and Dena'ina peoples. Economically, Kokhanok residents are highly dependent on subsistence fishing and hunting, with little industrial or tourist-based economic development; with subsistence hunting, fishing, and gathering representing a significant source of non-cash income (Deur 2008). In 2005, Kokhanok had an estimated year-round population of 158 people in 42 households. Kokhanok residents pursued a diverse range of productive subsistence activities, and harvested an estimated total of 107,645 pounds of wild foods (680 pounds per capita) in 2005. Salmon dominated the subsistence production of Kokhanok residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Kokhanok residents in 2005 in terms of edible weight are shown in Figure 3.9-12.

Salmon, as well as plants and fungi, were the most widely used resource categories (97 percent of households), followed by birds and eggs (91 percent), large land mammals (89 percent), non-salmon fish (74 percent), small land mammals (43 percent), and marine mammals (40 percent). Sharing and distribution of subsistence foods is widespread. In 2005, 94 percent of Kokhanok households received wild resources, and 83 percent of households gave resources away (Krieg et al. 2009). Table 3.9-9 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2005. Most households tried for and harvested salmon, non-salmon fish, birds and eggs, and plants and fungi.

**Figure 3.9-12: Composition of Kokhanok Subsistence Harvest by Estimated Edible Weight, 2005**



Source: Krieg et al. 2009

**Table 3.9-9: Kokhanok Subsistence Harvest Estimates by Resource Category, 2005**

Resource	Percent of Households					Estimated Edible Harvest <sup>1</sup>			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	97	83	94	107,645	2,563	680	100.0
Salmon	97	89	83	63	60	81,222	1,934	513	75.5
Non-Salmon Fish	74	66	66	57	51	5,752	137	36	5.3
Large Land Mammals	89	63	46	40	71	14,957	356	94	13.9
Small Land Mammals	43	40	37	20	14	239	6	2	0.2
Marine Mammals <sup>2</sup>	40	23	11	14	23	269	6	2	0.2
Birds and Eggs	91	89	89	69	43	1,237	30	8	1.1
Marine Invertebrates	9	9	9	6	3	74	2	1	0.1
Plants and Fungi	97	97	97	34	34	3,894	93	25	3.6

Notes:

<sup>1</sup>Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

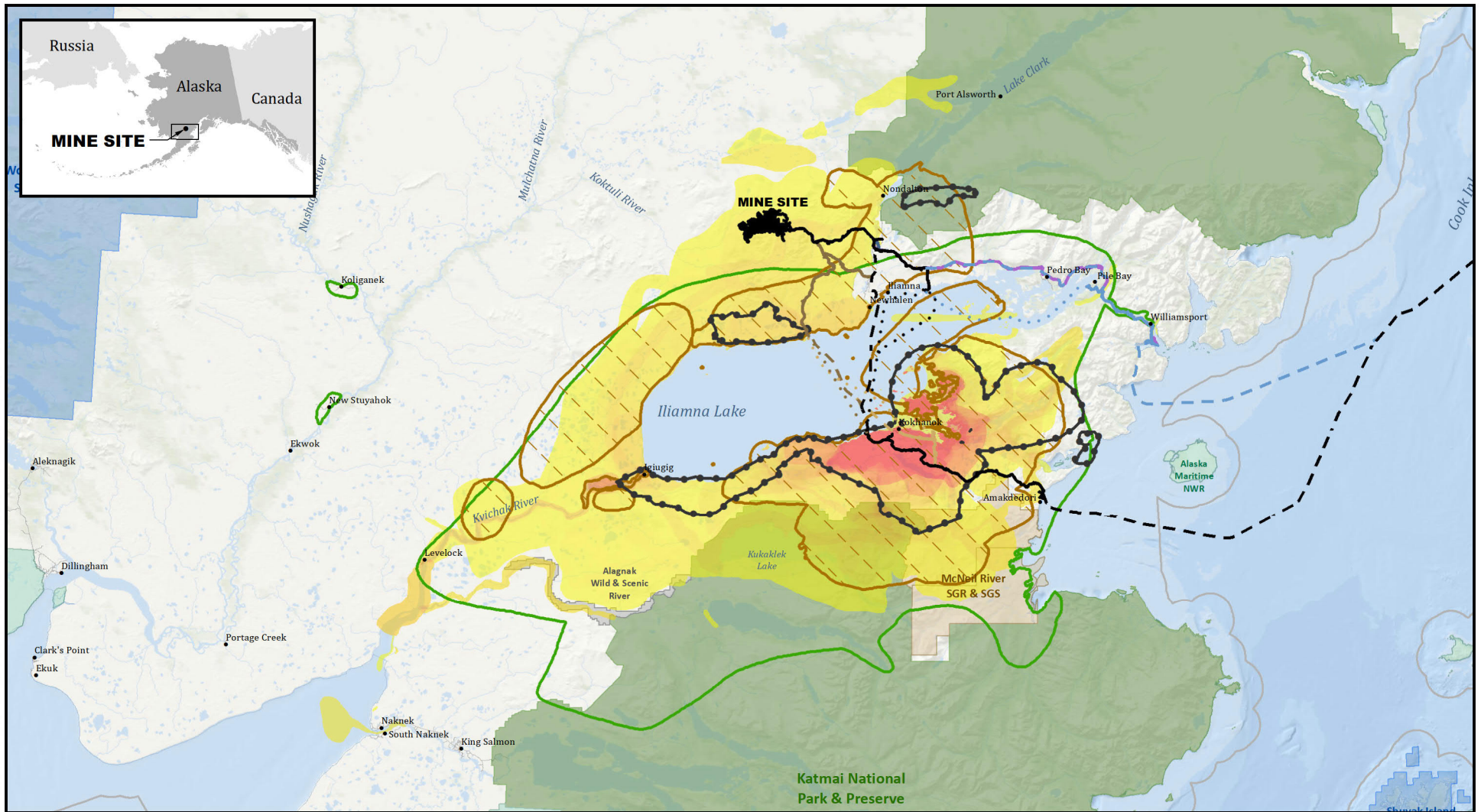
<sup>2</sup>The marine mammals category includes saltwater and freshwater seals

Source: Krieg et al. 2009

Trends in Kokhanok subsistence harvest over time indicate that the 2005 harvest was lower than in previous study years. This was primarily due to declines in large land mammal harvests. In 2005, Kokhanok residents most frequently cited animal population changes as the reason for changes in subsistence harvests and uses, particularly scarcity of moose and caribou. Weather was cited as another reason for changes in resource harvests and uses; weather can impact the abundance of resources, as well as travel conditions (Krieg et al. 2009).

Figure 3.9-13 illustrates the 1996 to 2005 overlapping subsistence search and harvest area for Kokhanok in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. The highest-use areas for all resources were the areas closest to the community along the Iliamna Lake shoreline towards Big Mountain, near the south ferry terminal, and along the south mine access road. The areas of use for all resources extend as far north as the Chulitna River, and west from Nondalton and Newhalen to the upper Koktuli River, Kaskanak Creek, and the Kvichak and Alagnak rivers. To the south of the community, use areas extend into Katmai National Park and Preserve, and east into Cook Inlet. Overlapping resource use areas are between Dennis Creek to the west near the southern ferry terminal, to the south along the south access road near Gibraltar Lake and east to Tommy Point, as well as the islands near Kokhanok and Intricate, Leon, and Kokhanok bays. The lands to the south of Kokhanok are overlapping use areas for caribou, moose, bear, fish, waterfowl, upland birds, berries, and plants (SRB&A 2018). Hunters from Kokhanok harvest freshwater seals in the northeastern portion of Iliamna Lake in waters around Triangle Island, two different islands known as “seal island,” Flat Island, Tommy Point, Tommy Islands, Tommy Creek area, Leon Bay, the mouth of the Gibraltar River, and Knutson Bay (Burns et al. 2016). Travel routes occur close to the Iliamna Lake shoreline, and would cross the south ferry terminal location, with a direct route to Igiugig along the shoreline and a route directly across Iliamna Lake between Iliamna and Kokhanok (PLP 2018-RFI 088).





Sources: PLP 2020; ADNRC  
Subsistence Use Areas by  
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#### Action Alternatives

- ..... Ferry Routes
- Natural Gas Pipelines
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- Alternative 1

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- Large Land Mammals, 1980-2002 (Holen et al., 2005)
- All Resources, 2005 (Krieg et al., 2009)
- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996-2005 (SRB&A 2018)

**SUBSISTENCE USE AREAS, ALL RESOURCES - KOKHANOK**

PEBBLE PROJECT EIS

FIGURE 3.9-13