PUBLIC

Application for Incidental Harassment Authorization during Construction of the Alaska LNG Project in Prudhoe Bay, Alaska

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REVISION HISTORY

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*This signature approves the most recent version of this document.

MODIFICATION HISTORY

Rev	Section	Modification

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ACRONYMS AND ABBREVIATIONS

4MP .....Marine Mammal Monitoring and Mitigation Program
ADF&G.....Alaska Department of Fish and Game
AEWC.....Alaska Eskimo Whaling Commission
AGDC .....Alaska Gasline Development Corporation
ASAMM .....Aerial Survey of Arctic Marine Mammals
ASAP .....Alaska Standalone Pipeline project
BA .....Biological Assessment
BOEM .....Bureau of Ocean Energy Management
BPXA.....British Petroleum (Alaska), Inc.
BWASP.....Bowhead Whale Aerial Survey Project
CAA.....Conflict Avoidance Agreement
Caltrans .....California Department of Transportation
CFR .....Code of Federal Regulations
CI .....confidence interval
COMIDA .....Chukchi Offshore Monitoring in Drilling Area
CV .....coefficient of variance
dB re 1 µPa.....decibels referenced to once microPascal
dBA.....A-weighted decibel
DH2 .....Dock Head 2
DH3 .....Dock Head 3
DH4 .....Dock Head 4
DPS .....Distinct Population Segment
EA .....Environmental Assessment
EIS.....Environmental Impact Statement
ENP .....Eastern North Pacific
ER .....Environmental Report
ESA .....Endangered Species Act
ESW .....effective strip width
FERC .....Federal Energy Regulatory Commission
FONSI.....Finding of No Significant Impact
FR .....Federal Register
GPS .....Global Positioning System - Real Time Kinematic
GTP .....Gas Treatment Plant
Hz .....Hertz
IHA.....Incidental Harassment Authorization
IR .....infrared
ITS.....Incidental Take Statement
IWC.....International Whaling Commission
kHz.....kiloHertz

LNG.....liquified natural gas
LOC.....Letter of Concurrence
L_{pk} .....peak sound level
MLLW .....Mean Lower Low Water
MMPA .....Marine Mammal Protection Act
MTSA.....Marine Transit Staging Area
NEPA.....National Environmental Policy Act
NGA .....National Gas Act
NMFS.....National Marine Fisheries Service
NOAA.....National Oceanic and Atmospheric Administration
NRC.....National Research Council
NSB.....North Slope Borough
NTU .....nephelometric turbidity units
NVD .....Night Vision Device
OSP.....Optimum Sustainable Population
PBOSA .....Prudhoe Bay Offshore Staging Area
PBTL.....Prudhoe Bay Transmission Line
PBU.....Prudhoe Bay Unit
PM.....Project Manager
POC.....Plan of Cooperation
PSO.....protected species observer
PTS.....Permanent Threshold Shift
PTU.....Point Thomson Unit
PTTL.....Point Thomson Gas Transmission Line
rms .....root mean square
rpm.....revolutions per minute
SBRA.....Stephen Braund Research Associates, Inc.
SD .....Standard Deviation
SEL.....sound exposure level
SPCC .....Spill Prevention, Control, and Countermeasure
SPMT .....Self-propelled module transporter
SPL.....sound pressure level
STP.....Seawater Treatment Plant
TL.....transmission loss
TS.....threshold shift
TTS.....Temporary Threshold Shift
USACE.....United States Army Corps of Engineers
USC.....United States Code
USCG .....U.S. Coast Guard
USDOT.....U.S. Department of Transportation
USFWS.....U.S. Fish and Wildlife Service

1. DESCRIPTION OF ACTIVITIES

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1. Nature of Request

The Alaska Gasline Development Corporation (AGDC) is the project sponsor and "Applicant" for the Alaska LNG Project (Project), and hereby petitions the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to issue an incidental harassment authorization (IHA) pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) for the non-lethal unintentional taking of small numbers of marine mammals incidental to construction activities in Prudhoe Bay, Alaska for the Project over a one-year period beginning July 1, 2021 through June 30, 2022.

AGDC plans to construct one integrated liquefied natural gas (LNG) Project (Figure 1) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and for in-state deliveries of natural gas. The Project includes a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 807-mile (1,299-kilometer) gas pipeline (Mainline); a gas treatment plant (GTP) within the PBU on the North Slope; an approximately 63-mile (101-kilometer) gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and an approximately 1-mile (1.6-kilometer) gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). These facilities are essential to export natural gas in foreign commerce and will have a nominal design life of 30 years.

An application has been submitted to the Federal Energy Regulatory Commission (FERC) for authorization of the Project under Section 3 of the Natural Gas Act (NGA). A full description of the Project is provided in Resource Report No. 1 within the Environmental Report (ER) submitted with the application. An Environmental Impact Statement (EIS) is being prepared, with FERC as the lead agency, as part of the regulatory review under the National Environmental Policy Act (NEPA). This EIS will include the activities described in the ER as well as this petition. FERC is also the lead agency for Section 7 consultation with NMFS and the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) for authorization of the Project under the NGA. A draft Applicant-prepared Biological Assessment (BA) has been prepared as part of this consultation effort, and can be viewed as Appendix C to Resource Report No. 3 in the FERC application. FERC will finalize the BA in consultation with NMFS and the USFWS in the course of the development of the Draft EIS.

Proposed Project construction activities in Prudhoe Bay consist of modifications to the existing West Dock causeway and associated dock heads. Aspects of these proposed West Dock modifications that have the potential to incidentally harass marine mammals are: the airborne and underwater noise generated by vibratory and impact pile driving and some construction activities through ice. The Geographic Region in which the planned activities would occur covers a total of approximately 155 square miles or 99,275 acres

(402 square kilometers) surrounding the West Dock causeway, the proposed temporary barge bridge, and a proposed barge marshalling area (Figure 1, Figure 2).

Section 216.104 of the MMPA sets out 14 specific items that must be addressed in requests for IHAs pursuant to Section 101(a)(5) of the MMPA. The 14 items are addressed in Sections 1 through 14 of this application. The IHA will identify permissible methods of non-lethal take, measures to ensure the least practicable adverse impact on the species and on the availability of these species for subsistence uses, and requirements for monitoring and reporting.

Figure 1: Alaska LNG Project Vicinity Map

Figure 2: Geographic Region: West Dock Modifications

1.1.1. Regulatory Context

1.1.1.1. Marine Mammal Protection Act

Section 101(a)(5) of the MMPA, 16 United States Code (USC) Section 1371(a)(5)(A) authorizes the Secretary of Commerce through the NMFS to issue permits that allow the incidental, but not intentional, taking of small numbers of marine mammals associated with specified activities (other than commercial fishing), provided that the total of such taking will have no more than a negligible impact on the affected marine mammal species or stocks, and does not have an unmitigable adverse impact on the availability of these species or stocks for subsistence uses. U.S. citizens seeking to carry out activities (other than commercial fishing) that may result in the incidental taking of small numbers of these marine mammals may petition the NMFS to issue IHAs for the specified activities in a specified geographical region. The following key terms and definitions have been promulgated in federal regulations implementing the MMPA at 50 Code of Federal Regulations (CFR) Section 18.27(c):

- **Take** means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.
- **Harassment** means any act of pursuit, torment, or annoyance which has the potential to: 1) injure a marine mammal or marine mammal stock in the wild (Level A harassment); or 2) disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).
- **Incidental, but not intentional taking** means takings which are infrequent, unavoidable, or accidental. It does not mean that the taking must be unexpected.
- **Negligible impact** is an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.
- **Unmitigable adverse impact** means an impact resulting from the specified activity: 1) that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs (i) by causing the marine mammals to abandon or avoid hunting areas, (ii) directly displacing subsistence users, (iii) or placing physical barriers between the marine mammals and the subsistence hunters; and 2) that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

IHAs issued under Section 101(a)(5)(A) of the MMPA do not permit, approve, or otherwise allow any individual or class of commercial, industrial, or development activity to occur. Each IHA issued by NMFS imposes specific enforceable mitigation, monitoring, and reporting tailored to the activity addressed in the IHA to ensure that interactions with the identified marine mammal species or stocks occur in small numbers and with no more than a negligible impact.

1.1.1.2. Endangered Species Act

The ESA establishes a comprehensive statutory scheme intended to conserve fish, wildlife, and plants facing extinction. Section 4 of the ESA, 16 USC Section 1533, provides authority for the listing of species as either "threatened" or "endangered," and for the designation of "critical habitat" for listed species. Once a species has been listed, the provisions of the ESA afford protection to such species and to designated critical habitat in the form of various procedural and substantive requirements and prohibitions.

Under Section 7 of the ESA, 16 USC Section 1536, federal agencies must ensure, through consultation with NMFS or the USFWS, that actions authorized, funded, or carried out by such agencies are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat designated for such species. If, as a result of consultation, NMFS or USFWS concludes that the proposed action is not likely to jeopardize listed species or to destroy or adversely modify designated critical habitat, it will issue an Incidental Take Statement (ITS) authorizing take expected to occur as a result of the action. Importantly, as to ESA-listed marine mammals, under Section 7(b)(4)(C) of the ESA, no ITS may be issued with respect to a marine mammal unless authorization for the incidental take has been obtained pursuant to Section 105(a)(5)(A) of the MMPA.

In addition to the consultation requirements of Section 7, Section 9 of the ESA, 16 USC Section 1538, broadly prohibits any person from the taking of any endangered species in the U.S. or on the high seas, except pursuant to an incidental take authorization issued by USFWS or NMFS, or as otherwise allowed by statutory exemption. The ESA defines a take to mean to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (50 CFR Section 17.3). In contrast to the MMPA, take under the ESA has been defined to encompass "harm," which has in turn been defined to include "significant habitat modification or degradation where it injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." The take prohibition does not apply to species listed as "threatened." Instead, under Section 4(d) of the ESA, 1 USC Section 1533(d), a regulation may be promulgated applying the taking prohibitions of Section 9 to threatened species.

1.1.1.3. National Environmental Policy Act

Section 102 of NEPA, 42 USC Section 4332(C), mandates a thoughtful and reasonably thorough analysis of the probable environmental impacts of a proposed major federal action, including analysis of both a reasonable range of alternatives that achieve the purpose and need for the Project, and analysis of the no action alternative. An environmental assessment (EA) is a concise document that provides sufficient information and analysis to determine whether preparation of an EIS is necessary. NEPA requires preparation of an EIS for major federal actions that significantly affect the quality of the human environment. An EIS is not required if, after preparation of an EA, a federal agency issues a finding of no significant impact (FONSI). The requirements of NEPA are entirely procedural.

Accordingly, while NEPA mandates a thoughtful and thorough analysis, it does not establish any substantive NMFS standards or compel a particular decision to approve, modify, or disapprove a proposal.

NMFS must comply with the NEPA process as a part of its analysis and issuance of an IHA. The proposed action – the IHA – does not permit, authorize, or otherwise allow any oil and gas activity. Rather, the agency action being analyzed is authorization of non-lethal incidental (unintentional) take of small numbers of marine mammals over a one-year period in a defined geographic area, that have no more than a negligible impact on these species and that have no unmitigable adverse impact on the availability of these species for subsistence uses by Alaska Natives. Because the proposed action must necessarily have no more than a negligible impact, we anticipate that NMFS may, as in the past, satisfy NEPA through an EA and FONSI process or most likely tier under the FERC EIS.

1.2. Purpose and Need

The purpose of the Alaska LNG Project is to commercialize the vast natural gas resources on Alaska's North Slope, principally by converting the available natural gas supply to LNG for export. Alaska LNG is a $43 billion energy infrastructure project proposed by the AGDC that will strengthen the United States economy by providing thousands of high-paying jobs, benefitting American businesses, and improving trade with Asia through the sale of LNG, an increasingly important commodity in the world market. Foreign demand for natural gas has increased, making LNG export the best option to commercialize these abundant Alaskan resources at this time.

When completed, the Project's pipeline will span approximately 807 miles (1,290 kilometers) from a gas treatment facility on Alaska's North Slope, which holds 35 trillion cubic feet of proven gas reserves, to a liquefaction and export facility in southcentral Alaska. The Project would require temporary construction activities in the marine environment to successfully build and operate a natural gas pipeline. The Alaska LNG Project will be the largest integrated natural gas/LNG project of its kind designed and constructed in the United States. It will result in the following benefits, which are consistent with the public interest:

- Stimulate the Alaska state, regional and national economies through job creation, an enhanced tax base, and an increase in overall economic activity, thus producing "unequivocally positive" economic impacts in Alaska and the United States as a whole;
- Create up to 15,000 jobs during construction and approximately 1,000 jobs for operation of the project;
- Develop infrastructure for future exploration and production opportunities; and
- Provide the opportunity for a reliable in-state gas supply that potentially will enable future economic development.

1.3. Description of Alaska LNG Activities

A description of the entire Alaska LNG Project is provided in Resource Report No.1 in the ER submitted to FERC. This application requests an IHA only for the pile driving activities associated with construction of the Project in the Prudhoe Bay area that would take place in the marine environment and potentially result in the incidental harassment of marine mammals as defined by the MMPA. Other activities are included for reference only. Alaska LNG components with activities to be included in the IHA are

summarized in Table 1. Authorization is requested only for activities to be conducted July 1, 2021 through June 30, 2022. Activities identified for 2022-2027 are not expected to result in incidental takes.

Table 1: Planned Alaska LNG Activities within the Geographic Region

Project Component	Activity	Year		
		2021	2022	2023-2027
Causeway Widening	Haul and deposit gravel [1]	*		
DH4 Construction	Gravel hauling and deposition [1]	*		
	Install sheet pile walls (pile driving) [2]	*		
	Install mooring dolphins (pile driving) [2]	*		
	Install bag armor [1]	*		
	Excavate overfill / re-compact gravel [3]		*	
	Prepare seabed / level berths (screeding) [4]		*	*
Barge Bridge and Abutments	Haul and deposit gravel [5]	*		
	Install bulkhead (pile driving) [5]	*		
	Install mooring dolphins (pile driving) [5]	*		
	Prepare barge bridge seabed pad [6]		*	*
	Install / remove barge bridge [7]		*	*
Sealift	Vessel transit to Prudhoe Bay [8]		*	*
	Offload materials / modules at DH4 [9]		*	*

[1] Planned for June-September 2021

[2] Planned for September-October 2021 outside of Nuiqsut whaling season

[3] Planned for May-June 2022

[4] Planned for July just after ice recedes 2022

[5] Planned for July-August 2021

[6] Initial preparation planned through the ice in February-April 2022, with additional minor smoothing in July 2022-2027

[7] Barge bridge to be installed in August and removed in September 2022-2027

[8] Vessels would transit Chukchi Sea and Beaufort Sea July-September 2022-2027

[9] Materials offloading (smaller modules, equipment, supplies) planned for August-September 2022-2023; GTP module offloading planned for August-September 2024-2027

These activities would occur on and around West Dock, an existing causeway located on the northwest shore of Prudhoe Bay, Alaska, within the PBU, and operated by BP Exploration (Alaska) Inc. (BPXA). West Dock is a multipurpose facility, commonly used to offload marine cargo to support Prudhoe Bay oilfield development. The West Dock causeway, which extends approximately 2.5 miles (4 kilometers) into Prudhoe Bay from the shoreline, is a solid-fill gravel causeway structure that was constructed in multiple phases between 1974 and 1981 (Figure 3). There are two existing loading docks along the causeway, referred to as Dock Head 2 (DH2) and Dock Head 3 (DH3), and a seawater treatment plant (STP) at the seaward terminus of the structure. A 650-foot (198-meter) breach with a single lane bridge was installed in the causeway between DH2 and DH3 during 1995 and 1996 due to concerns that the solid causeway was impacting coastal circulation and marine resources.

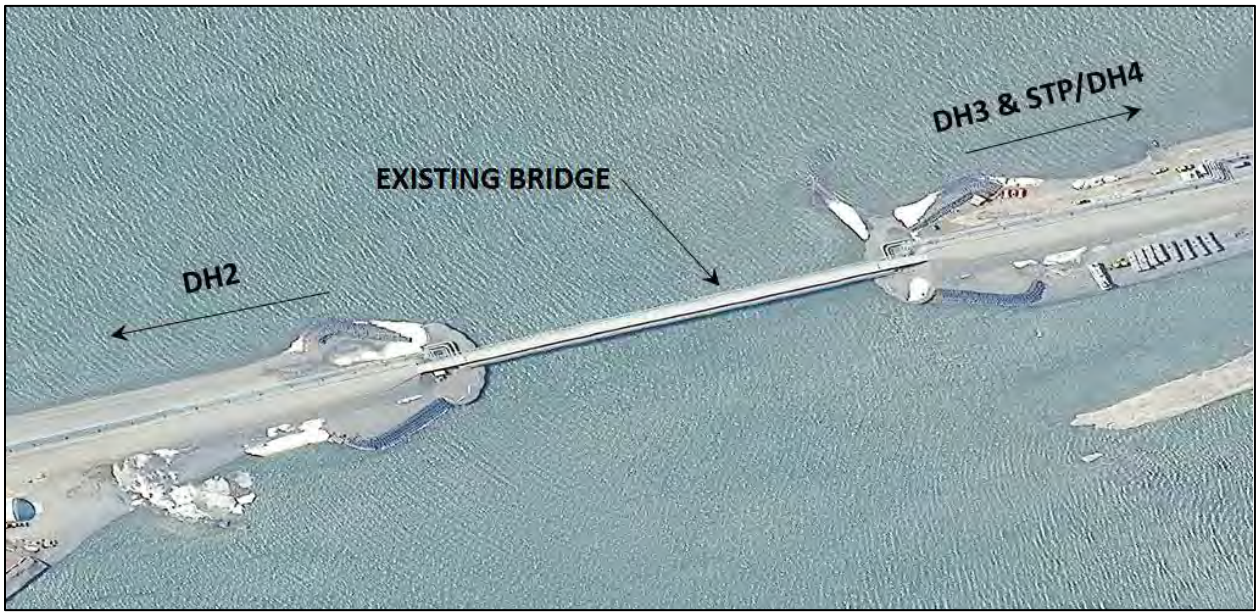
The proposed Alaska LNG GTP would be constructed with large pre-fabricated modules that that can only be transported to the North Slope with barges (sealift). An accessible and well-functioning dock facility

would be required in Prudhoe Bay to receive these large modular components and as such, upgrades to dock and causeway infrastructure at West Dock are required for offloading the modules, and for transporting the modules to the GTP construction site.

Development of the dock facility would require construction of a new dock head referred to as Dock Head 4 (DH4). The gravel causeway between the proposed DH4 site and the onshore road system is too narrow for module transport and must be widened in several areas. The existing bridge over the aforementioned breach is also too narrow for module transport and is not capable of supporting the weight of the Project modules (Figure 4). A temporary barge bridge is therefore proposed to accommodate transport of the modules over the breach. New sheet pile and gravel abutments would be constructed along the east side of the existing bridge, and four mooring dolphins would be installed. Two barges would then be placed along these mooring dolphins and between the abutments to form a temporary bridge for module transport. Sealifts and barge bridge installation/removal would occur each of six consecutive years to accommodate the modules required for the Project. The following describes these activities in detail.

Figure 3: Existing Conditions at West Dock

Figure 4: Existing Conditions at the West Dock Breach / Bridge



1.3.1. Causeway Widening

Existing segments of the West Dock causeway would be upgraded as follows:

- A parallel causeway approximately 100–125 feet (30.5-38.1-meter) wide and 5,000-foot-long (1,524-meter-long) would be built on the east side of the existing causeway from DH 3 to DH 4;
- The other two existing segments of West Dock causeway would be upgraded to a width of approximately 100–125 feet (30.5-38.1-meter) from the current width of 40-80 feet (12.2-24.4 meters). The widening would be conducted on the east side of the causeway because there is a pipeline along the west side. The widening would occur along approximately:
    - 4,500 feet (1,372 meters) from DH3 to DH2, and
    - 3,800 feet (1,158 meters) from DH2 to land.

This causeway widening work would be conducted during the summer (July-August). Gravel would be hauled in by truck and deposited in place by shore-based heavy equipment. Expected gravel requirements are indicated in Table 2. The primary source of gravel would be a new (proposed) onshore mine located southwest of the GTP plant site and just north of the Putuligayuk River.

Table 2: Gravel Requirements for Proposed West Dock Causeway Widening: Alaska LNG

Causeway Section	Gravel Quantity cubic yards (cubic meters)	Surface Area Acres (hectares)
1 – shore to barge bridge [1]	100,000 (76,455)	5 (2.0)
2 – barge bridge to DH3 [2]	150,000 (114,683)	7 (2.8)
3 – DH3 to DH4	300,000 (229,366)	14 (5.7)
All	550,000 (420,505)	26 (10.5)

[1] Includes the gravel to be placed behind the bulkhead at the south abutment of the barge bridge

[2] Includes the gravel to be placed behind the bulkhead at the north abutment of the barge bridge

Other proposed causeway upgrades include construction of DH4, construction of new bridge abutments, and installation and use of a temporary barge bridge as described below.

1.3.2. Dock Head 4 Construction

1.3.2.1. DH4 Work Area and Bulkhead

The new dock head would be a gravity-based structure, with a combi-wall (sheet piles connected by H piles) bulkhead or dock face back-filled with gravel. The gravel dock head would provide a working area of approximately 31 acres (0.13 square kilometers) and would have 5 cargo berths (Figure 5). Gravel requirements are quantified in Table 3. The primary source of gravel would be a new (proposed) onshore mine located southwest of the GTP plant site and just north of the Putuligayuk River. Gravel would be hauled in by truck and deposited in place by shore-based heavy equipment. Hauling and placement of gravel for construction of DH4 would occur in June-September.

Table 3: Gravel Requirements for Proposed DH4 Construction for the Alaska LNG Project

Section	Gravel Quantity cubic yards (cubic meters)	Surface Area Acres (hectares)
DH4 Surface	1,200,000 (917,466)	30 (12.1)
DH4 Side Slope	50,000 (38,228)	3 (1.2)
All	1,250,000 (955,694)	33 (13.3)

Construction of DH4 as proposed would require the installation of over 1,080 linear feet (329 meters) of combi-wall forming a bulkhead at the dock face (Figure 5). Other margins of the dock head would be sloped and armored with sand bags. Two types of hammers would be used for pile driving: vibratory hammers and impact hammers. The numbers and types of piles expected to be driven are indicated, by hammer type, in Table 4.

Table 4: Piles to be Installed at the Proposed DH4 for the Alaska LNG Project

DH4 Component	Pile Type / Size	Method	Total Piles	Piles / Day	Duration / Pile (strikes or minutes)	Work Days
Bulkhead	11.5-inch H pile [1,2]	Impact	212	26	1,000	9
Bulkhead	25-inch sheet pile [1,5]	Vibratory	422	12	24.0	36
Mooring Dolphins	48-inch pipe pile [1,3]	Impact	12	1.25	1,000	10
Mooring Dolphins	14-inch H pile (temp) [1,4]	Vibratory	48	4	13.4	12
All	NA	--	694	NA	NA	67

[1] All piles are steel.

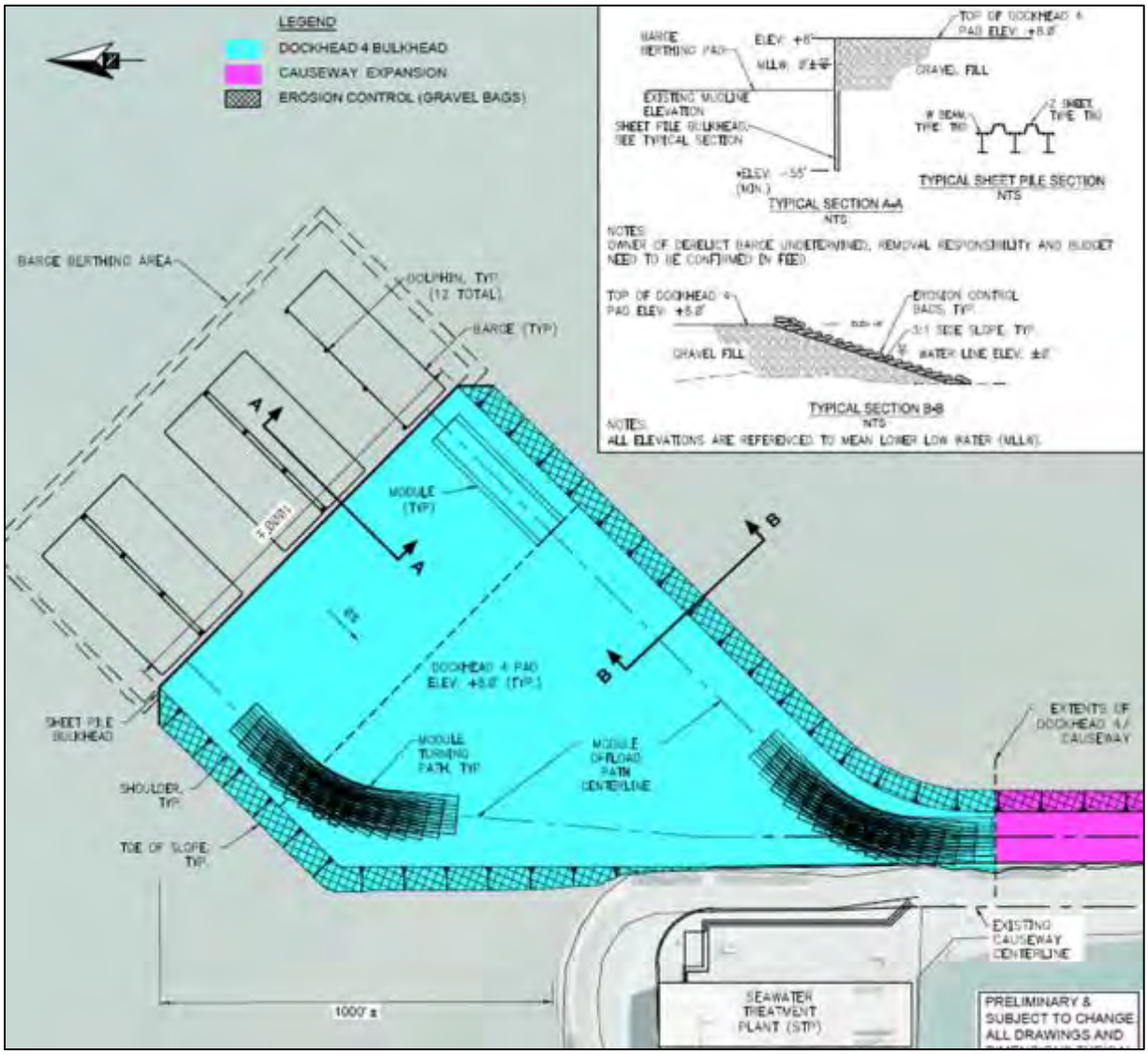
[2] These H piles are expected to be W 33x118 type steel H piles with width of 11.5 inches each, length of 63 feet, and embedment depth of 43 feet; along with the sheet pile they form a combi-wall; days is the number of calendar days on which pile driving of 11.5 inch H piles would be driven based on a rate of 25 feet linear (horizontal) feet of piles per day (total length 203 feet).

[3] Mooring dolphins are expected to be (1) 48-inch round steel pile each, with a length of 100 feet, and estimated embedment depth of 65 feet; days are calendar days during which these piles would be driven based on a rate of 1.25 piles per day.

[4] Temporary spud piles used for support during installation of mooring dolphins, are assumed to be steel H piles, 14 inches wide and 30 feet long, 4 per mooring dolphin. They are installed with vibratory hammer, then removed with vibratory hammer after mooring dolphin is installed; it takes 1 hour to install four spuds and 1 hour to extract them; however, with the hiatus between installation and extraction (for installing the mooring dolphin) we assume a rate of 4 spuds per day.

[5] Sheet piles expected to be PZC18 Type steel sheets with a width of 25 inches each, length of 63 feet, and estimated embedment depth of 43 feet; the total horizontal length of sheet pile is 859 feet; days is the number of calendar days sheet piles would be driven based on a rate of 25 linear (horizontal) feet of piles per day.

Figure 5: Plan View of the Proposed Dock Head 4 for the Alaska LNG Project



Pile driving crews are expected to install an average of 25 linear feet (7.6 meter) of combi-wall (sheet pile and connecting 11.5-inch H piles) per shift, with the hammers operating approximately 40 percent of the 12-hour shift. The H piles would be installed using an impact hammer, averaging approximately 26 piles per day, and 1,000 strikes per pile. The 25-inch sheet piles would be installed using a vibratory hammer, averaging 12 piles per day, and taking approximately 24 minutes per pile. These averages include contingencies for weather, equipment, work flow, and other factors that affect the number of piles per day; therefore, these averages are assumed to be a maximum anticipated per day. DH4 would be constructed in June-October (open water season), with the hauling and placing of the gravel taking place first. Installation of the combi-wall is planned for mid-September-October (after the Nuiqsut whaling season and before ice). A contingency time period for combi-wall installation is March thru April of the

following year working off the ice, if the originally scheduled time period becomes infeasible due to unexpected logistical or other constraints.

1.3.2.2. DH4 Mooring Dolphins

Twelve mooring dolphins would be installed in the cargo berths at the proposed DH4 dock head to hold the ballasted barges in place. Locations of the proposed mooring dolphins are indicated in Figure 5. Impact pile driving would be used to install these (twelve) mooring dolphins (Table 4). Each mooring dolphin consists of one 48-inch-diameter (1.2-meter), 100-foot (30.5-meter) long pile that would be driven to a minimum of 65 feet (19.8 meters) into the seabed. The mooring dolphins would be installed at a rate averaging 1.25 piles per day and approximately 1,000 strikes per pile.

Four temporary spuds (14-inch steel H piles) would be installed for support prior to the construction of each mooring dolphin and would be extracted immediately after completion of the dolphin. A vibratory hammer would be used for both installation and extraction of these temporary spuds. It is expected to take 1 hour to install the four spuds for a single mooring dolphin and 1 hour to extract them. We assume four spuds will be installed and extracted per day.

Installation of the mooring dolphins is planned for September-October (after the Nuiqsut whaling season and before ice up). A contingency time period for dolphin installation is March thru April of the following year working off the ice, if the originally scheduled time period becomes infeasible due to unexpected logistical or other constraints.

1.3.2.3. Berthing Basin

The proposed location of the DH4 bulkhead is approximately 1,000 feet (305 meters) beyond the end of the existing causeway at the STP. This location was selected as it provides an existing nominal water depth of -12 feet (-3.7 meters) mean lower low water (MLLW) across the length of the bulkhead, allowing for berthing of cargo barges at their intended transit draft of 10 feet (3.05 meters) without the exchange of ballast water. It also provides a nominal 2 feet (0.6 meters) under keel clearance; therefore, no dredging is required for construction or use of the proposed DH4.

Screeding would be conducted over the seafloor within the berthing area to a depth of -12 feet (-3.7 meters) MLLW to ensure a smooth seafloor for grounding the barges. The berthing area (Figure 5) encompasses approximately 13.7 acres (0.06 square kilometers). In the screeding process, a tug and/or barge (Figure 6) pushes or drags a beam or blade across the seafloor, removing high spots and filling local depressions in the seabed without the need for excavation or disposal of seabed materials. The screeding process would redistribute the seabed materials to provide a flat and even surface on which the module cargo barges can be grounded. The screeding operation is not intended to increase or decrease overall seabed elevation so there would be no excavated materials requiring disposal.

Screeding would be performed in the summer immediately prior to each sealift and as soon as sea ice conditions allow mobilization of the screeding barge. Based on historical ice data, screeding is anticipated to be conducted during July for a period of up to 14 days. While the barges produce underwater sounds that may result in some temporary disturbance of marine mammals, NMFS does not consider typical

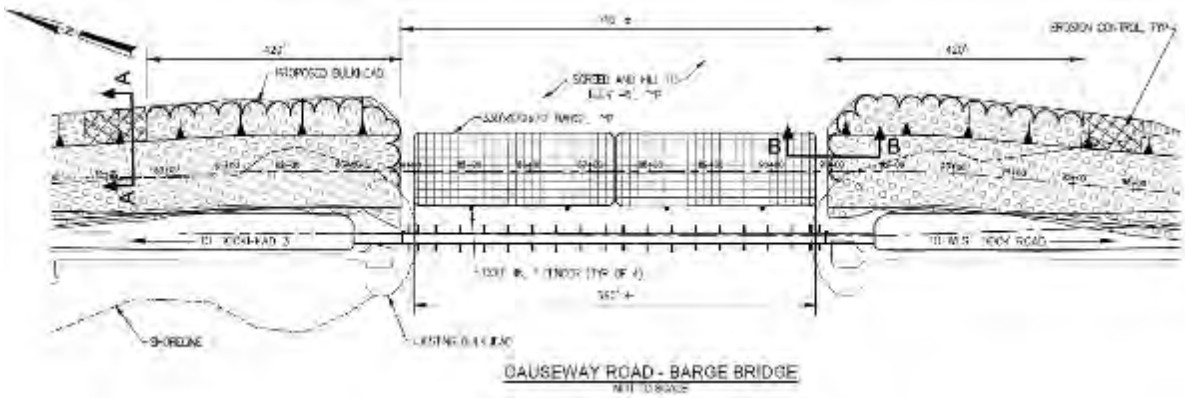
vessel work to require an IHA. A multi-beam hydrographic survey would be performed to identify high and low spots in the seabed prior to each season. The survey would be conducted with equipment emitting sound above 200 kiloHertz (kHz) to avoid marine mammal sound exposures.

Figure 6: A Screeding Barge with the Screed Blade Raised

1.3.3. Barge Bridge

The existing bridge over the aforementioned 650-foot (198-meter) breach in the causeway is too narrow for module transport and incapable of supporting the weight of the Project modules. A temporary barge bridge would therefore be constructed to accommodate transport of the modules over the breach and to the onshore road system (Figure 7). The barge bridge would be installed annually each sealift year, at the beginning of the open-water season, and would be removed each fall prior to freeze-up. The approach abutments would be constructed and mooring dolphins would be installed in the first season, and the seabed would be prepared before installation of the barge bridge for the first sealift. Some seabed preparation is expected to be required prior to installation and use of the barge bridge in each subsequent sealift year.

Figure 7: Proposed Temporary Barge Bridge



1.3.3.1. Barge Bridge Abutments

Approach abutments would be constructed along the east side of the existing causeway on both ends of the barge bridge. These abutments would be constructed of gravel filled open-cell sheet-piled bulkheads with gravel bags for erosion control where there is no bulkhead. The bulkheads would be approximately 420 feet (128 meters) long (along the causeway) and 120 feet (36.6 meters) across (Figure 7). Gravel quantities required for construction of the abutments are included in the quantities provided in Table 2 (south abutment included in Causeway Section 1 and north abutment in Section 2). Surface area impacts are included in the estimates for the causeway widening (Table 2). The numbers and types of pilings to be installed for the bulkhead are provided in Table 5.

Table 5: Piles to be Installed for the Barge Bridge Abutments, Alaska LNG Project

DH4 Component	Part	Piles (number by hammer type)		
		Vibratory Hammer	Impact Hammer	All
		Sheet Pile [1]	14-inch H Pile [2]	
South Abutment	Dock face [1]	429	--	429
	Tail wall [2]	540	18	558
	Total	969	18	987
North Abutment	Dock face [1]	389	--	389
	Tail wall [2]	448	13	461
	Total	837	13	850
Grand Total	--	1,806	31	1,837

[1] Steel sheet piles expected to be PS27.5 Type with width of 19.69 inches each, length of 63 feet, and estimated embedment depth if 43 feet.

[2] H piles expected to be HP 14 x 89 type steel H piles with width of 14 inches each, length of 63 feet, and embedment depth of 43 feet;

Much of the abutment sheet pile is for the tail walls that run back from the bulkhead into the gravel fill and terminate at an anchor pile (H pile). A large portion of this tail wall piling and many of the tail wall anchor piles (H piles) would be located above MLLW and would therefore be driven into dry ground and are not included in the analysis for assessing in-water noise impacts on marine mammals. The numbers

and types of piles that would be driven into Prudhoe Bay waters below MLLW for the barge bridge abutments are indicated in Table 6.

Table 6: Piles to be Installed Below MLLW for the Proposed Alaska LNG Barge Bridge Abutments

Barge Bridge	Component	Pile Type / Size	Method	Total Piles	Piles / Day	Duration / Pile (strikes or minutes)	Work Days [2]
South Abutment	Dock face	14-inch H pile [3]	Impact	--	--	--	--
		19.69-inch sheet pile [1]	Vibratory	350	16	18.9	23
	Tail wall	14-inch H pile [3]	Impact	4	22	1,000	1
		19.69-inch sheet pile [1]	Vibratory	345	16	18.9	23
	Total	NA	NA	699	NA	NA	47
North Abutment	Dock face	14-inch H pile [3]	Impact	--	--	--	--
		19.69-inch sheet pile [1]	Vibratory	353	16	18.9	24
	Tail wall	14-inch H pile [3]	Impact	4	22	1,000	1
		19.69-inch sheet pile [1]	Vibratory	256	16	18.9	17
	Total	NA	NA	613	NA	NA	42
Grand Total	All	NA	NA	1,312	NA	NA	89

[1] Steel sheet piles expected to be PS27.5 Type with width of 19.69 inches each, and length of 63 feet, and embedment depth of 43 feet; total linear (horizontal) length of the 1,304 sheet piles is 2,139.6 feet.

[2] Days is the number of calendar days on which pile driving of sheet piles would occur based on a rate of 25 feet linear (horizontal) feet of sheet piles per day rounded up to whole day.

[3] Steel H piles expected to be HP 14x89 type H piles with width of 14 inches each, length of 40 feet; total linear (horizontal) length of the 8 H piles is 9.3 feet.

[4] Days is the number of calendar days on which pile driving of sheet piles would occur based on a rate of 25 feet linear (horizontal) feet of sheet piles per day rounded up to whole day.

Two types of hammers would be used for pile driving: vibratory pile driving would be used to install the sheet pile (dock face and tail walls) for the new bulkhead, and impact hammers would be used to install the associated tail wall anchor piles. Sheet piles would be installed from land or barges on open water, and potentially from the ice if the schedule is altered. Pile driving crews typically install an average of approximately 25 linear (horizontal) feet (7.62 meters) of abutment (sheet pile and H pile) per shift, depending on weather, substrate, and equipment, with the hammers operating approximately 40 percent of the time. The 19.69-inch sheet piles would be installed using a vibratory hammer, averaging 15.24 piles per day taking approximately 19 minutes per pile. These averages include contingencies for weather, equipment, work flow, and other factors that affect the number of piles per day; therefore, these averages are assumed to be a maximum anticipated per day.

Construction of the barge bridge abutments is scheduled for July-August with no pile-driving to be conducted during the Nuiqsut whaling season (August 25-September 15). A contingency time period for installation is March thru April of the following year working off the ice, if the originally scheduled time period becomes infeasible due to unexpected logistical or other constraints.

1.3.3.2. Barge Bridge Mooring Dolphins

Four mooring dolphins (Table 7) would be installed at the barge bridge site to protect the current bridge from the barges and hold the ballasted barges in place. Each mooring dolphin consists of one 48 inch-diameter (1.2-meter), 100-foot (30.5-meter) long steel pipe pile that would be driven with an impact hammer to a minimum of 65 feet (19.8 meters) into the seabed. These 48-inch piles are expected to be driven to depth at a rate of 1.25 piles / day with an estimated 1,000 strikes would be required per pile.

As described above for the DH4 mooring dolphins, 4 temporary spuds (14.5-inch steel H piles) would be installed for support prior to the construction of each barge bridge mooring dolphin (Table 7) and would be extracted immediately after completion of the dolphin. A vibratory hammer would be used for both installation and extraction. It is expected to take 1 hour to install the four spuds for a single mooring dolphin and 1 hour to extract them. We assume four spuds would be installed and extracted per day.

Table 7: Piles to be Installed for the Proposed Barge Bridge Mooring Dolphins

Barge Bridge Component	Pile Type / Size	Method	Total Piles	Piles / Day	Duration / Pile (strikes or minutes)	Work Days[3,5]
Mooring Dolphins	48-inch pipe pile[1,2,3]	Impact	4	1.25	1,000	4
Mooring Dolphins	14-inch H pile (temp)[1,4,5]	Vibratory	16	4	13.4	4
All	NA	NA	20	NA	NA	8

[1] All piles are steel.

[2] Mooring dolphins are expected to be (1) 48-inch steel round pipe pile each, with a length of 100 feet, and estimated embedment depth of 65 feet. Total linear (horizontal) length of the 4 piles is 16 feet.

[3] Days is the number of calendar days on which pile driving of the 48-inch piles would be expected to occur (total days) based on a production rate of 1.25 piles per day rounded up to whole day; actual duration will be dependent on weather, substrate, and equipment.

[4] Temporary spud piles used for support during installation of mooring dolphins, are assumed to be steel H piles, 14 inches wide and 30 feet long, 4 per mooring dolphin. They will be installed with a vibratory hammer and extracted with a vibratory hammer after each mooring dolphin is installed.

[5] Days is the number of calendar days on which pile driving of the temporary spud pile would occur; they are installed with vibratory hammer, then removed with vibratory hammer after mooring dolphin is installed; it takes 1 hour to install four spuds and 1 hour to extract them; however with the hiatus between installation and extraction (for installing the mooring dolphin 48-inch pile) we assume a rate of 4 spuds per day.

Construction of the barge bridge abutments, including installation of the mooring dolphins, is scheduled for July-August, with no pile-driving to be conducted during the Nuiqsut whaling season (August 25-September 15). The contingency time period (if not completed as scheduled) for dolphin installation is March thru April of the following year, working off of ice.

1.3.3.3. Seabed Preparation at the Barge Bridge

At the beginning of each sealift season, bridge barges would be positioned in the breach and ballasted to a prepared pad surface to form a bridge. A level and stable barge pad must be constructed to support the ballasted barges at the proper horizontal and vertical location for successful transit of modules across the breach. The pad would be designed to support the fully loaded weight of the barge and the heaviest modules.

Pad construction would include an initial through-ice bathymetric survey within the breach. This through-ice survey would be conducted by drilling or augering holes through the ice and measuring the bottom elevations by a survey rod tied to the local Global Positioning System - Real Time Kinematic (GPS-RTK) system to provide the needed level of accuracy of horizontal positions and vertical elevations. A grid of survey holes would be established over the 710-foot (216-meter) by 160-foot (48.8-meter) dimensions (2.6 acres; 0.01 square kilometers) of the breach barge pad to allow for determination of the bottom bathymetry such that a plan can be developed accordingly to prepare the barge pad surface.

Seabed preparation would consist of smoothing the seabed within the pad area as necessary to level the seabed across the pad at an elevation grade of approximately -7 feet (-2.1-meter) MLLW. Some gravel fill may be required at scour holes. The primary source of gravel would be a new (proposed) onshore mine located southwest of the GTP plant site and just north of the Putuligayuk River. Trucks would be loaded at the mine with gravel and driven to the site for stockpiling and/or placement with loaders and excavators. Rock filled marine mattresses (Figure 8) or gabions approximately 1 foot (0.3 meters) thick would then be placed across the graded pad to provide a stable and low maintenance surface at -6 feet (-1.8 meters) MLLW on which the barges would be grounded. These mattresses are gravel filled containers constructed of high-strength geogrid, with the geogrid panels laced together to form mattress-shaped baskets.

The seabed preparations would be performed through the ice during winter using excavation equipment and ice excavation methods. Equipment required for the grading work includes ice trenchers, excavators, front end loaders, man-lifts, haul trucks, survey equipment, and other ancillary equipment necessary to support the operation. An equipment spread is considered to include a trencher for cutting ice, an excavator for removing ice, a second excavator, and haul units. Through-ice grading efforts would be initiated by cutting through the ice with trenchers. Excavators would then proceed to remove the ice to expose the seafloor bottom. Once a section has been exposed to the seafloor, the bottom will be graded to -7 feet (-2.1 meters) MLLW using the excavation equipment. Marine mattresses would then be installed on the graded pad, likely requiring use of a crane. Grounded ice conditions are expected to occur at the breach on or before February 1st of each year at the latest. Through-ice surveying and grading work would be expected to begin immediately after, if not sooner. Total construction duration is estimated at between 45 and 60 days with construction being complete by end of March and demobilization from the breach area in early April.

There would potentially be some smoothing (screeding) right before the barges are placed in summer in an effort to achieve a surface that is near flush with adjacent subsurface elevations. Any screeding at the barge bridge site would be expected to take 14 days or less.

Figure 8: Stacked Marine Mattresses

Figure 9: A Trencher Cutting Through Ice

1.3.3.4. Barge Bridge Installation

The first two barges to offload would be used to form the temporary bridge, paralleling the existing weight-limited bridge, and spanning the breach. These barges would be moved into place against the mooring dolphins with tugs where they would be ballasted and fastened to the causeway abutments and each other. The two ballasted barges would be placed bow-to-bow when resting on the seafloor. The

barge rakes would angle upward and touch at their adjoining point, leaving an approximately 52.5-foot (16-meter) gap at the seafloor between the barges. The stern of each barge would angle sharply upward at each end of the bridge, leaving an additional 10-foot (3.1-meter) gap at the seafloor at each end.

Ramps would be installed to accommodate smooth transit of the self-propelled module transporters (SPMTs) over the bridge. Modules would be transported by SPMTs down the causeway and over the temporary bridge to a staging pad at the base of West Dock. From there, they would be moved southward over approximately 6 miles (9.7 kilometers) of new and existing roads to the GTP construction site.

Construction of the temporary barge bridge is expected to take 3 days. The temporary bridge would be held in place by the mooring dolphins. The temporary bridge is expected to be in place for 21 to 39 days, depending on weather conditions and logistics. At the conclusion of each year's sealift, the barges would be de-ballasted, and removed from the breach. Upon the subsequent summer season and the next sealift, the barges would be positioned back in the breach and re-ballasted onto the barge pad for module transport operations.

West Dock modifications would be left in place after modules are offloaded, as their removal would result in greater disturbance to the surrounding environment. The piling and infrastructure forming the offshoot and ramp to the temporary barge bridge would be left in place rather than pulling it out as this may result in erosion or weakening of the existing causeway. Mooring pilings would be cut below the sediment surface and removed, and then covered with surrounding sediment.

1.3.3.5. Sealifts

Six sealifts, consisting of two preliminary sealifts (NEG1 and NEG2) transporting materials (smaller modules, equipment, and supplies) and four primary sealifts (Sealifts 1-4) carrying the GTP modules, are proposed for the Alaska LNG Project. The timing, numbers of vessels, and numbers of modules associated with each of these six sealifts are identified in Table 8. Dimensions of these types of vessels are provided in Table 9. The sealifts are not analyzed for marine mammal exposures in this IHA.

The barges will transport the modules from the manufacturing site (likely Asia) with first call being Dutch Harbor to clear customs. The barges would then proceed to a designated Marine Transit Staging Area (MTSA), with Port Clarence being the preferred location for the MTSA at this time. The tug and barge will wait in a secure anchorage there until sea ice conditions have improved to 3/10 ice cover or better. The tow spread would be accompanied by a light aircraft which would repeatedly fly along the tow route to give a detailed report on sea and ice conditions. When such conditions are favorable, the tug and barge would proceed to the Prudhoe Bay Offshore Staging Area (PBOSA) located south (shoreward) of Reindeer Island and approximately 5 miles (8 kilometers) north of DH4 to await berthing at DH4.

Table 8: Pre-construction and Construction Sealifts to West Dock

Sealift	Year	Modules	Barges	Tugs		
				Ocean-going	Primary Assist [1]	Secondary Assist [1]
NEG2 [2]	2022	8	9	9	2	6
NEG1 [2]	2023	57	9	9	2	6
Sealift 1 [3]	2024	17	12	12	2	6
Sealift 2 [3]	2025	15	12	12	2	6
Sealift 3 [3]	2026	10	10	10	2	6
Sealift 4 [3]	2027	9	9	10	2	6

[1] Primary and secondary assist tugs remain in Prudhoe Bay area for the season, they are used to transit barges between PBOSA and DH4;

[2] Sealifts in NEG years are preconstruction sealifts transporting materials (smaller modules, equipment, and supplies); and

[3] Sealifts 1-4 are the primary construction sealifts transporting GTP modules.

The sealift barges would be moved from the PBOSA to DH4 with the shallow draft assist tugs. Offloading operations at DH4 would occur 24 hours a day during periods of favorable metocean and weather conditions. Current North Slope sealift practices limits operations to wind speed below 20 knots. The barges would be butted up against the dock face and then ballasted down until they rest on the pre-prepared barge bearing pad. Ramps would be placed to connect the barge deck with the dock so that the SPMTs are able to roll under the modules, lift them, then roll out and transport them to the onshore module staging area.

The barges would be demobilized from the PBOSA by ocean-going tugs using standard marine shipping routes. The barges would transit individually through the Beaufort and Chukchi seas rather than in groups, as occurred during their arrival into Prudhoe Bay. They would be demobilized from Prudhoe Bay on or about mid-September.

Table 9: Dimensions of the Types of Vessels to be used for Sealifts

Vessel Type	Bollard Pull (tons)	Length feet (meters)	Width feet (meters)	Height feet (meters)	Draft feet (meters)
Ocean-going tug	120	132 (40.2)	41 (12.5)	--	18 (5.5)
Assist tug (primary)	40	76.1 (23.2)	32 (9.8)	7.1 (2.2)	4 (1.2)[3,4]
Assist tug (secondary)	15	--	--	--	--
Coastal barge	NA	360 (109.8)	150 (45.7)	20 (6.1)	10 (3.0)
Purpose-built barge	NA	400 (121.9)	135 (41.1)	20 (6.1)	10 (3.0)

2. DATES, DURATION, AND GEOGRAPHIC REGION OF ACTIVITY

The dates and duration of such activity and the specific geographical region where it will occur.

The scope of this application includes construction activities in Prudhoe Bay, Alaska consisting of modifications to the existing West Dock causeway and associated dock heads. Aspects of these proposed West Dock modifications that have the potential to incidentally harass marine mammals are the airborne and underwater noise generated by vibratory and impact pile driving. The Geographic Region of activity for this application covers a total of approximately 155 square miles or 99,275 acres (402 square kilometers) surrounding the West Dock causeway, the proposed temporary barge bridge, and a proposed barge marshalling area (Figure 1, Figure 2) for the period of one year beginning July 1, 2021 through June 30, 2022. The construction activities are planned for the open water season (July through October), with a break in activity for the Nuiqsut bowhead whaling period (August 25-September 15 or earlier if whaling is complete). A contingency time period for installation is March thru April of the following year working off the ice, if the originally scheduled time period becomes infeasible due to unexpected logistical or other constraints.

The total number of in-water pile driving days, both impact and vibratory, is estimated to be 164 days. It is important to note this is not 164 calendar days, as different pile types would be installed on the same day. Pile driving is planned to occur between July and October in 2021 and 2022. Pile driving is planned to occur for a 24-hour work day with two crews working consecutive 12-hour days, 6 days each week.

3. TYPE AND ABUNDANCE OF MARINE MAMMALS IN THE GEOGRAPHIC REGION

The species and numbers of marine mammals likely to be found within the activity area.

3.1. Species and Number in the Geographic Region

The marine mammal species most likely to occur in the vicinity of the West Dock area are the bowhead whale (*Balaena mysticetus*), Beaufort Sea and Eastern Chukchi Sea stocks of beluga whale (*Delphinapterus leucas*), ringed seal (*Phoca hispida*), spotted seal (*Phoca largha*), and bearded seal (*Erignathus barbatus*). Most of these species migrate seasonally, following the ice north into the Beaufort Sea as it retreats in the spring and summer and south as it advances with freeze-up in the fall. Only ringed seals are expected around Prudhoe Bay in winter. The estimated stock size and status of these marine mammals are found in Table 10.

Table 10: Cetaceans and Pinnipeds in the Geographic Region

Species	Stock Estimate	Stock	ESA Status
Bowhead whale	16,820[1]	Western Arctic	Endangered
Gray whale	20,990[2]	Eastern North Pacific	None
Beluga whale	39,258[1]	Beaufort Sea	None
Beluga whale	20,752[1]	Eastern Chukchi Sea	None
Ringed seal	249,000[3]	Alaska	Threatened
Spotted seal	461,625[1]	Alaska	None
Bearded seal	155,000[4]	Alaska	Threatened

[1] Muto et al. 2018

[2] Caretta et al. 2018

[3] Allen and Angliss 2011

[4] Cameron et al. 2010

4. DESCRIPTION OF MARINE MAMMALS IN GEOGRAPHIC REGION

A description of the status, distribution, and seasonal distribution of the affected species or stocks of marine mammals likely to be affected by such activities.

Descriptions of the status, distribution, and seasonal distribution of the species or stocks of marine mammals that could potentially be affected by the planned activities (Table 10) are presented in the following subsections. Information provided in this section relates to the proposed activities in Prudhoe Bay.

4.1. Bowhead Whale

Of the five stocks of bowhead whale, only the Western Arctic stock is found within U.S. waters. This stock is listed as endangered under the ESA and depleted under the MMPA. The bowhead is classified as a strategic stock and an Alaska Species of Special Concern (Muto et al. 2018). From 1978 to 2011, the Western Arctic stock increased at a rate of 3.7% (95% Confidence Interval [CI] = 2.9-4.6%), and abundance tripled from approximately 5,000 to approximately 16,820 whales (Givens et al. 2016).

Bowhead whales belonging to the Western Arctic stock are distributed seasonally in ice-covered waters of the Arctic and near-Arctic, generally between 60 degrees and 75 degrees North latitude in the Western Arctic Basin (Moore and Reeves 1993; Muto et al. 2018). The majority of the stock migrates annually from wintering areas (December to March) in the central and northwestern Bering Sea, north through the Chukchi Sea in the spring (April through May) following offshore ice leads around the coast of Alaska, and into the eastern Beaufort Sea where they spend most of the summer (June through early to mid-October). Most animals from the stock return to the Bering Sea in the fall (September through December) where they overwinter (Braham et al. 1980; Moore and Reeves 1993; Citta et al. 2015; Muto et al. 2018).

Critical habitat has not been designated for the bowhead whale. NMFS was petitioned in 2000 to consider designating the nearshore areas from Utqiaġvik east to the U.S. – Canada border as critical habitat for the Western Arctic stock. In 2002, NMFS determined that a critical habitat designation was not necessary as the population was increasing and approaching the pre-commercial whaling size, there were no known

habitat issues slowing the population growth, and activities that occurred in the petitioned area were already being managed to minimize impacts to the population (Federal Register [FR] 67:55767).

The annual migration of the Western Arctic stock to and from the summer feeding grounds in the Beaufort Sea has been monitored by the Bureau of Ocean Energy Management (BOEM), NMFS, and/or industry since 1982 (Treacy et al. 2006; Blackwell et al. 2007; Ireland et al. 2009; Reiser et al. 2011; Bisson et al. 2013; Clarke et al. 2014). Survey data indicate that the fall migration off northern Alaska occurs primarily over the continental shelf, generally 12–37 miles (19-60 kilometers) offshore, in waters 66–197 feet (11-60 meters deep (Moore et al. 1989; Moore and Reeves 1993; Treacy 2002; Monnett and Treacy 2005; Treacy et al. 2006). Waters less than 15 feet (4.5 meters) deep are considered too shallow to support these whales, and in three decades of aerial surveys by BOEM (Aerial Survey of Arctic Marine Mammals [ASAMM], no bowhead whale has been recorded in waters less than 16.4 feet (5 meters) deep (Clarke and Ferguson 2010).

Monitoring surveys have been conducted annually since 2001 at the Northstar offshore oil and gas facility located just offshore of West Dock. Over 95% of the bowheads observed during these fall surveys occurred more than 13.9 miles (22.3 kilometers) offshore in 2001, 14.2 miles (22.9 kilometers) in 2002, 8.4 miles (13.5 kilometers) in 2003, and 10.1 miles (16.3 kilometers) in 2004 (Blackwell et al. 2007). West Dock extends out from the shoreline 2.7 miles (4.3 kilometers) and is within shallow waters less than 14.2 feet (4.3 meters) deep. The proposed Project activities would be conducted primarily along the West Dock causeway in an area developed for oil and gas with existing vessel traffic. While a small number of bowhead whales have been seen or heard offshore near Prudhoe Bay in late August (LGL and Greenridge 1996; Greene et al. 1999; Blackwell et al. 2007; Goetz et al. 2008), bowheads are not likely to occur in the immediate vicinity of the proposed activities (Figure 10).

Figure 10: Bowhead Whale Biologically Important Areas and Range: U.S. Waters

4.2. Gray Whale

There are two distinct population stocks inhabiting the Pacific Ocean. The Eastern North Pacific (ENP) stock utilizes U.S. waters from the southern coast of California north into Alaska. The most recent abundance estimate of 20,990 ENP gray whales was derived from the 2010/2011 survey of whales migrating southbound along the central California coast (Durban et al. 2013). In 1994, the ENP stock was delisted from the ESA due to recovery (59 FR 31094). Punt and Wade (2012) estimated the stock was at 85% of carrying capacity and is, therefore, within range of its optimum sustainable population (OSP).

The majority of the ENP stock of gray whales spend the summer and fall feeding in the Chukchi, Beaufort, and northwestern Bering seas before migrating south to the warmer water lagoons of coastal Baja California and Mexico. Prior to 1997, reports of gray whales in the Beaufort Sea were very rare. A single gray whale was killed at Cross Island in 1933 (Maher 1960), and small numbers were observed in the Canadian Beaufort Sea approximately 700 coastal miles (1,100 coastal kilometers) east of Point Barrow in 1980 (Rugh and Fraker 1981). Gray whale sightings became more common from 1998 to 2004, although still infrequent (Miller et al. 1999; Treacy 2000; Williams and Coltrane 2002), and, after 2005, the species has been regularly observed in the Beaufort Sea (Green and Negri 2005; Green et al. 2007; Jankowski et al. 2008; Lyons et al. 2009). Feeding gray whales were observed near Elson Lagoon (immediately east of Point Barrow) in 2005 (Green and Negri 2005) and in Smith Bay (approximately 62 miles [100 kilometers] east of Point Barrow) in 2007 (Green et al. 2007). Few gray whales have been documented as far east as Cape Halkett (approximately 99 miles [160 kilometers] east of Point Barrow) in the Beaufort Sea, and their occurrence within the Project area is not expected (Figure 11).

Figure 11: Gray Whale Biologically Important Areas and Range: U.S. Waters

4.3. Beluga Whale

Of the five stocks of beluga whales occurring in Alaska waters, two are known to inhabit the Beaufort Sea: the Beaufort Sea stock and the Eastern Chukchi Sea stock. The most current population estimate for the Beaufort stock is 39,258 animals, however, this estimate is based on aerial surveys conducted in 1992 and uses a conservative correction factor (Muto et al. 2018). For the Eastern Chukchi Sea stock, Lowry et al. (2017) combined ASAMM data collected in the northeastern Chukchi and Alaska Beaufort seas in late June through August 2012 with correction factors calculated from satellite-linked dive recorders and estimated a total abundance of 20,752 whales. Neither stock is listed as endangered under the ESA or depleted under the MMPA, and both stocks are classified as non-strategic (Muto et al. 2018).

Beluga whales from the two stocks migrate between the Bering and Beaufort seas and are closely associated with open leads and polynyas. The Beaufort Sea stock departs the Bering Sea in early spring, migrating through the Chukchi Sea and into the Canadian Beaufort Sea where they spend the summer and most of the fall, returning to the Bering Sea in the late fall. The Eastern Chukchi stock remains in the Bering Sea slightly longer, departing in the late spring and early summer for the Chukchi Sea and western Beaufort Sea where they spend the summer before returning to the Bering Sea in the fall (Muto et al. 2018).

Most belugas recorded during aerial surveys conducted in the Alaskan Beaufort Sea in the last two decades were found over 40 miles (65 kilometers) from shore (Miller et al. 1999; Funk et al. 2008; Christie et al. 2010; Clarke and Ferguson 2010; Brandon et al. 2011). ASAMM surveys in 2016 observed belugas along the continental slope with few sightings nearshore in the western Beaufort Sea, and Clarke et al. (2017) reported that distribution was similar to that documented in previous years with light sea ice cover.

Surveys have recorded belugas close to shore and in the vicinity to the activity area: Green and Negri (2005) reported small beluga groups nearshore Cape Lonely (August 26) and in Smith Bay (September 4); Funk et al. (2008) reported a group just offshore of the barrier islands near Simpson Lagoon; Aerts et al. (2008) reported summer sightings of three groups of eight animals inside the barrier islands near Prudhoe Bay; and Lomac-MacNair (2014) recorded 15 beluga whales offshore Prudhoe Bay between July and August. While it is possible for belugas to occur in the Project area, nearshore sightings are unlikely (Figure 12).

Figure 12: Eastern Chukchi & Beaufort Sea Beluga BIA and Range: U.S. Waters

4.4. Ringed Seal

Ringed seals are one of the most common marine mammals in the Beaufort, Chukchi, and Bering Seas, with the Alaska stock estimated at a minimum of 249,000 animals (Allen and Angliss 2011). Ringed seals rely on the sea ice for key life history functions and remain associated with the ice most of the year. Diminishing sea ice and snow resulting from climate change is the primary concern for this population and NMFS listed Arctic ringed seals as threatened under the ESA in 2012 (77 FR 76706). The threatened listing was vacated by the U.S. District Court for the District of Alaska in 2016 (Alaska Oil and Gas Association et al. v. Pritzker, Case No. 4:14-cv-00029-RPB), however, the U.S. Ninth Circuit Court of Appeals ruled to restore the ESA threatened listing in May 2018 (Alaska Oil and Gas Association et al. v. Ross). Because of the threatened ESA status, the stock is also listed as depleted under the MMPA and classified as a strategic stock. Critical habitat was proposed after the initial listing and will likely be re-evaluated by NMFS with the recently restored listing.

Ringed seals are associated with sea ice for most of the year and are well adapted to inhabiting both shorefast and pack ice. The ice provides a platform for pupping and nursing in late winter and early spring, for molting in late spring to early summer, and for resting during other times of the year. When sea ice is at its maximal extent during the winter and early spring in Alaska waters, ringed seal numbers are high in the northern Bering Sea, and throughout the Chukchi and Beaufort Seas. The species is generally not abundant south of Norton Sound, but animals have occurred as far south as Bristol Bay in years of extensive ice coverage (Muto et al. 2018).

Seasonal movements have not been thoroughly documented; however, most ringed seals that overwinter in the Bering and Chukchi seas are thought to migrate north as the ice retreats in the spring. Summers are spent feeding in the pack ice of the northern Chukchi and Beaufort seas, and in nearshore ice remnants of the Beaufort Sea. As the ice advances with freeze-up in the fall, many seals move west and south and disperse throughout the Chukchi and Bering seas while some remain in the Beaufort Sea (Muto et al. 2018).

Frost et al. (2004) conducted aerial surveys over the Beaufort Sea coast from Utqiaġvik to Kaktovik and determined that ringed seal density was greatest in water depths between 16 and 115 feet (5 and 35 meters), and in relatively flat ice close to the fast ice edge. Aerial surveys conducted in association with construction near the Northstar facility found ringed seal densities ranged from 0.39 to 0.83 seals per square kilometers (Moulton et al. 2005). Historically, ringed seal occurrence in or near the activity area has been minimal, and large concentrations of seals are not expected near West Dock during Project operations (Figure 13).

Figure 13: Ringed Seal Range: U.S. Waters

4.5. Spotted Seal

Spotted seals of the Alaska stock are found along the continental shelf of the Bering, Chukchi, and Beaufort Seas. Conn et al. (2014), with a limited subsample of aerial data collected over the U.S. Bering Sea, calculated a population estimate of approximately 461,625 spotted seals (95% CI: 388,732-560,348). The Alaska stock is not designated as depleted under the MMPA or listed as threatened or endangered under the ESA. NMFS completed an ESA status review of the species in 2009 and determined the listing was not warranted (73 FR 51615).

Distribution of the stock can be separated into two periods associated with specific life history events. During the late fall through spring, when seals are hauled out on sea ice, whelping, nursing, breeding, and molting occurs. After the sea ice has melted, most spotted seals haul out on land in the summer and fall (Boveng et al. 2009). Pupping occurs along the Bering Sea ice front during March and April, followed by mating and molting in May and June (Quakenbush 1988). During the summer months the seals follow the retreating ice north into the Chukchi and Beaufort seas, and haul out on lagoon and river delta beaches during the open water period. The migration back to the Bering Sea wintering grounds begins with sea ice advancement, usually in October (Lowry et al. 1998).

Spotted seals were recorded during barging activities between Prudhoe Bay and Cape Simpson from 2005-2007 (Green and Negri 2005, 2006; Green et al. 2007). Between 23 and 54 seals were observed annually, with the peak distributions found off the Colville and Piasuk rivers. Savarese et al. (2010) surveyed the central Beaufort Sea from 2006 to 2008 and recorded greater numbers of animals, with 59 to 125 spotted seals observed annually. Lomac-MacNair et al. (2014) observed 37 spotted seals in Prudhoe Bay (and another 39 that were either spotted or ringed seals), including several in the immediate vicinity of West Dock, while monitoring July-August seismic activity. Sighting data indicate that spotted seals could be encountered in the Project area during the summer months (Figure 14).

Figure 14: Spotted Seal Range: U.S. Waters

4.6. Bearded Seal

A reliable population estimate for the entire Alaska stock is not available. Cameron et al. (2010) provided a conservative estimate of 155,000 animals for the Beringia Distinct Population Segment (DPS), found in the Bering, Chukchi, and Beaufort Seas, based on data collected over the previous four decades. Based on more recent aerial abundance and distribution surveys conducted in the Bering Sea, Conn et al. (2014), with a very limited subsample of data, calculated an abundance estimate of approximately 299,174 (95% CI: 245,476-360,544) bearded seals in U.S. waters. The greatest cause for concern for the population is the ongoing and anticipated loss of sea ice due to climate change. For this reason, the Alaska stock of bearded seals was listed as threatened under the ESA in 2012 (77 FR 76740). The U.S. District Court for the District of Alaska vacated the listing in 2014 (Alaska Oil and Gas Association v. Pritzker, Case No. 4:13-cv-00018-RPB), however, the Ninth Circuit Court of Appeals restored the listing in 2016. The stock is now also listed as depleted under the MMPA and classified as a strategic stock. Critical habitat has not yet been designated for the bearded seal (Muto et al. 2018).

The Alaska stock of bearded seals is seasonally found in the shallow shelf waters of the Beaufort, Chukchi, and Bering Seas (Cameron et al. 2010). Bearded seals are closely associated with ice and their migration coincides with the sea ice retreat and advancement. Some seals are found in the Beaufort Sea year-round, however, most prefer to winter in the Bering Sea and summer in areas with high ice coverage (70-90%) in the Chukchi and Beaufort seas (Simpkins et al. 2003; Bengston et al. 2005). The stock feeds primarily on benthic organisms and demersal fishes, and is, therefore, closely linked to shallow waters that are less than 656 feet (200 meters) where they can reach the seafloor to forage (Muto et al. 2018).

Aerial surveys conducted in the Beaufort Sea indicated that bearded seals preferred water depths between 82-246 feet (25-75 meters) and areas of open ice cover (Cameron et al. 2010). ASAMM commonly observe bearded seals offshore in the Beaufort Sea; however, no sightings have been observed in the West Dock activity area. Based on bearded seal water depth and ice coverage preferences, survey observations in the Prudhoe Bay region, and the normal level of ongoing industrial activity in the Project area, only very small numbers of bearded seals are expected in the vicinity of the Project area (Figure 15).

Figure 15: Bearded Seal Range: U.S. Waters

5. REQUESTED TYPE OF INCIDENTAL TAKING AUTHORIZATION

The type of incidental taking authorization that is being requested and the method of incidental taking.

The Applicant requests an IHA from NMFS for the incidental take by harassment (Level A and Level B as defined in 50 CFR 216.3) of a small number of marine mammals during its planned activities from July 1, 2021 through June 30, 2022. The operations in Section 1 have the potential to result in takes by acoustic harassment of marine mammals during vibratory and impact pile driving activities. The effects would depend on the species and the distance and received level of the sound (Section 7). Temporary disturbance or localized displacement reactions are most likely to occur. While AGDC does not believe the construction activities would result in a serious injury or mortality of any marine mammal, AGDC is requesting Level A takes for bowhead whales and ringed, spotted and bearded seals over the 1-year period as part the request based on analyses of the potential acoustic harassment. This request is a precautionary measure to reduce the likelihood of marine mammal interactions. With implementation of the mitigation and monitoring measures described in Sections 11 and 13, Level A and Level B acoustic harassment are expected to be minimized.

6. NUMBER OF INCIDENTAL TAKES BY ACTIVITIES

By age, sex, and reproductive condition, the number of marine mammals [by species] that may be taken by each type of taking, and the number of times such takings by each type of taking are likely to occur.

6.1. Applicable Acoustic Criteria

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "…any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "…any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering."

For Level A, the revised NOAA Technical Memorandum NMFS-OPR (NMFS 2018a) provides guidelines for assessing the onset of temporary (TTSs) or permanent threshold shifts (PTSs) from anthropogenic sound. Under these guidelines, marine mammals are separated into five functional hearing groups; sound sources are separated into two types, impulsive (impact pile driving) and non-impulsive (vibratory pile driving); and analyses of the distances to both peak received sound pressure level (L_{pk}) and 24-hour cumulative sound exposure level (SEL_{24h}) are required.

The current Level B (disturbance) threshold for impulsive sound is 160 decibels referenced to 1 microPascal root mean square (dB re 1 µPa rms) and 120 dB re 1 µPa rms for non-impulsive sound for marine mammals.

NMFS has also established an airborne disturbance threshold of 90 dB re 20 µPa (un-weighted) for harbor seals and 100 dB re 20 µPa for all other pinnipeds.

Table 11 provides a summary of the disturbance guidelines. For purposes of this section, underwater sound pressure levels (SPLs) are reported as dB re 1 µPa and airborne SPLs are reported as dB re 20 µPa.

Table 11: Marine Mammal Injury and Disturbance Thresholds for Underwater Sound

Marine Mammals	Disturbance (Level A) Threshold		Injury (Level B) Threshold		Airborne (Level B) Threshold
	Impulsive	Non-Impulsive	Impulsive	Non-Impulsive	
Low-Frequency Cetaceans	219 dB L_{pk} 183 dB SEL	199 dB SEL	160 dB rms	120 dB rms	N/A
Mid-Frequency Cetaceans	230 dB L_{pk} 185 dB SEL	198 dB SEL	160 dB rms	120 dB rms	N/A
High-Frequency Cetaceans	202 dB L_{pk} 155 dB SEL	173 dB SEL	160 dB rms	120 dB rms	N/A
Phocid Pinnipeds	218 dB L_{pk} 185 dB SEL	201 dB SEL	160 dB rms	120 dB rms	90 dB/100 dB
Otariid Pinnipeds	232 dB L_{pk} 203 dB SEL	219 dB SEL	160 dB rms	120 dB rms	100 dB

6.2. Description of Underwater Sound Sources

Section 1 provides an overview of the construction activities that would occur in the period of July 1, 2021 through June 30, 2022. The acoustic characteristics of each of the activities are described in the following section and summarized in Table 12. Proposed Project construction activities in Prudhoe Bay consist of modifications to the existing West Dock causeway and associated dock heads. Aspects of these proposed West Dock modifications that have the potential to incidentally harass marine mammals are the airborne and underwater noise generated by vibratory and impact pile driving and some construction activities through ice.

6.2.1. Impact Pile Driving

As described in Section 1, the pile sizes requiring the use of an impact driver for this Project include 11.5-inch H pile, 14-inch H piles, and 48-inch pipe piles. Source levels for these piles were adopted from California Department of Transportation (Caltrans) (2015) who compiled measured SPL data from impact pile driving for pile sizes ranging in diameter from 12 to 96 inches. The reported SPLs for 12-inch H piles of 183 dB rms, 200 dB peak and 170 SEL at 16.4 feet (5 meters), were used as representatives for the 11.5-inch H piles for the Project. The reported SPLs for 14-inch H piles of 187 dB rms[1],208 dB peak, and 177 SEL at 16.4 feet (5 meters) were used as representatives for the Project's 14-inch H piles. The reported SPLs for 60-inch piles of 195 dB rms, 210 dB peak, and 185 SEL re 1 µPa at 16.4 feet (5 meters) were used as representative of the Project's 48-inch piles. The energy is generally between 100 and 4,000 Hertz (Hz) with a concentration at 125 Hz.

The U.S. Department of Transportation (USDOT's) Construction Noise Model Handbook provides a summary of equipment with measured maximum airborne sound levels at 50 feet (15 meters). The

[1] 183 dB rms was from Illingworth and Rodkin (2007), not Caltrans 2015 as it was not provided in the Table I.2-1.

handbook reports an airborne level of 101 dBA[2] at 50 feet (15 meters) for impact pile driving. These sources are summarized in Table 12.

Table 12: Summary of Noise Sources

Activity	Airborne Sound Level (dB re 20 µPa)	Underwater Sound Level (dB re 1 µPa)	Frequency	Reference
Impact 11.5-inch H piles	101 dBA at 50 feet (15 meters)	183 dB rms at 16.4 feet (5 meters) 200 dB peak at 16.4 feet (5 meters) 170 dB SEL at 16.4 feet (5 meters)	Range: 100-4,000 Hz Concentration: 125 Hz	Airborne: USDOT 2006 Underwater: Caltrans 2015
Impact 14-inch H piles	101 dBA at 50 feet (15 meters)	187[1] dB rms at 19.7 feet (6 meters) 208 dB peak at 19.7 feet (6 meters) 177 dB SEL at 19.7 feet (6 meters)	Range: 100-4,000 Hz Concentration: 125 Hz	Airborne: USDOT 2006 Underwater: Caltrans 2015
Vibratory 14-inch H piles	101 dBA at 50 feet (15 meters)	150 dB rms at 16.4 feet (5 meters) 160 dB peak at 16.4 feet (5 meters) 150 dB SEL at 16.4 feet (5 meters)	Range: 100-4,000 Hz Concentration: 125 Hz	Airborne: USDOT 2006 Underwater: Caltrans 2015
Impact 48-inch pipe piles	101 dBA at 50 feet (15 meters)	195 dB rms at 16.4 feet (5 meters) 210 dB peak at 16.4 feet (5 meters) 185 dB SEL at 16.4 feet (5 meters)	Range: 100-10,000 Hz Concentration: 24-25 Hz	Airborne: USDOT 2006 Underwater: Caltrans 2015
Vibratory sheet piles 19.69 & 25 inch	81 dB at 328 feet (100 meters)	160 dB rms at 49.2 feet (15 meters) 175 dB peak at 49.2 feet (15 meters) 160 dB SEL 49.2 feet (15 meters)	Range: 10-10,000 Hz Concentration: 24-25 Hz	Caltrans 2015
Screeding (tug & barge)	N/A	164-179 dB rms at 3.28 feet (1 meter)	Range: 10-10,000 Hz Concentration: 10-2,000 Hz	Blackwell and Greene 2003
Ice trenchers (bulldozer)	64.7 dB at 328 feet (100 meters)	114 dB rms at 328 feet (100 meters)	Range: 10-8,000 Hz Concentration: 31-400 Hz	Greene et al. 2008
Grading Excavators (backhoe)	78 dBA at 50 feet (15 meters)	125 dB rms at 328 feet (100 meters)	Range: 10-8,000 Hz Concentration: 31-400 Hz	Airborne: USDOT 2006 Underwater: Greene et al. 2008
General vessel operations	N/A	145-175 dB rms at 3.28 feet (1 meter)	10 Hz – 1,500 Hz	Richardson et al. 1995; Blackwell and Greene 2003; Ireland and Bisson 2016

[1] 183 dB rms was from Illingworth and Rodkin (2007), not Caltrans 2015 as it was not provided in the Table I.2-1.

[2] The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at mid-range frequencies. This is called A-weighting, and the measured level is called the A-weighted sound level (dBA). Sound levels to assess potential noise impacts on terrestrial wildlife, airborne or underwater, are not weighted and measure the entire frequency range of interest, unless specified by an agency.

6.2.2. Vibratory Pile Driving

Piles requiring the use of a vibratory driver for this Project include 14-inch H piles (temporary spuds for mooring dolphins) and sheet piles. Source levels used for the temporary spuds are SPLs of 150 dB rms, 160 dB peak, and 150 dB SEL at 16.4 feet (5 meters) reported by Caltrans (2015) for 12-inch H piles. The underwater levels of 160 dB rms, 175 dB peak, and 160 SEL at 49.2 (15 meters) reported by Caltrans (2015) for vibratory pile driving of AZ sheet piles were used for the Project's sheet piles. These sources are summarized in Table 12.

6.2.3. Screeding and Ice Trenching

Seabed preparation at the berthing basin and barge bridge would use a barge with a screeding device. Blackwell and Greene (2003) reported a source level of 164 dB re 1 µPa rms at 3.28 feet (1 meter) for the tug *Leo* pushing a full barge near the Port of Anchorage. The source level increased to 179 dB re 1 µPa rms at 3.28 feet (1 meter) when the tug was using its thrusters to maneuver the barge during docking. Most of the sound energy was in the band 100-2,000 Hz with a large peak at 50 Hz. There are no measurements available in Alaska of screeding, so these levels are used as a proxy for characterization of these activities.

Greene et al. (2008) conducted underwater sound, airborne sound, and iceborn vibrations associated with construction of Northstar Island (~39 feet / 12 meters depth). The measured underwater level of the bulldozer was 114.2 dB re 1 µPa rms at 328 feet (100 meters), and the backhoe was 122 dB re 1 µPa rms at 328 feet (100 meters) with the center frequency at 63 Hz for the bulldozer and 10 Hz for the backhoe. They reported broadband sounds from these activities diminished to the median background level of 77-116 dB (10-10,000 Hz range) at distances between 0.62 and 3.1 miles (1 and 5 kilometers). The measured airborne level of the bulldozer was 64.7 dB re 20 µPa rms; airborne sound associated with the backhoe was not measured. The USDOT's Construction Noise Model Handbook provides a summary of equipment with measured maximum levels at 50 feet (15 meters). The handbook reports an airborne level of 78 dBA at 50 feet (15 meters). These sources are summarized in Table 12.

The underwater levels associated with the construction activities (backhoe, excavator/bulldozer) do not exceed the 120 dB non-impulsive threshold and would occur during the ice season, so they were not included in the acoustic harassment exposure evaluation. Underwater sound levels generated by the tug and barge during screeding may exceed the underwater non-impulsive threshold, but are considered transient (the vessel is moving) and NMFS does not consider transiting vessel sound to rise to the level of "take." Screeding was therefore not included in the acoustic harassment exposure evaluation. The Applicant has included measures to reduce disturbance from these activities in Section 11. These measures are consistent with the Alaska Stand Alone Pipeline (ASAP) BA (AGDC 2017) and Letter of Concurrence (LOC) (NMFS 2018b).

6.2.4. Vessels

Some vessels such as tugs associated with the sealifts can under some circumstances generate underwater sound exceeding the non-impulsive threshold of 120 dB due largely to the continuous cavitation sound produced from the propeller arrangement of both drive propellers and thrusters. Large

ships produce broadband SPLs of about 180 dB re 1 µPa rms at 1 meter (Richardson et al. 1995; Blackwell and Greene 2003). Thrusters have generally smaller blade arrangements operating at higher rotations per minute (rpm) and, therefore, largely produce more cavitation sound than drive propellers. These sources are summarized in Table 12.

The vessels used for the Project may exceed the underwater non-impulsive threshold, but are also considered transient (the vessel is moving), and NMFS does not consider transiting vessel sound to rise to the level of "take", so they were not included in the acoustic harassment exposure evaluation. The Applicant has included measures in Section 11 to reduce disturbance from these activities. These measures are consistent with the ASAP BA (AGDC 2017) and LOC (NMFS 2018b).

6.3. Calculation of Distances to NMFS Thresholds

Underwater sound propagation depends on many factors, including sound speed gradients in water, depth, temperature, salinity, and bottom composition. Characteristics of the sound source, such as frequency, source level, type of sound, duration, and depth of the source will also affect propagation. The distance at which a given sound source can be detected is also affected by the level and frequency characteristics of the background noise. A major component of transmission loss (TL) is spreading or logarithmic (log) loss. From a point source in a uniform medium, sound spreads out in spherical waves, known as spherical spreading. With spherical spreading, sound levels diminish by 6 dB for every doubling of distance (or at a rate of 20 dB when distance increases by a factor of 10, or 20 log). In shallow water, sound reflects from the surface and bottom creating cylindrical spreading. For cylindrical spreading, sound levels diminish by 3 dB for every doubling of distance (or at a rate of 10 dB when distanced increases by a factor of 10, or 10 log). NMFS generally suggests the use of practical spreading, or 15 log, where sound levels diminish by 4.5 dB for every doubling of distance.

For ease in estimating distances to thresholds, simple TL can be calculated using the logarithmic spreading loss with the formula:

$TL = B * \log10(R)$, where TL is transmission loss, B is logarithmic loss, and R is radius.

There have been numerous studies characterizing underwater sounds and propagation in the Beaufort Sea over the last 30 years associated with oil and gas development. Greene (1983) measured sounds during construction of Seal Island. He found that noise from construction above 1,000 Hz was not detectable above ambient at 2.2 miles (3.6 kilometers) from the Seal Island construction site. During early island construction when ice was being cut and moved, noise from this construction operation at frequencies < 500 Hz was detectable to 0.5 miles (0.8 kilometers), and a single tone near 60 Hz was detectable up to 1 mile (1.6 kilometers). During late island construction, low-frequency sounds were detectable underwater out to a distance of 0.5 miles (0.8 kilometers).

Greene et al. (2008) conducted underwater sound, airborne sound, and iceborne vibrations associated with construction of Northstar Island (~39 feet, 12 meters depth). Vibratory pile driving was found to have a low frequency tone of 25 Hz with an underwater propagation loss of 39.1 log; the broadband propagation loss was 18.4 log. The measured levels of the ditchwitch and backhoe were 122 dB at 328 feet (100 meters) with the center frequency at 20 Hz for the ditchwitch and 160 Hz for the backhoe. The

propagation loss was 22.4 log for the ditchwitch and 26.4 log for the backhoe. They report broadband sounds from these activities diminished to the median background level of 77-116 dB (10-10,000 Hz range) at distances between 0.62 and 3.1 miles (1 and 5 kilometers).

West Dock modification activities include impact pile driving, vibratory pile driving, screeding, trenching, and grading. Sound sources associated with the planned activities will generate relatively low frequency (<1,000 Hz) sound and will be located in shallow waters at West Dock (<14 feet, < 4 meters). Based on results from these other measurements, project noise will likely diminish to background levels within less than 3.1 miles (5 kilometers). The Applicant understands NMFS requires the use of practical spreading or a propagation loss of 15 log in the absence of site-specific data; even though the Applicant believes there is sufficient evidence from these other studies to warrant a more realistic propagation loss of 17.5 log for pile driving, a transmission loss of 15 log was used to calculate distances to thresholds.

6.3.1. Calculation of Distances to Level A Thresholds

The distances to the Level A thresholds were calculated using the peak and rms source levels in Table 12, the revised NMFS Acoustical Guidance Spreadsheet (NMFS 2018a), the assumptions summarized in Table 13, and a TL of 15 log.

Table 13: Assumptions for Acoustical Calculations

Activity Pile Type (hammer type)	Total Piles	Piles per Day	Work Days	Duration to Drive a Single Pile (minutes)	Strikes Per Pile	Weighting Factor Adjustment
DH4						
DH4 bulkhead 11.5-inch H-pile (impact)	212	26	9	NA	1,000	2 kHz
DH4 bulkhead 25-inch sheet pile (vibratory)	422	12	36	24.00	NA	2.5 kHz
Mooring dolphin 48-inch pipe pile (impact)	12	1.25	10	NA	1,000	2 kHz
14-inch H-pile temporary spud (vibratory) [a]	48	4	12	15	NA	2.5 kHz
Bridges Abutments						
19.69-inch sheet pile (vibratory)	1,304	16	87	18.9	NA	2.5 kHz
14-inch H-pile (impact)	8	8	2	NA	1,000	2 kHz
Barge Bridge Mooring Dolphins						
Mooring dolphin 48-inch pipe pile (impact)	4	1.25	4	NA	1,000	2 kHz
14-inch H-pile temporary spud (vibratory) [a]	16	8	4	15	NA	2.5 kHz
Total	2,026	NA	164	NA	NA	NA

[a] Each temporary spud (14-inch steel H pile) is expected to take 15 minutes to install and 15 minutes to extract. There are 4 total spuds, but we include 4 for installation and 4 for extraction in the acoustic calculation for a total of 8 piles per day.

The resulting estimated distances to the Level A thresholds for each of the marine mammal groups are provided in Table 14. The distances to the peak thresholds (for impulsive) range from 1 foot (0.07 meters) to 112 feet (34 meters). The distances to the SEL thresholds (for impulsive) range from 117 feet (36 meters) to 6,154 feet (1,876 meters). The highest impulsive SEL is for high frequency cetaceans, of which there are none in this area. The highest SEL for species in the area is 5,166 feet (1,575 meters) for low frequency cetaceans. The distances to the SEL thresholds (for non-impulsive) range from 0.28 feet (0.09 meters) to 80.8 feet (24.6 meters). Similarly, the highest non-impulsive SEL is for high-frequency cetaceans, so the highest SEL for species in this area is 54.7 feet (16.7 meters) for low frequency cetaceans.

Bowhead whales generally transit outside of the barrier islands and would not be exposed to levels exceeding Level A thresholds. Gray whales are not common as far east as West Dock and would also be expected to remain outside of the barrier islands. It is important to note that SEL is the accumulated energy over time, so the amount of time of actual pile driving will affect the size of the zone. In other words, if the amount of time is smaller (or greater), the zone at which a marine mammal may be exposed to sound levels exceeding the Level A SEL threshold would be smaller (or larger).

Table 14: Calculated Distances in Meters to Level A Underwater Thresholds

Activity	High Frequency Cetaceans			Mid-Frequency Cetaceans [1]			Low Frequency Cetaceans [2]			Phocids			Otariids		
	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive
	202 pk	155 SEL	173 SEL	230 pk	185 SEL	198 SEL	219 pk	183 SEL	199 SEL	218 pk	185 SEL	201 SEL	232 pk	203 SEL	219 SEL
11.5-inch H pile (impact)	7.4	1,422.3	NA	0.1	42.5	NA	0.5	1,194.0	NA	0.6	639.0	NA	0.1	46.5	NA
14-inch H pile (impact)	25.1	1,193.3	NA	0.3	35.6	NA	1.9	1,001.8	NA	2.2	536.1	NA	0.3	39.0	NA
14-inch H pile (vibratory)	NA	NA	3.0	NA	NA	0.2	NA	NA	2.0	NA	NA	1.2	NA	NA	0.1
48-inch pipe pile (impact)	34.2	1,876.4	NA	0.5	56.0	NA	2.5	1,572.2	NA	2.9	843.0	NA	0.3	61.4	NA
25-inch Sheet pile (vibratory)	NA	NA	24.6	NA	NA	1.5	NA	NA	16.7	NA	NA	10.1	NA	NA	0.7
19.69-inch Sheet pile (vibratory)	NA	NA	24.6	NA	NA	1.5	NA	NA	16.7	NA	NA	10.1	NA	NA	0.7

[1] Mid-frequency cetaceans include the beluga whale

[2] Low frequency cetaceans include the gray whale and the bowhead whale

Note: Peak (pk) sound levels are reported as dB re 1 µPa; sound exposure levels (SEL) sound levels are reported as dB re 1 μPa^2-s.

6.3.2. Calculation of Distances to Level B Thresholds

The distances to the Level B thresholds were calculated using the rms source levels for the respective pile sizes and types in Table 12 assuming a TL of 15 log. The resulting estimated distances to the Level B thresholds (Table 15) range from 1,120 feet (341.5 meters) to 7,067 feet (2,154 meters) for the impact pile driving and range from 3,280 feet (1,000 meters) to 15,224 feet (4,641.6 meters) for the vibratory pile driving.

Table 15: Calculated Distances in to Level B Underwater Thresholds

Activity pile type (hammer type)	Impulsive 160 dB rms (meters)	Non-Impulsive 120 dB rms (meters)
11.5-inch H-pile (impact)	341.5	NA
14-inch H-pile (impact)	631.0	NA
14-inch H-pile (vibratory)	NA	1,000
48-inch pipe pile (impact)	2,154.4	NA
25-inch Sheet pile (vibratory)	NA	4,641.6
19.69-inch Sheet pile (vibratory)	NA	4,641.6

Root mean square (rms) sound levels are reported as dB re 1 µPa.

6.3.3. Calculation of Distances to Airborne Level B Thresholds

The distances to the airborne Level B thresholds were calculated using the airborne sound levels for the activities in Table 12 and a TL of 20 log. The resulting distances (Table 16) range from 3.28 feet (1 meter) to 174 feet (53 meters). There are no haul out sites near West Dock, so hauled out seals would not be exposed to airborne sound levels exceeding these thresholds. For activities occurring in the winter season, seals on ice within these distances may be exposed to these sound levels, but the mitigation measures outlined in Section 11 will minimize Level B disturbance.

Table 16: Calculated Distances to Level B Airborne Thresholds

Activity	Pinnipeds 100 dB rms (meters)
Impact pipe driving	16.8
Vibratory pipe driving	16.8
Vibratory sheet pile driving	11.2
Bulldozer	1.8
Backhoe	1.2

Root mean square (rms) sound levels are reported as dB re 20 µPa.

6.3.4. Calculation of Areas of Ensonification

The area of ensonification for pile driving (in square kilometers) was calculated using the formula for an area of a circle ($A = \pi r^2$) and then converted from meters to kilometers by dividing by 10^3.

6.4. Durations

Estimated durations in total number of days in which sound will be transmitted into the water by facility, pile type, and pile size are provided in Table 17. The total number of days are based on an assumed period of July through October (open water season with the break for the Nuiqsut whaling period) in 2021, a 24-hour work day with up to 2 crews working consecutively.

For the sheet piles and H piles at the DH4 dock face (Table 4) and abutments (Table 6), the estimated durations are based on an assumed production rate of 25 linear (horizontal) feet (7.62 linear meters) per day, so the total linear length of the piles was divided by 25.

For the 48-inch piles associated with the mooring dolphins for DH4 (Table 4) and the barge bridge (Table 6), the estimated durations are based on an assumed production of 1.25 piles per day, so the total number of 48-inch piles was divided by 1.25. Durations for the temporary spud piles was based on an assumption that it would require 1 hour to install all four spuds at a given dolphin and 1 hour to extract them, and that this would occur within a single day so the number of temporary spuds was divided by four.

Table 17: Calculated Durations for Installation of Piles Below MLLW

Pile Type	Number of Piles by Size					Linear Length (feet) Below MLLW	Number of Days (rounded up to whole days)
	Impact Hammer			Vibratory Hammer			
	11-5-inch H Pile [1]	14-inch H Pile [1]	48-inch Pipe Pile [2]	14-inch H Pile [3]	Sheet Pile [1]		
DH4							
Sheet pile [1]	0	0	0	0	422	879.17	36
Anchor pile (H-pile) [1]	212	0	0	0	0	203.17	9
Mooring dolphins [2]	0	0	12	0	0	NA	10
Temporary spud piles [3]	0	0	0	48	0	NA	12
South Bridge Abutment							
Dock face (sheet pile) [1]	0	0	0	0	350	574.29	23
Tailwall (sheet pile) [1]	0	0	0	0	345	566.09	23
Anchor pile (H-pile) [1,4]	0	4	0	0	0	4.67	1
North Bridge Abutment							
Dock face (sheet pile) [1]	0	0	0	0	353	579.21	24
Tailwall (sheet pile) [1]	0	0	0	0	256	420.05	17
Anchor pile (H-pile) [1,3]	0	4	0	0	0	3.83	1
Barge Bridge							
Mooring dolphins [2]	0	0	4	0	0	NA[4]	4
Temporary spud piles [3]	0	0	0	16	0	NA[4]	4

[1] Durations (days of pile driving) based on an expected production rate of 25 linear (horizontal) feet of piles per day rounded up to the next whole number of days.

[2] Durations (days of pile driving) based on an expected production rate of 1.25 piles per day rounded up to the next whole number of days; actual duration dependent on weather, substrate, and equipment.

[3] Four temporary spuds (14-inch steel H piles) are installed for each mooring dolphin (48-inch pile), the mooring dolphin is installed, and then the 4 spuds are extracted. The assumed production rate for mooring dolphins is 1.25/day. Installation of 4 spuds takes 1 hour and extraction takes 1 hour; we assume 4 spuds would be installed and removed per day.

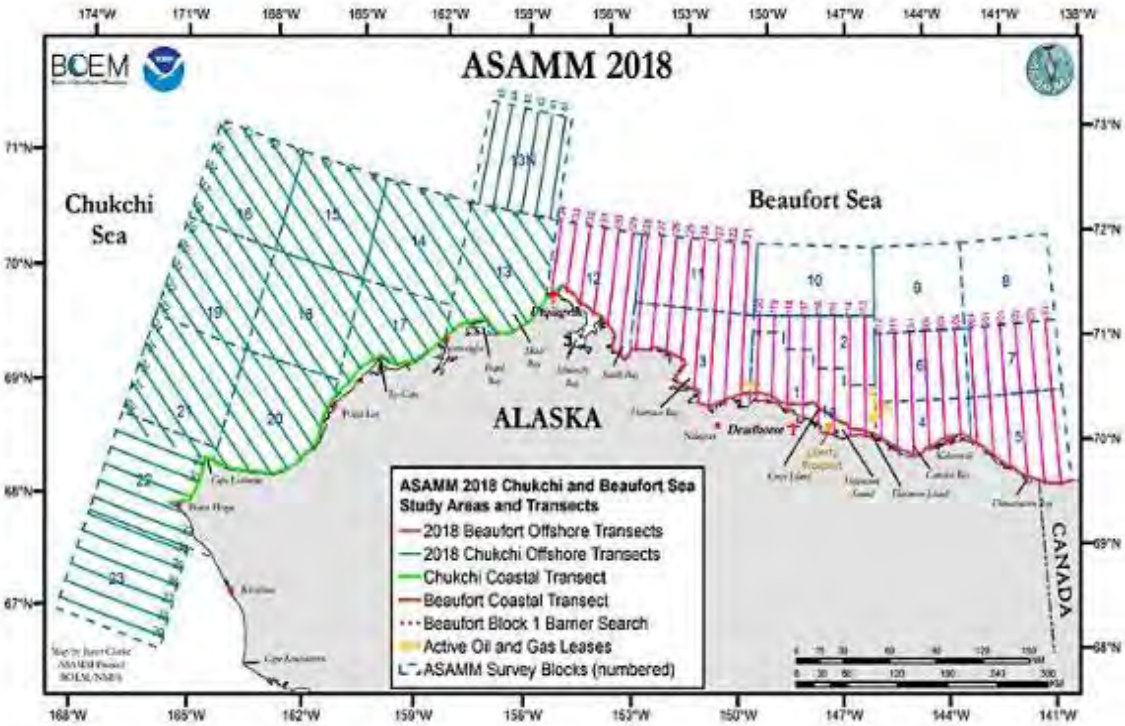
[4] NA is not applicable – horizontal length not utilized in duration calculations.

6.5. Estimates of Marine Mammal Densities

6.5.1.1. Cetaceans

Aerial surveys for marine mammals have been conducted in the Alaskan Arctic since 1979. The Bowhead Whale Aerial Survey Project (BWASP), targeted the autumn migration of bowhead whales in the Beaufort Sea from 1979–2010. Broad-scale aerial surveys for marine mammals in the Chukchi Sea Planning Area began in 2008 and the project was referred to as the Chukchi Offshore Monitoring in Drilling Area (COMIDA). The ASAMM project began in 2011 and is a continuation of BWASP and COMIDA. ASAMM surveys are flown during both the summer and fall months, with a typical field season from 1 July – 31 October. Survey blocks and generated transects overlay the oil and gas lease areas in the Alaskan Beaufort and northeastern Chukchi Seas (Figure 16). Block 1 of the ASAMM survey encompasses part of the Geographic Region; however, transects historically terminated 0.62 miles (1 kilometer) offshore of land. Beginning in 2016, ASAMM extended transects in block 1 to cover the area between the barrier islands and the mainland (referred to as Block 1a) to provide survey coverage of the area around the Liberty Prospect. Cetaceans were not observed in Block 1a during surveys conducted in 2016–18, and this effort was not included in the density estimate calculations.

Figure 16: ASAMM Survey Blocks and Representative Transects in the Beaufort and Northeastern Chukchi Seas



Densities were calculated by determining the sighting rate, or number of whales per kilometer of effort, for each species during the summer (July and August) and fall (September and October) months. ASAMM surveys were conducted in an Aero Commander aircraft with bubble windows, and the species-specific effective strip widths (ESW) for bowhead, gray, and beluga whales were calculated for this aircraft

(Ferguson and Clarke 2013). The ESW is the strip half-width, and was, therefore, multiplied by 2 to account for observations made on both sides of the aircraft or transect line.

$$Density = \frac{sighting\ rate}{(2 \times ESW)}$$

6.5.1.1.1. Bowhead Whales

Bowhead densities for Survey Block 1 were calculated using ASAMM data collected from 2011– 2018. There were 166 bowhead whales recorded during 13,484 kilometers of on-transect effort in the summer months and 505 bowhead whales recorded during 12,846 kilometers of on-transect effort in the fall months. The summer sighting rate is 0.012 whales/kilometer and the fall sighting rate is 0.039 whales/kilometer. The ESW for bowhead whales from the Aero Commander is 1.15 kilometers (Coefficient of Variance [CV]=0.08; Ferguson and Clarke 2013). The summer density estimate is 0.0054 bowhead whales/square kilometers, and the fall density estimate is 0.017 bowhead whales/square kilometers. The higher fall density was used to estimate exposures from the Project.

6.5.1.1.2. Gray Whales

Gray whale sightings in the Beaufort Sea have increased in recent years, however, encounters are still infrequent. The ASAMM surveys flew 13,484 kilometers of on-transect effort in the summer months and 12,846 kilometers of on-transect effort in the fall months between 2011 and 2018. In Survey Block 1, one gray whale was observed in the fall of 2014 and another gray whale was observed in the summer of 2016. The ESW for gray whales is 1.20 kilometers (CV=0.07; Ferguson and Clarke 2013). The summer and fall density estimates are 0.00003 gray whales/square kilometers.

6.5.1.1.3. Beluga Whales

Beluga densities for Survey Block 1 were calculated using ASAMM data collected from 2014–2018. There were 60 beluga whales recorded during 10,063 kilometers of on-transect effort in the summer months and 13 beluga whales recorded during 8,899 kilometers of on-transect effort in the fall months. The summer sighting rate is 0.006 whales/kilometer and the fall sighting rate is 0.001 whales/ kilometer. The ESW for beluga whales is 0.614 kilometers (CV=0.07; Ferguson and Clarke 2013). The summer density estimate is 0.005 beluga whales/square kilometers, and the fall density estimate is 0.001 beluga whales/square kilometers. ASAMM sighting and effort summaries for beluga data from 2011-2013 is presented by depth zone and region, not by block. The block-based density estimates are more current and reported here. The higher summer density was used to estimate exposures from the Project.

6.5.1.2. Pinnipeds

Data on pinniped density in the Beaufort Sea are limited. ASAMM data collection methods are not ideal for sighting and identifying pinniped species and sighting rates are primarily from monitoring programs in the region. Ringed, bearded, and spotted seals occur in the Beaufort Sea in the summer months, and ringed seals and bearded seals are present year-round.

6.5.1.2.1. Ringed Seals

Ringed seals are the most abundant species in the project area. During the winter months, ringed seals create subnivean lairs and maintain breathing holes in the landfast ice. Tagging data suggest that ringed seals utilize multiple lairs and Kelly et al. (1986) determined that, on average, one seal used 2.85 (Standard Deviation [SD]=2.51) lairs, although this is likely a conservative estimate. Density estimates for the number of ringed seal ice structures have been calculated (Frost and Burns 1989; Kelly et al. 1986; Williams et al. 2001), and the average density of ice structures from these reports is 1.45/square kilometers (Table 18).

Table 18: Ringed Seal Sea Ice Structure Density in the Vicinity of the Project Area

Year	Ice Structure Density (per square kilometer)	Source
1982	3.6	Frost and Burns 1989
1983	0.81	Kelly et al. 1986
1999	0.17	Williams et al. 2001
2000	1.2	Williams et al. 2001
Average density	**1.45**	All of above

To estimate ringed seal density in the winter, the average ice structure density (1.45/square kilometers) was divided by the average number of structures used by the seals (2.85). The estimated density is 0.509 ringed seals/square kilometers in the winter; however, this is likely an overestimate as the average number of ice structures utilized is thought to be an underestimate.

Ringed seals haul out on the ice between late May and early June to molt, and spring aerial surveys conducted during this time provide the most comprehensive density estimates available. Industry monitoring programs for the construction of the Northstar production facility conducted spring aerial surveys in the area surrounding West Dock from 1997 to 2002 (Moulton et al. 2005). Densities were consistently very low in areas where the water depth was less than 10 feet (3 meters), and only sightings observed in water depths greater than 10 feet (3 meters) have been included in the density calculations. The uncorrected average spring ringed seal density from this monitoring effort was 0.548 seals/square kilometer (Table 19). The estimate is likely conservative as seals are missed or not available to be counted.

Table 19: Ringed Seal Densities Estimated from Spring Aerial Surveys Conducted from 1997-2002

Year	Density (seals / square kilometer)
1997	0.43
1998	0.39
1999	0.63
2000	0.47
2001	0.54
2002	0.83
Average	**0.548**

Summer densities in the project area are expected to significantly decrease as ringed seals range considerable distances during the open water season. Following the methods reported in LGL (2007) and used in the Liberty ITR Petition, summer density was conservatively estimated to be 50% of the spring

density. Based on the average spring density of 0.548, the summer density is estimated to be 0.274 ringed seals/square kilometer.

Like summer density estimates, fall density data are limited. Ringed seals remain in the water through the fall and in to the winter. Given the lack of data, fall density is assumed to be the same as the summer density of 0.274 ringed seals/square kilometer.

6.5.1.2.2. Spotted Seals

The spotted seal occurs in the Beaufort Sea in small numbers during the summer open water period. At the onset of freeze-up in the fall, spotted seals return to the Chukchi and then Bering Sea to spend the winter and spring. Summer density was estimated from the percentage of pinniped sightings observed during monitoring projects in the region (Harris et al. 2001; Aerts et al 2008; Hauser et al. 2008; HDR 2012). Of the total sightings observed during the survey effort of these projects, 63% were ringed seals, 20% were spotted seals, and 17% were bearded seals. The summer density of spotted seals was estimated to be 0.055, 20% of the summer ringed seal density of 0.274 seals/square kilometer.

6.5.1.2.3. Bearded Seals

The majority of bearded seals spend the winter and spring in the Chukchi and Bering seas; however, some remain in the Beaufort Sea year-round. A reliable population estimate for the bearded seal stock is not available, and occurrence in the Beaufort Sea is less known. Spring aerial surveys conducted as part of industry monitoring for the Northstar production facility provide limited sighting numbers from 1999–2002. During the 4 years of survey, an average of 11.75 bearded seals were observed during 3,997.5 square kilometers of effort, and winter and spring density are estimated to be 0.003 bearded seals/square kilometer.

Bearded seals occur in the Beaufort Sea more frequently during the open water season, and prefer waters farther offshore. Sightings data are limited during this time period and summer density was estimated the same way spotted seal density was, from the percentage of pinniped sightings observed during monitoring projects in the region (Harris et al. 2001; Aerts et al 2008; Hauser et al. 2008; HDR 2012). Bearded seals comprised 17% of the pinniped sightings during the monitoring efforts, and the summer density was estimated to be 0.047 bearded seals/square kilometers. The same estimate is assumed for bearded seal fall density.

6.5.1.3. Summary of Marine Mammal Densities

The marine mammal densities used in the take calculations are summarized below in Table 20.

Table 20: Marine Mammal Densities in the Geographic Region by Season

Species	Seasonal Average Density (individuals/square kilometer)			
	Spring	Summer	Fall	Winter
Bowhead whale[1]	0	0.005	0.017	0
Gray whale[1]	0	0.0003	0.0003	0
Beluga whale[2]	0	0.005	0.001	0
Ringed seal[3]	0.548	0.274	0.274	0.509
Spotted seal[4]	0	0.055	0	0
Bearded seal[5]	0.003	0.047	0.047	0.003

[1] Calculated densities in ASAMM Survey Block 1, 2011-2018

[2] Calculated densities in ASAMM Survey Block 1, 2014-2018

[3] Spring values from Moulton et al, 2005 (see Table 19), summer / fall density estimated at 50% of spring density, winter densities based on reported ice structure density (see Table 18) and an estimate of 2.85 structures / seal.

[4] Estimated as 20% of ringed seal density based on reported relative densities (see Section 6.5.1.2.2).

[5] Spring density based on observations at Northstar, summer / fall densities based on reported relative bearded seal densities (17% of all seals) and reported ringed seal densities (see Section 6.5.1.2.3).

6.6. Estimating Potential Marine Mammal Exposures

To estimate the number of marine mammals potentially exposed to sound exceeding NMFS thresholds, the following three variables were multiplied: 1) the area (in square kilometers) of ensonification for Level A and B for pile driving for each size and hammer type (Tables 14, 15, 16), 2) the duration (in days) of the sound activity per facility per season (Table 17), and 3) the density (number of marine mammals/ square kilometer; Table 20) to estimate the total number of marine mammals potentially exposed to sound exceeding NMFS thresholds (Table 11). These estimates do not include any reductions from mitigation measures, such as shutdowns or construction windows, or reductions from the variability in seasonal habitat use or distribution of the marine mammals in Prudhoe Bay.

6.6.1. Estimates of Level A Exposures

The total estimated number of Level A exposures without mitigation was calculated to be 3 bowhead whales, less than 1 animal for gray and beluga whales (Table 21). There were no estimated of Level A exposures to peak sound levels, and, 42.7 ringed seals, 8.6 spotted seals, and 7.3 bearded seals were estimated to be exposed to Level A SEL sound levels during the installation of the H-piles and mooring dolphins using the impact pile driver. The SEL threshold is an accumulation of energy over time, so if the number of strikes or duration of total pile driving is less than anticipated, the SEL zone will be smaller. The density used for seals during the open water time is likely much higher than what will be observed during the activities, as West Dock is a highly industrialized area with low numbers of seals reported. Further, the mitigation measures outlined in Section 11 will reduce the number of Level A exposures. The total number of requested annual Level A takes (Table 22) compared to the population estimates (Table 10) is less than 1 percent of the population for all species.

Table 21: Estimated Level A Exposures without Mitigation by Pile Type and Species

Activity	Bowhead whale			Gray whale			Beluga whale			Ringed seal			Spotted seal			Bearded seal		
	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive
	pk	SEL	SEL	pk	SEL	SEL	pk	SEL	SEL	pk	SEL	SEL	pk	SEL	SEL	pk	SEL	SEL
Dock Head 4																		
Sheet pile	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0.01	NA	NA	0	NA	NA	0
Anchor pile (11.5-inch H-pile)	0	0.7	NA	0	0	NA	0	0.20	NA	0	11.05	NA	0	2.21	NA	0	1.88	NA
Mooring dolphins (48-inch pipe pile)	0	1.33	NA	0	0	NA	0	0.38	NA	0	21.37	NA	0	4.27	NA	0	3.63	NA
Spud piles (14-inch H pile pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0
South Bridge Abutment																		
Dock face (sheet pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0
Tailwall (sheet pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0.01	NA	NA	0	NA	NA	0
Anchor pile (14-inch H pile)	0	0.05	NA	0	0	NA	0	0.02	NA	0	0.86	NA	0	0.17	NA	0	0.15	NA
North Bridge Abutment																		
Dock face (sheet pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0
Tailwall (sheet pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0
Anchor pile (14-inch H pile)	0	0.05	NA	0	0	NA	0	0.02	NA	0	0.86	NA	0	0.17	NA	0	0.15	NA
Barge Bridge																		
Mooring dolphins (48-inch pipe pile)	0	0.53	NA	0	0	NA	0	0.15	NA	0	8.55	NA	0	1.71	NA	0	1.45	NA
Spud piles (14-inch H pile)	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA	0
Total	**0.00**	**2.66**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.76**	**0.00**	**0.00**	**42.70**	**0.03**	**0.00**	**8.54**	**0.01**	**0.00**	**7.26**	**0.00**

Table 22: Requested Level A Takes for the Project

Species	Population	Estimated Level A Exposures	Requested Takes	% population
Bowhead whale	16,892	2.66	3	0.02%
Gray whale	20,990	0	0	0%
Beluga whale (BS)	39,258	0.76	0	0%
Beluga whale (CS)	20,752	0.76	0	0%
Ringed seal	249,000	42.73	43	0.02%
Spotted seal	461,625	8.55	10	0%
Bearded seal	155,000	7.26	10	0.01%

The Applicant seeks authorization for the potential taking through potential injury (Level A) of small numbers of bowhead whale, ringed seal, spotted seal, and bearded seal in the Beaufort Sea. These takes are less than 1 percent of the population of each species and may have no more than a minor effect on individual animals or no effect on the populations of these four species.

6.6.2. Estimates of Level B Exposures

The total estimated numbers of Level B exposures without mitigation are provided in Table 22. The density used for all species of seals during the open water time is likely much higher than what will be observed during the activities, as West Dock is a highly industrialized area with low numbers of seals reported. Further, the mitigation measures outlined in Section 11 will reduce the number of Level B exposures.

Table 23: Estimated Level B Exposures without Mitigation by Pile Type and Species

Year	Bowhead Whale	Gray Whale	Beluga Whale	Ringed Seal	Spotted Seal	Bearded Seal
Dock Head 4						
Bulkhead (sheet pile)	41.65	0.08	11.83	668.04	133.61	113.57
Anchor pile (11.5-inch H pile)	0.06	0	0.02	0.90	0.18	0.15
Mooring dolphins (48-inch pipe pile)	2.49	0	0.71	39.98	8.00	6.80
Temporary spud piles (14-inch H pile)	0.64	0	0.18	10.34	2.07	1.76
South Bridge Abutment						
Dock face (sheet pile)	26.61	0.05	7.56	426.80	85.36	72.56
Tailwall (sheet pile)	26.61	0.05	7.56	426.80	85.36	72.56
Anchor pile (14-inch H pile)	0.02	0	0.01	0.34	0.07	0.06
North Bridge Abutment						
Dock face (sheet pile)	27.76	0.05	7.89	445.36	89.07	75.71
Tailwall (sheet pile)	19.67	0.04	5.59	315.46	63.09	53.63
Anchor pile (14-inch H pile)	0.02	0	0.01	0.34	0.07	0.06
Barge Bridge						
Mooring dolphins (48-inch pipe pile)	1.00	0	0.28	15.99	3.20	2.72
Spud piles (14-inch pipe pile)	0.21	0	0.06	3.45	0.69	0.59

The Applicant seeks authorization for the potential taking through disturbance (Level B) of small numbers of bowhead whale, gray whale, beluga whale, ringed seal, spotted seal, and bearded seal in the Beaufort

Sea. These takes are less than 1 percent of the population of each species and may have no more than a minor effect on individual animals or no effect on the populations of these six species.

The total number of requested annual Level B takes (Table 24) compared to the population estimates (Table 10) is less than 1 percent of the population for all species.

Table 24: Requested Level B Takes for the Project

Species	Population	Estimated Level B Exposures	Requested Takes	% population
Bowhead whale	16,892	146.74	150	0.89%
Gray whale	20,990	0.27	5	0.02%
Beluga whale (BS)	39,258	41.69	45	0.11%
Beluga whale (CS)	20,752	41.69	45	0.22%
Ringed seal	249,000	2,353.80	2,355	0.95%
Spotted seal	461,625	470.76	471	0.10%
Bearded seal	155,000	400.15	400	0.26%

7. DESCRIPTION OF IMPACT ON MARINE MAMMALS

The anticipated impact of the activity upon the species or stock.

7.1. General Effects of Sound on Marine Mammals

Marine mammals use hearing and sound transmission to perform vital life functions. Introducing sound into their environment could be disrupting to those behaviors. Sound (hearing and vocalization/echolocation) serves four primary functions for marine mammals, including: 1) providing information about their environment, 2) communication, 3) prey detection, and 4) predator detection. The distances to which pile installation noise from the proposed construction activities are detectable by marine mammals depends on source levels, frequency, ambient sound levels, the propagation characteristics of the environment, and sensitivity of the receptor (Richardson et al. 1995).

The effects of sounds from pile driving and associated construction activities on marine mammals might include one or more of the following: temporary or permanent hearing impairment, non-auditory physical effects, masking of natural sounds, behavioral disturbance, and tolerance (Richardson et al. 1995). In assessing potential effects of sound, Richardson et al. (1995) has suggested four criteria for defining zones of influence. These zones are described below from greatest to least influence.

Zone of hearing loss, discomfort, or injury – the area within which the received sound level is potentially high enough to cause discomfort or tissue damage to auditory or other systems. This includes TTS (temporary loss in hearing) or PTS (loss in hearing at specific frequencies or deafness). Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage.

Zone of masking – the area within which the sound may interfere with detection of other sounds, including communication calls, prey sounds, or other environmental sounds.

Zone of responsiveness – the area within which the animal reacts behaviorally or physiologically. The behavioral responses of marine mammals to sound is dependent upon several factors, including: 1) acoustic characteristics of the sound source of interest; 2) physical and behavioral state of animals at time of exposure; 3) ambient acoustic and ecological characteristics of the environment; and 4) context of the sound (e.g., whether it sounds like a predator) (Richardson et al. 1995; Southall et al. 2007). However, temporary behavioral effects are often simply evidence that an animal has heard a sound and may not indicate lasting consequence for exposed individuals (Southall et al. 2007).

Zone of audibility – the area within which the marine mammal might hear the sound. Marine mammals as a group have functional hearing ranges of 10 Hz to 180 kHz, with best thresholds near 40 dB (Ketten 1994; Kastak et al. 2005; Southall et al. 2007). These data show reasonably consistent patterns of hearing sensitivity within each of three groups: small odontocetes (such as the harbor porpoise), medium-sized odontocetes (such as beluga whales), and pinnipeds (such as ice seals). There are no applicable criteria for the zone of audibility due to difficulties in human ability to determine the audibility of a sound for a species.

The Project activities would produce relatively low sound levels with louder sound emitted over a short period of time during certain activities, like pile installation. With the anticipated sound levels and planned mitigation measures, it is unlikely that any marine mammals would experience temporary or permanent hearing impairment, or non-auditory physical effects. The following text describes the potential impacts on marine mammals due to the sources associated with pile installation and other construction activities associated with this program.

7.2. Potential Effects of Sounds on Marine Mammals

7.2.1. Hearing Loss, Discomfort, or Injury

Sound has the potential to induce TTS or PTS hearing loss and the level of loss is dependent on both the sound source exposure characteristics including, duration, amplitude, frequency content, temporal pattern, and energy distribution, as well as characteristics of the animal including, behavior, age, history of sound exposure, and health (Kryter 1985; Richardson et al. 1995; Southall et al. 2007). TTS or PTS could occur when marine mammals are exposed to very strong sounds, to moderate sounds for prolonged a period, or when animals are in close proximity to the sound source. Typically, TTS includes impacts to middle-ear muscular activity, increased blood flow, and general auditory fatigue (Southall et al. 2007). PTS occurs when hairs within the inner ear system die. TTS is not considered to be auditory injury and does not constitute “Level A Harassment” as defined by the MMPA. Sound levels associated with TTS onset are generally considered to be below the levels that would cause PTS, which is auditory injury. NMFS has developed sound exposure criteria for marine mammals based on the most recent scientific data on TTS and other relevant factors for marine and terrestrial mammals. For more information on TTS and PTS, please refer to NMFS Acoustic Criteria for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2018a).

Like masking, hearing loss reduces the ability of marine mammals to forage efficiently, maintain social cohesion, and avoid predators (Weilgart 2007). For example, Todd et al. (1996) found an unusual increase

in fatal fishing gear entanglement of humpback whales to coincide with blasting activities, suggesting hearing damage from the blasting may have compromised the ability for the whales to use sound to passively detect the nets. Experiments with captive bottlenose dolphins and beluga whales found that short duration impulsive sounds can cause TTS (Finneran et al. 2002). Popov et al. (2013) conducted studies of TTS in two captive beluga whales with exposure to center frequencies ranging from 11.2 to 90 kHz, a level of 165 dB re 1 µPa, lasting 1 to 30 minutes. Noises with lower frequencies (11.2 and 22.5 kHZ) produced the highest TTS with the longest recovery duration and the TTS effect gradually increased with prolonged exposure (Popov et al. 2013).

Non-auditory physical effects might also occur in marine mammals exposed to strong underwater sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, and other types of organ or tissue damage. It is possible that some marine mammal species (i.e., beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, there is no definitive evidence that any of these effects occur even for marine mammals near industrial sound sources and beaked whales do not occur in the proposed project area. It is unlikely that any effects of these types would occur during the proposed project given the brief duration of exposure of any given mammal, and the planned monitoring and mitigation measures.

Available data on the potential for underwater sounds from industrial activities to cause auditory impairment or other physical effects in marine mammals suggest that such effects, if they occur at all, would be temporary and limited to short distances. Marine mammals that show behavioral avoidance of the proposed activities, including most baleen whales, some odontocetes (including belugas), and some pinnipeds, are especially unlikely to incur auditory impairment or other physical effects.

7.2.2. Masking

Masking occurs when louder sounds interfere with marine mammal vocalizations or ability to hear natural sounds in their environment (Richardson et al. 1995), which limit their ability to communicate or avoid predation or other natural hazards. Pile installation during the Project will produce the most intense underwater sounds and minor masking may occur.

Masking is of special concern for baleen whales that vocalize at low frequencies over long distances, as their communication frequencies overlap with some anthropogenic sounds such as shipping traffic. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, McDonald et al. (1995) found that California blue whales (*Balaenoptera musculus*) have shifted their call frequencies downward by 31 percent since the 1960s, possibly to communicate below shipping sound frequencies. Melcón et al. (2012) found blue whales to increase their call rates in the presence of typically low frequency shipping sound, but to significantly decrease call rates when exposed to mid-frequency sonar. Also, Di Iorio and Clark (2010) found blue whales to communicate more often in the presence of seismic surveys, which they attributed to compensating for an increase in ambient sound levels. Fin whales have reduced their calling rate in response to boat noise (Watkins 1986).

Odontocetes hear and communicate at frequencies well above the frequencies of pile driving, dredging, and ship propellers/thrusters (Wartzok and Ketten 1999). Beluga whales have a well-developed and well-documented sense of hearing, and captive studies indicate that beluga whales hear from approximately 40 Hz to 130 kHz, with maximum sensitivity from approximately 30 to 50 kHz (White et al. 1978; Awbrey et al. 1988; Johnson et al. 1989; Ridgway et al. 2001; Finneran et al. 2005). It is important to note that captive studies represent the best hearing of belugas, measured in very quiet conditions, which are rarely present in the wild where high levels of ambient sound may exist. As an anti-masking strategy, belugas may shift the frequency of their echolocation clicks in response to loud noise (Tyack 2000). It is expected that while odontocetes such as beluga whales, would be able to detect sound from the planned pile driving and associated operations, it is unclear whether the operations would mask the ability of these high-frequency animals to communicate.

Erbe et al. (2016) reviewed anti-masking strategies for marine mammals when both sending and receiving signals, and determined that most, if not all, species have strategies such as altering signal amplitude or frequency, the quantity of signals emitted, or spatial release to counteract masking. Pile installation and associated Project activities have the potential to mask important acoustic marine mammal signals, however the short duration of work, and limited affected area would result in insignificant impacts from masking.

7.2.3. Behavioral Responses of Marine Mammals

7.2.3.1. Baleen Whales

Southall et al. (2007) reviewed several papers describing the responses of marine mammals to non-pulsed sound. In general, little or no response was observed in animals exposed at received levels from 90–120 dB re 1 µPa rms. The probability of avoidance and other behavioral effects increased when received levels were 120-160 dB re 1 µPa rms. Some of the relevant reviews of Southall et al. (2007) are summarized as follows.

7.2.3.1.1. Bowhead Whales

Experiments conducted during the 1980s with seismic airguns indicated that bowhead whales showed clear and sustained avoidance of operational areas with impulsive sounds where received levels were between 160 to 170 dB re 1 µPa rms (Malme et al. 1983, 1984, 1986, 1988; Richardson et al. 1986; Ljungblad et al. 1988). The threshold for behavioral disturbance with continuous industrial sounds, such as those associated with drilling operations, is lower and responses have been observed at distances where received levels are 120 dB re 1 µPa rms (Malme et al. 1984; Richardson et al. 1990, 1995). Within the range of “typical” behavioral responses, significant individual variability was observed. Some whales only responded when very close to sound sources while others reacted at much greater distances and lower received sound levels. The context appears to influence the reaction or lack thereof, e.g., if the whales are feeding or migrating when exposed to seismic airgun sounds (Richardson et al. 1986, 1999; Miller et al. 2005). Bowhead reactions to vessels also seem to depend on if the vessel is moving, and the relative movement of the vessel and the whale (Richardson et al. 1995, Wartzok et al. 2004). The type and severity of behavioral response is, therefore, difficult to reliably predict when exposure metrics are

considered without context (Southall et al. 2007). For the Northstar facility, behavioral responses within and beyond 0.62 miles (1 kilometer) generally consisted of a reduction in calls and possible minor deflection away from the noise source (BPXA 2009).

7.2.3.1.2. Gray Whales

Gray whales, like other large baleen whales, have shown strong overt reactions to impulsive sounds, such as seismic operations, at received levels between 160 and 173 dB re 1 µPa rms (Richardson et al. 1986; Ljungblad et al. 1988; Miller et al. 2005; McCauley et al. 1998). However, baleen whales seem to be less tolerant of continuous sound (Richardson and Malme 1993), often detouring around drilling activity when received levels are as low as 119 dB re 1 µPa rms (Malme et al. 1983; Richardson et al. 1985). Based on the previously cited studies, NMFS developed the 120 dB re 1 µPa rms harassment criteria for continuous sound sources.

Based upon the information regarding baleen whale disturbance reactions, the Applicant anticipates that some baleen whales may exhibit minor, short-term disturbance responses to underwater sounds from pile installation and associated construction activities. Any potential impacts on baleen whale behavior would be localized within the activity area and would not result in population-level effects.

7.2.3.2. Toothed Whales

Most toothed whales have the greatest hearing sensitivity at frequencies much higher than that of baleen whales and may be less responsive to low-frequency sound commonly associated with industry activities. In reviewing responses of cetaceans with best hearing in mid-frequency ranges, which includes toothed whales, Southall et al. (2007) reported that combined field and laboratory data for mid-frequency cetaceans exposed to nonplused sounds did not lead to a clear conclusion about received levels coincident with various behavioral responses. In some settings, individuals in the field showed profound behavioral responses to exposures from 90 to 120 dB re 1 µPa rms, while others failed to exhibit such responses for exposure to received levels from 120 to 150 dB re 1 µPa rms. Contextual variables other than exposure received level, and probable species differences, are the likely reasons for this variability. Context, including the fact that captive subjects were often directly reinforced with food for tolerating sound exposure, may also explain why there was great disparity in results from field and laboratory conditions—exposures in captive settings generally exceeded 170 dB re 1 µPa rms before inducing behavioral responses.

7.2.3.2.1. Beluga Whales

Like bowhead whales, Wartzok et al. (2004) found that belugas exhibited highly variable responses to similar sounds depending on the context. Location, recent experience with the sound stimulus, current activity, and the motivation of the whales to leave or remain in the area were all factors that influenced the behavioral response. Miller et al. (2005) documented the behavioral response of belugas exposed to airgun operations and there were no observable reactions at received levels of 100 to 120 dB re 1 µPa rms. Temporary avoidance behaviors were observed at received levels between 120 and 150 dB re 1 µPa rms, and, based on both vessel and aerial surveys, exposures did not exceed 150 dB re 1 µPa rms. For

continuous sounds, Richardson et al. (1995) reported that beluga whales did not show any apparent reaction to playback of underwater drilling sounds at distances greater than 656–1,312 feet (200–400 meters). Reactions included slowing down, milling, or reversal of course after which the whales continued past the projector, sometimes within 164–328 feet (50–100 meters). Reports indicate that pile driving activities at the Port of Alaska did not affect beluga whale use of the Knik Arm, evidenced by the consistency of timing, location, and numbers of beluga whales (Cornick and Pinney 2011; Cornick and Saxon-Kendall 2008, 2009; Cornick et al. 2011; Kendall 2010; Markowitz and McGuire 2007; Prevel-Ramos et al. 2006). Blackwell and Greene (2003), observed that belugas did not appear to react to the sounds from a passing cargo freight ship, and larger vessels that do not alter course or speed seem to elicit little, if any, behavioral response. Avoidance reactions have been observed when belugas have been approached by small, fast moving vessels that can maneuver quickly and unpredictably (NMFS 2008).

The primary beluga migration route is farther offshore and outside of the project area, however, disturbance from construction activities could cause short-term behavioral disturbance to toothed whales that are nearby. Any potential impacts on behavior would be localized within the project area and would not result in population-level effects.

7.2.3.3. Pinnipeds

7.2.3.3.1. Underwater Sound

Literature suggests that pinnipeds may be tolerant of underwater industrial sounds, and they are less sensitive to lower frequency sounds. Pinnipeds generally seem to be less responsive to exposure to industrial sound than most cetaceans. Pinniped responses to underwater sound from some types of industrial activities such as seismic exploration appear to be temporary and localized (Harris et al. 2001; Reiser et al. 2009).

Southall et al. (2007) reviewed literature describing responses of pinnipeds to non-pulsed sound and reported that the limited data suggest exposures between ~90 and 140 dB re 1 µPa rms generally do not appear to induce strong behavioral responses in pinnipeds exposed to nonplused sounds in water; no data exist regarding exposures at higher levels. It is important to note that among these studies of pinnipeds responding to nonplused exposures in water, there are some apparent differences in responses between field and laboratory conditions. In contrast to the mid-frequency odontocetes, captive pinnipeds responded more strongly at lower levels than did animals in the field. Again, contextual issues are the likely cause of this difference.

Richardson et al. (1995) were not aware of any detailed data on reactions of seals to impulsive sounds (seismic in this case), and expected them to tolerate or habituate to underwater sound, especially if food sources were present. Most information on the reaction of seals and sea lions to boats relates to disturbance of animals hauled out on land. There is little information on the reaction of these pinnipeds to ships while in the water, other than some anecdotal reports that sea lions are often attracted to boats (Richardson et al. 1995).

Based upon the above information regarding pinniped disturbance reactions, the Applicant anticipates that some pinnipeds may exhibit minor, short-term disturbance responses to underwater sounds from

construction activities. Any potential impacts on pinniped behavior would be localized within the activity area and would not result in population-level effects.

7.2.3.3.2. Airborne Sound

Ringed seals inhabit the Beaufort Sea year-round, maintaining breathing holes and creating subnivean lairs for hauling out and pupping during the winter and spring months. Winter construction activities emit both underwater and airborne sound, and there is the potential for ringed seals to be exposed during the sensitive birthing time period.

Numerous studies have been conducted to evaluate ringed seal responses to industrial activities near Northstar and the results indicate that ringed seals tolerate construction noise (Moulton et al. 2003; Blackwell et al. 2004a,b; Williams et al. 2006). Spring aerial surveys associated with Northstar were conducted pre-construction (1997-1999) as well as post-construction (2000-2001), and ringed seal density did not change before or after construction (Moulton et al. 2003). Blackwell et al. (2004b) observed ringed seal behavior during winter and spring pile driving at Northstar and reported that there were no strong reactions to either acoustic or visual stimuli. Williams et al. (2006) determined that the abandonment rate of lairs and breathing holes was not significantly different between areas closer to or farther away from the Northstar Island and ice roads. Moulton et al. (2005) had similar results, and reported that there was no detectable altered habitat use near Northstar. Higher ringed seal structure abandonment rates were observed compared to previous surveys, however, the season and ice deformation were likely the main factors for this increase (Moulton et al. 2005).

Received airborne levels will be less than the 90 dB threshold at approximately 175 feet (53 meters) from the source at West Dock (Table 16), and could cause short-term, minor behavioral disturbance to ringed seals that are nearby. Occasional adult and sub-adult individual seals in very low numbers may occur within the airborne ensonified radius of West Dock activities and any potential impacts on behavior would be localized within the project area and would not result in population-level effects.

7.2.3.4. Stress and Mortality

Marine mammal stranding or mortality would be highly unlikely to result from any of the proposed activities. Marine mammal strandings have been correlated with pulsed sounds produced during previous marine survey activities.

Chronic exposure to impulsive sound could lead to physiological stress eventually causing hormonal imbalances (National Research Council [NRC] 2005). If survival demands are already high, and/or additional stressors are present, the ability of the animal to cope decreases, leading to pathological conditions or death (NRC 2005). Effects may be greatest where sound disturbance can disrupt feeding patterns, however, there are no critical feeding grounds in the vicinity of the activity area. Chronic exposure to these sound levels is not expected. The proposed impact and vibratory pile driving and construction activities would be limited to the West Dock activity area, where industrial operations have been ongoing and relatively few marine mammals utilize the area.

7.2.4. Tolerance

Studies have shown that underwater sounds from anthropogenic activities are often detectable underwater at distances of many miles away from the source. Studies have also shown that marine mammals at distances more than a few kilometers away often show no apparent response to various types of industry activities (Moulton et al. 2005; Harris et al. 2001; LGL et al. 2014). This is often true even in cases when the sounds are likely audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Marine mammals have exhibited some behavioral reaction to underwater industry sounds, but they have also exhibited no overt reactions to underwater sounds (Stone and Tasker 2006; Hartin et al. 2013). In general, pinnipeds and small odontocetes appear to be more tolerant of exposure to some types of underwater sound than are baleen whales. The Applicant anticipates that some marine mammals would be exposed to underwater sounds from pile installation and associated construction activities in Prudhoe Bay but the exposures would not result in long-term disturbance.

8. DESCRIPTION OF IMPACT ON SUBSISTENCE USES

The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.

8.1. Subsistence Uses

The proposed construction activities would occur closest to the marine subsistence use area used by Nuiqsut. However, the communities of Utqiaġvik and Kaktovik area also discussed in this section as the communities are located on or near the coast and harvest various species of marine mammals.

Utqiaġvik is the northernmost community in the United States and is located 320 miles (515 kilometers north of the Arctic Circle. Utqiaġvik's subsistence-harvest areas are to the northwest of the Geographic Region. Residents reported continuous search areas along the coast from Wainwright east to Admiralty Bay, a distance of approximately 115 miles (185 kilometers; Brown et al. 2016). Hunters reported searching as far as 40 miles (64 kilometers) out to sea, likely in pursuit of bowhead whales (Figure 17). Smaller search and harvest areas for marine mammals were reported near and to the west of Wainwright (Brown et al. 2016).

Kaktovik is the easternmost village in the North Slope Borough. Kaktovik is located on the north shore of Barter Island, situated between the Okpilak and Jago rivers on the Beaufort Sea coast. Kaktovik's subsistence-harvest areas are to the east of the Geographic Region (Figure 18) and target marine mammal species migrating eastward during spring and summer occur seaward of the project area and westward in the fall.

Nuiqsut is located on the west bank of the Nechelik Channel on the lower Colville River, about 25 miles (40 kilometers) from the Arctic Ocean and approximately 150 miles (242 kilometers) southeast of Utqiaġvik. Nuiqsut subsistence users utilize an extensive search area, spanning 16,322 square miles (square kilometers) across the central Arctic Slope (Figure 19, Brown et al. 2016). Marine mammal hunting is primarily concentrated in two areas: 1) Harrison Bay, between Atigaru Point and Oliktok Point, including

a northward extent of approximately 50 miles (80 kilometers) beyond the Colville River Delta (Brown et al. 2016); and 2) east of the Colville River Delta between Prudhoe and Foggy Island bays, which includes an area of approximately 100 square miles surrounding the Midway Islands, McClure Island and Cross Island (Brown et al. 2016). The community of Nuiqsut uses subsistence-harvest areas adjacent to the proposed construction area; however, West Dock is not a common hunting area, nor is it visited regularly by Nuiqsut subsistence hunters primarily because of industrial history.

Figure 17: Utqiaġvik Subsistence Use Areas for Bowhead Whales and Seals 1996-2006

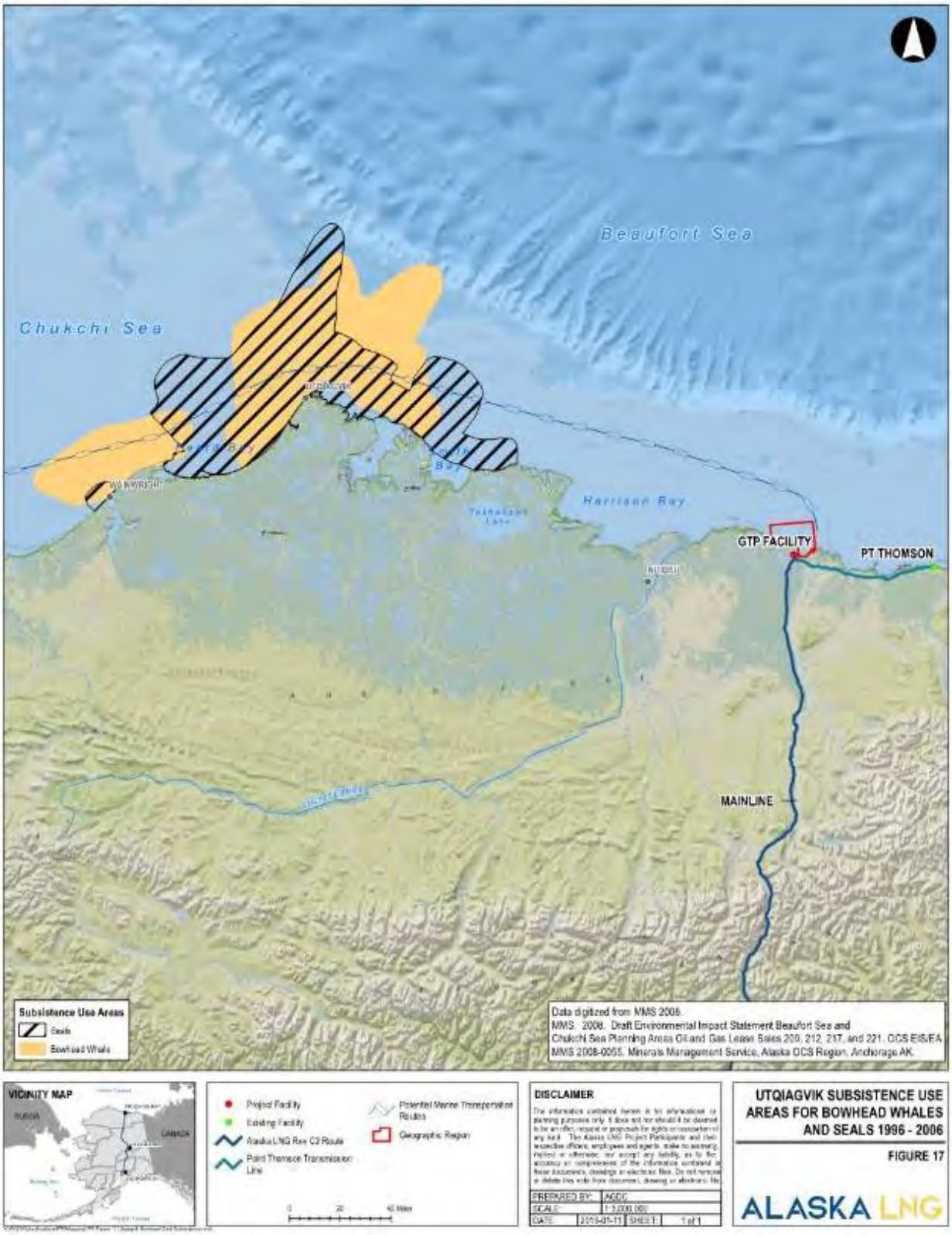


Figure 18: Kaktovik Subsistence Use Areas for Bowhead Whales and Seals 1996-2006

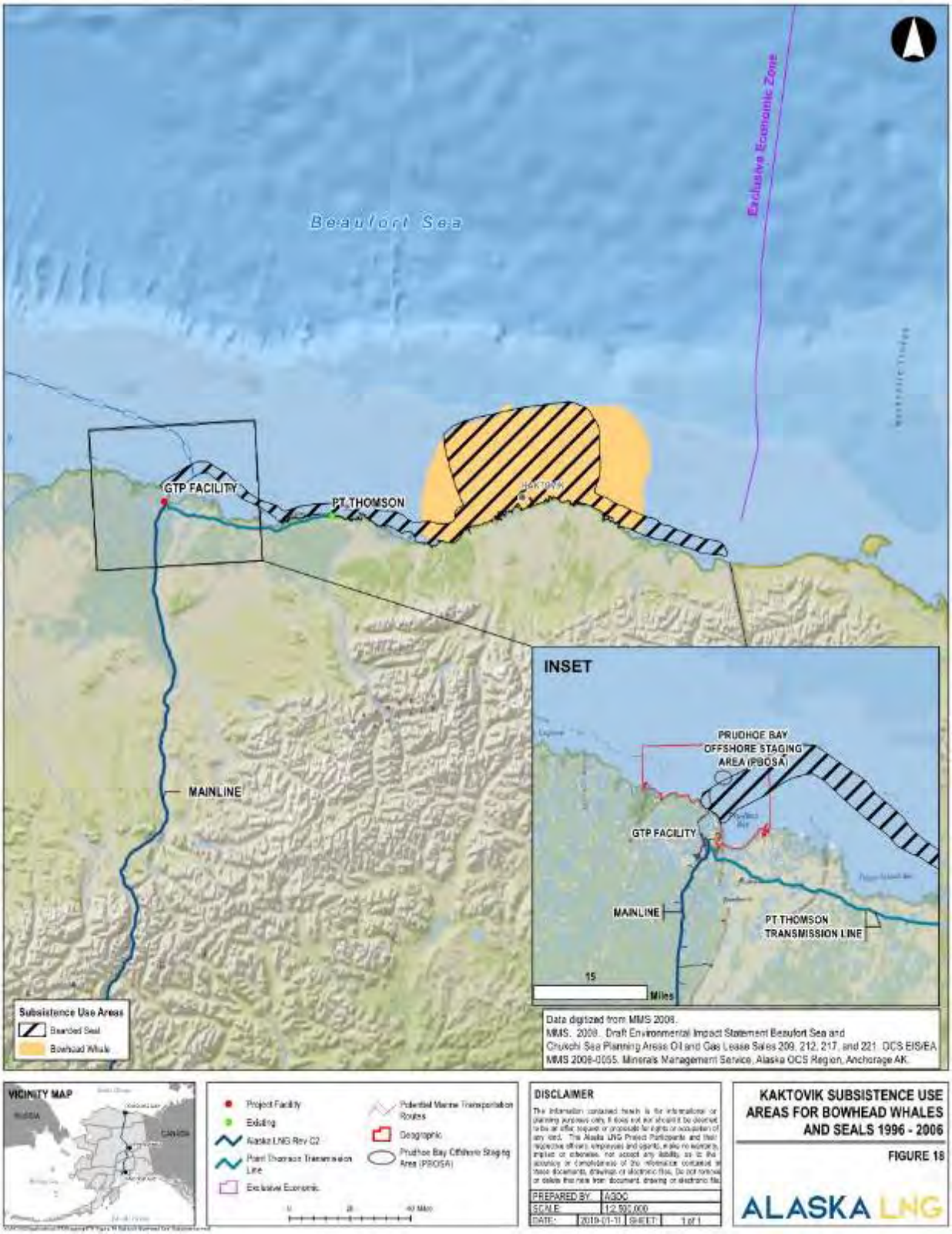
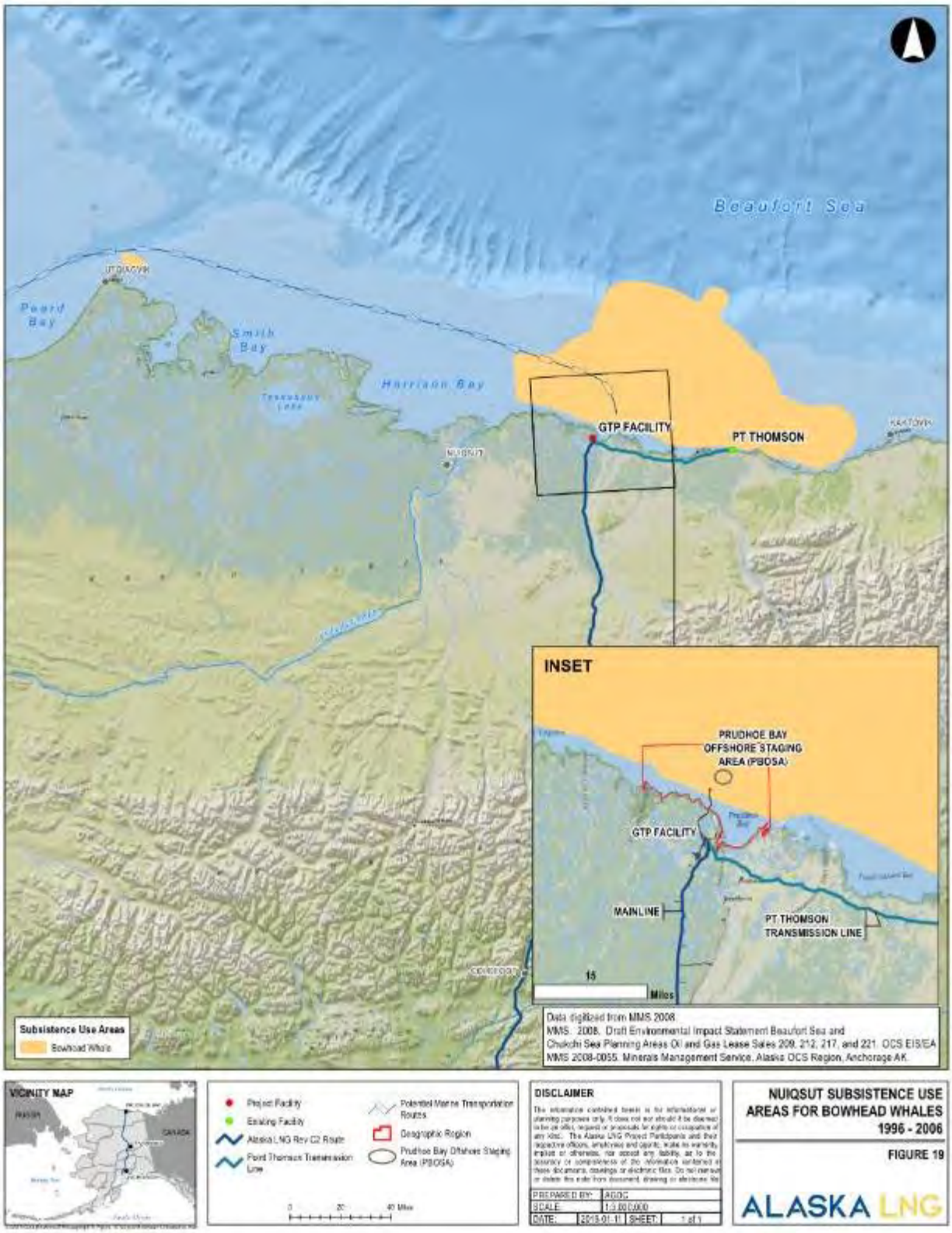


Figure 19: Nuiqsut Subsistence Use Areas for Bowhead Whales 1996-2006



This section was developed using a number of reports, listed in order of publication date, below.

- BOEM funded a jointly-led project with the North Slope Borough (NSB) Department of Wildlife Management, conducted by Stephen R. Braund & Associates (SRBA) (2010), to map the subsistence activities of Nuiqsut, Kaktovik, and Utqiaġvik. These data provide contemporary subsistence use patterns in the communities mentioned above. It should be noted that BOEM outlined which species would be addressed in this survey, so some species such as the beluga whale and spotted seal may not have been included (i.e., there are no data presented for those species in this study).
- The Alaska LNG Project conducted a subsistence and traditional knowledge data gap analysis related to communities potentially affected by the proposed Project in 2013. SRBA were used as the subcontractor and as part of a data gap analysis, SRBA inventoried available subsistence and traditional knowledge information for potentially affected study communities. The report provided detailed descriptions of the available subsistence information in the form of subsistence use areas, harvest data, and timing of subsistence activities (i.e., seasonal round) for individual study communities located within seven regions (North Slope, Yukon River, Tanana River, Copper River, Southcentral, Prince William Sound and the Kenai Peninsula) (Alaska LNG 2015). The report was submitted as Resource Report No. 5, Appendix C as part of the Project Applicant's Resource Report No. 5 submittal to FERC.
- The Alaska LNG Project funded a study, conducted by the Alaska Department of Fish and Game (ADF&G) in 2014 to document the harvest and use of wild resources by residents of several communities in arctic Alaska, which included Utqiaġvik and Nuiqsut (Brown et al. 2016). Data describing wild resource harvest and use were collected, including basic information about who, what, when, where, how, and how much wild resources have been. Kaktovik was last surveyed in 1992 through ADF&G funding.

8.1.1. Cetaceans

Cetaceans harvested by the communities of Nuiqsut, Utqiaġvik, and Kaktovik include the bowhead whale and beluga whale. Gray whales were not reported harvested from any of the communities surveyed by ADF&G in any of the survey years and therefore are not included as an important subsistence species and are not further discussed.

8.1.1.1. Bowhead Whale

Alaska Native communities have harvested bowhead whales for subsistence and cultural purposes with oversight and quotas regulated by the International Whaling Commission (IWC). The NSB Department of Wildlife Management has been conducting bowhead whale subsistence harvest research since the early 1980's to collect the data needed by the IWC to set harvest quotas. Bowhead whale harvest (percent of total marine mammal harvest), harvest weight, and percent of households using bowhead whale are presented in Table 25.

Table 25: Bowhead whale harvest by Utqiaġvik and Nuiqsut in 2014, and Nuiqsut in 1992.

Community[a]	Percent Bowhead Whale Harvest (% of total marine mammal harvest)	Total Bowhead Whale Harvest (Pounds)	Percent of Households Using Bowhead Whale (%)
Utqiaġvik[b]	54.0	546,085	69.9
Nuiqsut[b]	20.7	148,087	93.1
Kaktovik[a]	6.4	80,691	87.2

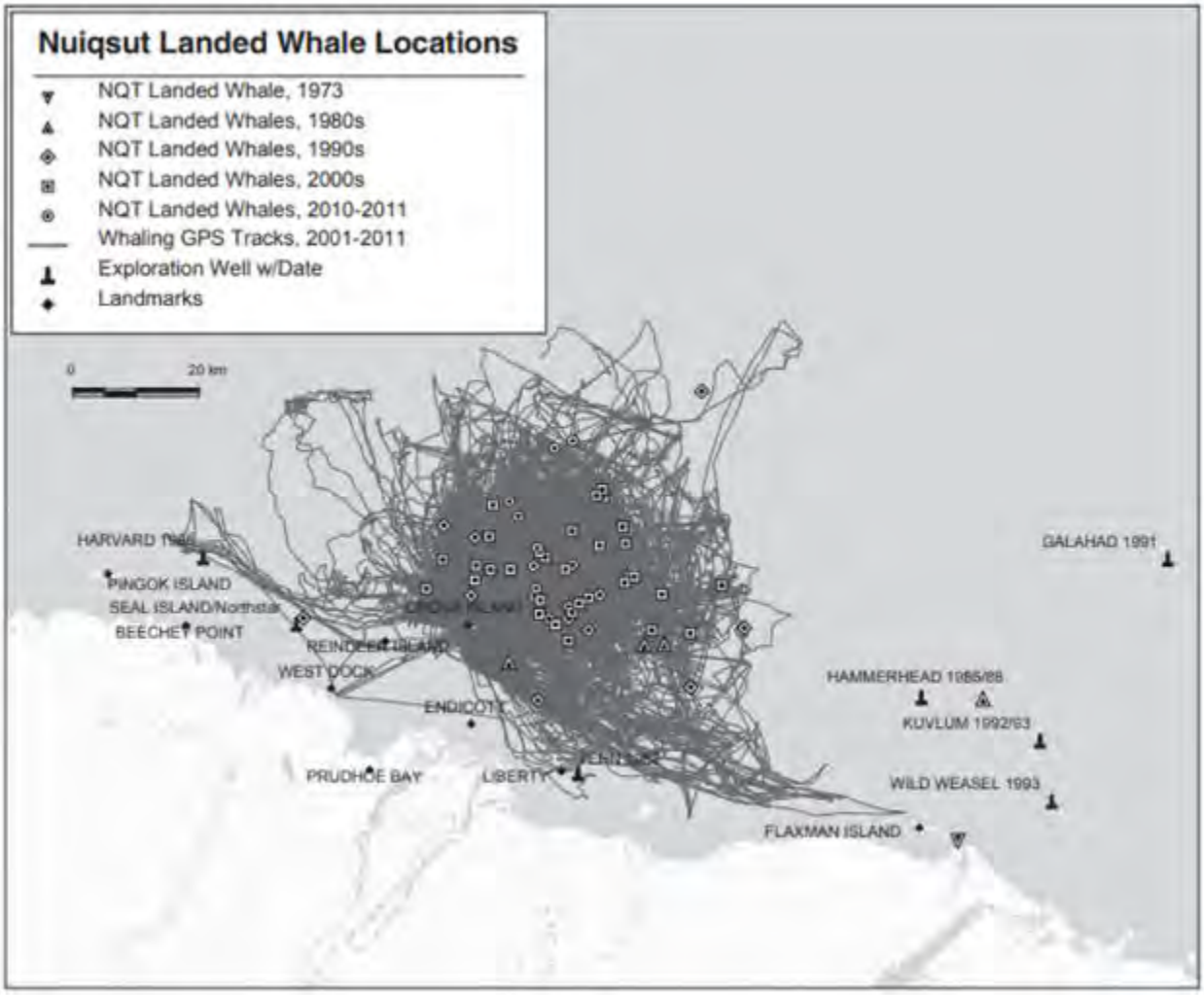
[a] Data downloaded and analyzed from the Community Subsistence Information System: CSIS (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm)
[b] Brown et al. 2016

Historically, Utqiaġvik's subsistence harvest areas for bowhead whale have not usually reached as far southeast as Foggy Island Bay, but instead often terminate near the Colville River Delta. Spring (April-May) hunting for bowhead whales is the major focus of activity but whaling also occurs in the fall (Brown et al. 2016). In September and October, crews travel on open water by boat in search of bowhead whales during fall migration, travelling via motor boat sometimes 30 or more miles (48 kilometers) offshore (Brown et al. 2016). Utqiaġvik whaling crews do not typically travel east of Smith Bay and are therefore not expected to be impacted by any activities at the project area. Vessel traffic may interfere with hunting activities during the months of May-August, however, mitigation measures would be implemented to lessen the interaction and potential impact.

Utqiaġvik bowhead harvests are the largest of the communities with an average annual harvest of 16 whales, supplying an average of 367,228 pounds of edible meat annually (Alaska LNG 2015). Bowhead whale was the single greatest contributor to the marine mammal harvest accounting for 54% of the total edible weight of marine mammal resources. This resource contributed 546,085 pounds and was the second most highly consumed resource in 2014 based on weight (Brown et al. 2016). In 2006, 23 people (31% of survey respondents) in Utqiaġvik indicated that they had recently hunted for bowhead whales (SRBA 2010). In 2016, 10 bowheads were landed between 20 September and 6 October by Utqiaġvik whaling crews (Suydam et al. 2017).

Nuiqsut's bowhead whale hunt occurs in the fall at Cross Island, a barrier island located approximately 12 miles (19 kilometers) northwest of West Dock. Nuiqsut whalers base their activities from Cross Island (Galginaitis 2014), and the whaling search and the harvest areas typically are concentrated north of the island. Bowhead whales are harvested by Nuiqsut whalers during the fall whaling season (Nuiqsut residents typically hunt bowhead whales in September, although a small number of use areas were reported in August and extending into October [SRBA 2010]), during which time in-water construction activities would be curtailed. Hunting activities between 1997 and 2006 have occurred almost as far west as Thetis Island, as far east as Barter Island (Kaktovik), and up to approximately 50 miles (80 kilometers) offshore (SRBA 2010). Harvest locations in 1973-2011 and GPS tracks of 2001-2011 whaling efforts are shown in Figure 19.

Figure 20: Cross Island Bowhead Harvest Locations 1973–2011; GPS Tracks for Most 2001-2011 Whaling Trips



Source: Galginaitis 2014.

Three to four bowhead whales per year have been harvested by Nuiqsut subsistence hunting crews operating from Cross Island (Bacon et al. 2009; Galginaitis 2014). Successful bowhead harvests provided the community with an average of 76,762 edible pounds (Alaska LNG 2015). In 2014, the Alaska Eskimo Whaling Commission (AEWC) allocated Nuiqsut a quota of four bowhead whales each year, however through transfers of quota from other communities, in 2015 Nuiqsut was able to harvest five whales (Brown et al. 2016). The bowhead whale harvest in 2014 provided 148,087 pounds of meat. In 2006, 10 people (30% of survey respondents) in Nuiqsut indicated that they had recently hunted for bowhead whales (SRBA 2010). In 2016, Nuiqsut whaling crews harvested four bowhead whales (Suydam et al. 2017)

Kaktovik bowhead whale hunters reported traveling between Camden Bay to the west and Nuvagapak Lagoon to the east (SRBA 2010). The Kaktovik bowhead use area is 2,525 square miles (SRBA 2010). Residents generally indicated that they stay within 15 and 30 miles (24 to 48 kilometers) from shore. The highest use areas were located near Barter Island up to 15 miles (24 kilometers) with crews taking day

trips from the island in search of whales (SRBA 2010). Kaktovik whalers harvested between one and five whales per year over the 40 years between 1972 and 2012 with an average of 66,297 edible pounds harvested annually. On average, Kaktovik residents have harvested three bowhead whales per year (Alaska LNG 2015). In 2016, three whales were landed at Kaktovik between late August and early September (Suydam et al. 2017). Respondents to the survey conducted by SRBA frequently reported bowhead whale use areas for the month of September (SRBA 2010). In 2006, 32% of survey respondents (12 people) in Kaktovik indicated that they had recently hunted for bowhead whales (SRBA 2010). Activities at the Alaska LNG Project would have no impact on subsistence hunting out of Kaktovik.

8.1.1.2. Beluga Whale

Beluga whales are harvested opportunistically during the bowhead harvest and throughout ice-free months. Beluga whale percent harvest (of total marine mammal harvest), harvest in pounds, and percent of households using beluga whale are presented in Table 26. Beluga whales were not reported harvested in 2006 survey interviews conducted by SRBA in any community (SRBA 2010).

Belugas accounted for 2% of Utqiaġvik's marine mammal harvest with 25 animals contributing 24,341 pounds in 2014 (Brown et al. 2016). All beluga whales were harvested in the month of July (Brown et al. 2016). Beluga harvests were not reported in Nuiqsut and Kaktovik, although households did report using beluga whale likely through sharing from other communities.

Table 26: Beluga whale harvest by Utqiaġvik and Nuiqsut in 2014, and Nuiqsut in 1992.

Community	Percent Beluga Whale Harvest (% of total marine mammal harvest)	Total Beluga Whale Harvest (Pounds)	Percent of Households Using Beluga Whale (%)
Utqiaġvik[b]	2	24,341	15.4
Nuiqsut[b]	0	0	15.5
Kaktovik[a]	0	0	29.8

[a] Data downloaded and analyzed from the Community Subsistence Information System: CSIS (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm)
[b] Brown et al. 2016

Most of the Beaufort Sea population of beluga whales migrate from the Bering Sea into the Beaufort Sea in April or May. The spring migration routes through ice leads are similar to those of the bowhead whale. A major portion of the Beaufort Sea population concentrates in the Mackenzie River estuary (Canada) during July and August. Fall migration through the western Beaufort Sea is in September or October. Surveys of the fall distribution strongly indicate that most belugas migrate offshore along the pack ice front beyond the reach of subsistence harvesters. The proposed activities at the Alaska LNG Project site are not expected to affect beluga whale subsistence harvests.

8.1.2. Pinnipeds

Pinnipeds harvested by the communities of Nuiqsut, Utqiaġvik, and Kaktovik include the ringed, spotted and bearded seal. While seal meat is eaten, the dietary significance of seals in both communities primarily

comes from seal oil, served with almost every meal that includes subsistence foods. Seal oil also is used as a preservative for meats, greens, and berries. Seal skins are important in the manufacture of clothing and spotted seal skins often are preferred for making boots, slippers, mitts, and parka trim. Ringed seal skins, however, are used more often in the making of clothing because the harvest of this species is more abundant.

Nuiqsut and Kaktovik residents hunt seals in ice-free months, primarily July-August, in rivers. The most important seal hunting area for Nuiqsut hunters is off the Colville Delta, extending as far west as Fish Creek and as far east as Pingok Island. Cross Island is a productive area for seals, but is too far from Nuiqsut to be used on a regular basis.

Seal hunting typically begins in April and May with the onset of warmer temperatures, but many residents continue to hunt seals after spring breakup as well (Brown et al. 2016). In addition to Harrison Bay, seal hunting search areas by Nuiqsut hunters included a 30-mile (48-kilometer) stretch northeast of Nuiqsut between the Colville and Kuparuk rivers, near Simpson Lagoon and Jones Islands (Brown et al. 2016). Seal percent harvest (of total marine mammal harvest), harvest in pounds, and percent of households using seals are presented in Table 27 for ringed seals, Table 28 for spotted seals, and Table 29 for bearded seals.

Seal subsistence use areas of Nuiqsut from 1995 through 2006 are depicted in Figure 21. Seal subsistence use areas for Utqiaġvik and Kaktovik are not presented in this application, as Utqiaġvik use areas do not extend east of Cape Halkett and Kaktovik use areas do not extend west of Camden Bay (see SRBA 2010; Brown et al. 2016). However, seal subsistence use areas are presented in Figures 17 and 18 for Utqiaġvik and Kaktovik, respectively.

Figure 21: Nuiqsut Subsistence Use Areas for Seals 1996-2006

8.1.2.1. Ringed Seal

Ringed seals are an important subsistence resource for Native Alaskans living in communities along the Beaufort Sea coast. Ringed seal harvests occur throughout the summer months of June, July and August. In Utqiaġvik, ringed seals are targeted during the winter season, and hunters go to the edge of the ice in pursuit of this resource (Brown et al. 2016). Ringed seals contributed 2% to the total marine mammal harvest with an estimated 428 animals totaling 24,402 pounds being harvested in Utqiaġvik in 2014 (Brown et al. 2016). Ringed seals are typically harvested between May and August (Brown et al. 2016), but have been harvest year round (SRBA 2010). In 2006, 26 people (39% of survey respondents) indicated that they had recently hunted for ringed seals in Utqiaġvik (SRBA 2010). Respondents of the same survey indicated that ringed seals are not harvested in great quantities and are not as important a resource as bearded seal (SRBA 2010). Harvest of ringed seals does not typically occur east of Smith Bay and therefore would not be affected by Alaska LNG Project construction activities. Vessel traffic may interfere with hunting activities during the months of May-August; however, mitigation measures described in Section 11 would be implemented to lessen the interaction and potential impact.

Nuiqsut residents commonly harvest ringed seal in the Beaufort Sea during the summer months (SRBA 2010). There are a higher number of use areas extending east and west of the Colville River delta. Residents reported traveling as far as Cape Halkett to the west and Camden Bay to the east in search of ringed seal. Survey respondents reported traveling offshore up to 30 miles (48 kilometers; SRBA 2010). Nuiqsut hunters harvested 6,156 pounds of ringed seals. Residents reported hunting ringed seals throughout the late spring, summer, and early fall with a higher number of use areas reported in June, July, and August (SRBA 2010). Ringed seal harvests occurred throughout the summer months of June, July and August. Ringed and spotted seals combined accounted for 5% of the total marine mammal harvest in edible pounds (Brown et al. 2016). In 2006, 12 people (36% of survey respondents) indicated that they had recently hunted for ringed seals in Nuiqsut (SRBA 2010). Harvest of ringed seals does not typically occur to the east of Camden Bay and therefore is not expected to be affected by Alaska LNG project activities. Vessel traffic could potentially overlap with some hunting activities during the months of June-August; however, AGDC intends to work with NMFS and stakeholders to implement measures that would result in minimizing impacts, preserving or benefiting subsistence species.

Kaktovik hunters harvested 1,260 pounds of ringed seal in 1992 (ADF&G CSIS; retrieved and analyzed August 15, 2018). Kaktovik hunters travel by boat to look for ringed seals on floating ice, often while also hunting for bearded seal, or sometimes along the ice edge by snow machine before break-up, during the spring (SRBA 2010). In 2006, 7 people (18% of survey respondents) indicated that they had recently hunted for ringed seals in Kaktovik (SRBA 2010). Residents reported looking for ringed seal, usually while also searching for bearded seal, offshore between Prudhoe Bay to the west and Demarcation Bay to the east (SRBA 2010). Ringed seal hunting typically peaks between March and August but continues into September, as well (SRBA 2010). Although residents reported hunting ringed seals up to approximately 30 miles (48 kilometers) from shore, the highest numbers of overlapping use areas generally occur within a few miles from shore (SRBA 2010). The total use area for ringed seal over the last 10 years encompassed approximately 2,139 square miles. Harvest of ringed seals by Kaktovik hunters does not typically occur to the west of Camden Bay and therefore is not expected to be affected by Alaska LNG project activities.

There is no anticipated vessel traffic east of Prudhoe Bay. Therefore, vessel traffic would not affect Kaktovik's ability to hunt ringed seals.

Table 27: Ringed Seal Harvest, as Reported by Utqiaġvik and Nuiqsut in 2014, and Kaktovik in 1992.

Community	Percent of Ringed Seal in Total Marine Mammal Harvest (%)	Total Ringed Seal Harvest (Pounds)	Percent of Households Using Ringed Seal (%)
Utqiaġvik[b]	2	24,402	18.5
Nuiqsut[b]	>5	6,156	51.7
Kaktovik[a]	25.5	1,260	46.8

[a] Data downloaded and analyzed from the Community Subsistence Information System: CSIS (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm)
[b] Brown et al. 2016

8.1.2.2. Spotted Seal

Utqiaġvik hunters reported limited harvest (9,589 pounds) of spotted seal mainly in the summer (June to September) which was the season of highest harvest for the spotted seal species (Brown et al. 2016). 98% of spotted seals were harvested in the summer with the majority (69%) occurring in June and July (Brown et al. 2016). Spotted seals were not reported harvested in 2006 survey interviews conducted in Utqiaġvik by SRBA (SRBA 2010).

Kaktovik hunters harvested 126 pounds of spotted seals in 1992 (ADF&G CSIS; retrieved and analyzed August 15, 2018). Spotted seals were not reported harvested in 2006 survey interviews conducted in Nuiqsut by SRBA (SRBA 2010).

Table 28: Spotted Seal Harvest, as Reported by Utqiaġvik and Nuiqsut in 2014, and Kaktovik in 1992.

Community[a]	Percent of Spotted Seal in Total Marine Mammal Harvest (%)	Total Spotted Seal Harvest (Pounds)	Percent of Households Using Spotted Seal (%)
Utqiaġvik[b]	0.5[a]	9,589	5.4
Nuiqsut[b]	>5	1,277	6.9
Kaktovik[a]	4.3	126	14.9

a Data downloaded and analyzed from the Community Subsistence Information System: CSIS (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm)
b Brown et al. 2016

8.1.2.3. Bearded Seal

Bearded seal contributed the second largest amount to Utqiaġvik's marine mammal harvest if 2014; hunters harvested roughly 1,070 seals which provided 306,097 edible pounds of meat (Brown et al. 2016). Bearded seals are generally targeted in June, July and August when they are commonly found near ice floes (Brown et al. 2016), with the number of use areas peaking in July and declining in August and September (SRBA 2010). In the summer months, 98% of bearded seals are harvested, including 60% in July alone (Brown et al. 2016). In 2006, 30 people (40% of survey respondents) indicated that they had recently hunted for ringed seals in Utqiaġvik (SRBA 2010). Bearded seal use areas extend as far west as

Wainwright and as far east as Prudhoe Bay. Residents traveled up to approximately 40 miles (64 kilometers) from shore in pursuit of bearded seal (SRBA 2010).

Nuiqsut residents use bearded seal for meat and oil (SRBA 2010). Bearded seal use areas extend as far west as Cape Halkett, as far east as Camden Bay, and offshore up to 40 miles (64 kilometers). Nuiqsut hunters harvested an estimated 48 bearded seals which accounted for 8% of the total edible pounds of marine mammals (Brown et al. 2016). Bearded seals were harvested in the summer months, June through August. In 2006, 12 people (69% of survey respondents) indicated that they had recently hunted for bearded seals in Nuiqsut (SRBA 2010). Nuiqsut hunters reported hunting bearded seal during the summer season in open water as the seals are following the ice pack. Residents reported hunting bearded seal between June and September, although a small number of use areas were reportedly used in May and October (SRBA 2010). The number of reported bearded seal use areas peak in July and August, when the majority of seals are available along the ice pack (SRBA 2010).

Survey respondents to the 2006 survey conducted by SRBA (2010) indicated that bearded seals hunting is more common than ringed seal hunting. Bearded seal hunting occurs along the coast as far west as Prudhoe Bay and as far east as the United States/Canada border (SRBA 2010). Residents reported looking for bearded seal as far as approximately 30 miles (48 kilometers) from shore, but generally hunt them closer to shore, up to 5 miles (8 kilometers; SRBA 2010). Between 1994 -2003, 29 bearded seals were taken in Kaktovik. In 2006, 7 people (18% of survey respondents) indicated that they had recently hunted for bearded seals in Kaktovik (SRBA 2010). Bearded seal hunting activities, like ringed seal, begin in March, peaking in July and August, and then conclude in September (SRBA 2010).

Table 29: Bearded Seal Harvest, as Reported by Utqiaġvik and Nuiqsut in 2014, and Nuiqsut in 1992.

Community[a]	Percent of Bearded Seal in Total Marine Mammal Harvest (%)	Total Bearded Seal Harvest (Pounds)	Percent of Households Using Bearded Seal (%)
Utqiaġvik[b]	15	306,097	43.6
Nuiqsut[b]	8	13,846	67.2
Kaktovik[a]	27.7	3,168	74.5

[a] Data downloaded and analyzed from the Community Subsistence Information System: CSIS (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm)
[b] Brown et al. 2016

8.2. Potential Impacts on Availability for Subsistence Uses

Section 101(a)(5)(A) requires NMFS to determine that the taking would not have an unmitigable adverse effect on the availability of marine mammal species or stocks for subsistence use. NMFS has defined ‘‘unmitigable adverse impact’’ in 50 CFR 216.103 as an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

The majority of concerns discussed by North Slope Region respondents to subsistence and traditional knowledge surveys conducted by SRBA in 2013 concerning the biological environment include potential habitat damage as a result of Project construction and operation, disturbance of local wildlife, and potential contamination of resources if project infrastructure is damaged or if a spill or leak occurs (Alaska LNG 2016). Potential impacts on availability for subsistence uses for Utqiaġvik, Nuiqsut, and Kaktovik are discussed below. Following those individual community discussions, potential impacts on availability for subsistence uses for subsistence for the entire North Slope are discussed.

Project construction activities in Prudhoe Bay could result in disturbances of marine mammals, including bowheads and beluga whales and the three species of seals discussed above. The communities of Utqiaġvik and Kaktovik are 100-200 (direct) miles (160-320 kilometers) from the proposed Project at Prudhoe Bay; subsistence activities for these communities are outside both the Project construction area and any associated zones of influence due to the generation of underwater sound during construction. Nuiqsut is 70 miles (112 kilometers) away from the proposed Project, although its subsistence activities are closer to the Project. Nuiqsut is likely to be the community that has the greatest potential to experience some impacts to subsistence practices.

8.2.1. Utqiaġvik

The greatest potential for impact to Utqiaġvik subsistence uses would be associated with barging activity, which could potentially interfere with summer seal, walrus, and fall bowhead whale hunting (Alaska LNG 2016). Barge traffic would occur over six sequential years from July through September, and barging activities would not cease during fall bowhead whale hunting activities (Alaska LNG 2017). Noise from barging could deflect bowhead whales as they migrate through Utqiaġvik's fall whaling grounds or cause temporary disturbances of seals and walrus, making successful harvests more difficult (Alaska LNG 2016).

8.2.2. Nuiqsut

Potential for Project impacts to Nuiqsut's subsistence use of marine mammals is associated with barge activity, which could interfere with summer seal and fall bowhead whale hunting (Alaska LNG 2016). Noise associated with barging could deflect bowhead whales as they migrate through Nuiqsut's fall whaling grounds or cause temporary disturbances of seals, making successful harvests more difficult. Barge traffic would occur over six sequential years from July through September. Although barging activities would not cease during Nuiqsut's fall bowhead whale hunting activities, the potential for impact would be greatly reduced by keeping Project vessels landward of Cross Island during the August 25-September 15 period, avoiding the high use areas offshore of the island during the entire whaling season in most years (Alaska LNG 2016, 2017).

8.2.3. Kaktovik

Because of the distance from Kaktovik and Kaktovik's limited use of waters offshore of Prudhoe Bay, and because the proposed activities would occur in an already-developed area, it is unlikely that the proposed activities would have any effects on the use of marine mammals for subsistence by residents off Kaktovik.

8.2.4. Conclusion

The planned construction and use of improvements to West Dock would occur in Prudhoe Bay, adjacent to existing oil and gas infrastructures, and in an area not used for subsistence. The planned activities would therefore not impact marine mammals in numbers or locations sufficient to render them unavailable for subsistence harvest. Impacts would also be limited due to the Project's distance from the subsistence communities (Barrow, Nuiqsut, Kaktovik) and planned mitigation measures. Impacts would be largely limited to temporary behavioral disturbances of seals. Barging activities could potentially impact Utqiaġvik and Nuiqsut's fall bowhead whale hunt and possibly other marine mammal harvest activities in the Beaufort Sea; but mitigation measures such as limiting barges to waters shoreward of Cross Island during the Nuiqsut whaling season (August 25 – September 15) would minimize such effects. AEWC and NSB would be consulted on mitigation measures to limit impacts (Alaska LNG 2016).

Serious injury or mortality of marine mammals is not anticipated from the proposed activities, and the activities would not have any impacts on reproductive or survival rates of any of the species. Because of the short-term, temporary, and localized nature of construction activities, the Applicant concludes, based on the analyses and information presented above, that any impacts to marine mammal harvests would be negligible. While some Project activities would occur within the traditional area for hunting marine mammals, no relevant subsistence uses of marine mammals would be impacted by this action.

9. DESCRIPTION OF IMPACT ON MARINE MAMMAL HABITAT

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

9.1. Potential Physical Impacts on Habitat

9.1.1. Seafloor Disturbance

Planned Project activities that would result in seafloor disturbance include screeding, grading, pile driving, and causeway widening (fill) at West Dock. Benthic infauna abundance and diversity are very low in this area, probably due to the shallow water depth (< 16 feet [5 meter]), run-off from adjacent rivers, and ice-related stress (Carey et al. 1984). Freezing and thawing sea ice and river runoff during the summer melting season significantly affect the coastal water mass characteristics and decrease the salinity. River outflow and coastal erosion also transport significant amounts of suspended sediments (BPXA 2009). Sea ice pressure ridges scour and gouge the seafloor and move sediments, creating natural, seasonal disruptions of the seafloor. These factors result in a less than favorable habitat for benthic organisms in the activity area. Bottom disturbance is a natural and frequent occurrence in this nearshore region resulting in benthic communities with patchy distributions (Carey et al. 1984). The low nearshore densities of benthic prey items suggest that the proposed construction activities would have a negligible effect on the marine mammal feeding ecology.

9.1.2. Water Quality Disturbance

The primary effects on water quality from construction of the project in Prudhoe Bay would be the temporary suspension of sediment in the water column during seabed preparation (screeding, grading, filling) and pile driving. The Project would also result in discharges to surface waters of Prudhoe Bay, primary normal vessel discharges from construction vessels, including deck drainage (runoff of precipitation and deck wash water), ballast water, bilge water, non-contact cooling water, and gray water.

9.1.2.1. Water Quality Disturbance from Screeding and Seabed Preparation

Seabed preparation operations would cause a temporary, localized increase in turbidity and sedimentation in the waters in the vicinity of the project area. The screeding process redistributes seabed materials to create a flat even seafloor surface without the need for excavation or disposal of materials. Screeding would occur each summer immediately prior to the arrival of the first cargo barge. Water quality would be temporarily affected in the localized area surrounding West Dock. Turbidity and sedimentation rates are naturally high in this region due to ice scouring and gouging of the seafloor and significant amounts of suspended sediments from river outflow and coastal erosion. Additional mobilization of sediment from screeding activities is not anticipated to have a significant impact.

9.1.3. Ice Habitat Disturbance

Winter construction activities include through-ice surveying and through-ice grading. Ice will be cut and removed to facilitate grading the seafloor. Work is expected to begin immediately after the ice becomes grounded, conditions which typically occur in the work area on or before February 1.

Ringed seal density is low in areas with water depths less than 10 feet (3 meters; Moulton et al. 2005), and the grounded ice conditions suitable for construction activities are not preferred habitat for ringed seals. Additionally, winter construction activities would begin prior to March 1, reducing the potential for disturbance to ringed seal birth lairs. Any ice roads that were constructed over marine habitats would melt during breakup or be carried away in broken ice and then melt.

9.2. Potential Impacts on Food Sources from Sound Generation

9.2.1. Zooplankton

Zooplankton is a food source for several marine mammal species, including bowhead whales, as well as a food source for fish that are then prey for marine mammals. Bowhead whales primarily feed in the eastern Beaufort Sea during the summer and early autumn, but will occasionally feed during their fall migration. Copepods and euphausiids were the most common prey item found in stomach samples taken from harvested bowheads in the Kaktovik area between 1979 and 2000 (Lowry and Sheffield 2002). Gray whales are predominantly bottom feeders and benthic amphipods and isopods comprise the majority of their diet in the typical summering areas west of Alaska (Oliver et al. 1983; Oliver and Slattery 1985).

Population effects on zooplankton could therefore have indirect effects on marine mammals. The primary generators of sound energy associated with the planned activities include vibratory and impact pile

driving, vessel traffic, and screeding. Popper and Hastings (2009) reviewed information on the effects of pile driving and concluded that there are no substantive data on whether the high sound levels from pile driving or any man-made sound would have physiological effects on invertebrates. Any such effects would be limited to the area very near (3-16 feet [1–5 m]) the sound source and would result in no population effects due to the relatively small area affected at any one time and the reproductive strategy of most zooplankton species (short generation, high fecundity, and very high natural mortality).

No adverse impact on zooplankton populations would be expected to occur from these activities, due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortalities or impacts that might occur would be expected to be negligible compared to the naturally occurring high reproductive and mortality rates. Impacts from sound energy generated by trenching, grading, screeding, and vessels would be expected to have even less impact, as these activities produce much lower sound energy levels.

9.2.2. Benthos

No adverse impacts on benthic populations would be expected due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortalities or impacts that might occur because of the planned activities is negligible compared to the naturally occurring high reproductive and mortality rates.

9.2.3. Fish

Fish are the primary prey for beluga whales and ice seals, ringed, spotted, and bearded, in the Beaufort Sea. Belugas feed on a variety of fish, as well as shrimp, squid, and octopus (Burns and Seaman 1985). Occasional sightings occur in the vicinity of the action area, however the main migration route for belugas is located farther offshore. The ringed seal feeds on fish and a variety of benthic species such as crabs and shrimp. Spotted seal prey consists of pelagic and demersal fish including herring, capelin sand lance, Arctic cod, saffron cod, and sculpins. Shrimp and cephalopods are also part of the spotted seal diet. Bearded seals primarily feed on crabs, shrimp, clams, and other benthic organisms.

Both saltwater and anadromous species of fish inhabit the waters surrounding the project area. Most are circumpolar, small, and do not feed high in the water column. Arctic cod is the only abundant pelagic species and is the most important as a means of transferring energy from lower to higher trophic levels. Very large schools of cod form in the summer and can be found in nearshore and offshore waters (Craig et al. 1982). Both beluga whales and ringed seals rely on Arctic cod as a major food source (Frost and Lowry 1984).

Fish have been shown to react when engine and propeller sounds exceed a certain level (Olsen et al. 1983; Ona 1988; Ona and Godo 1990). Avoidance reactions have been observed in fish such as cod and herring when vessel sound levels were 110–130 dB re 1 µPa rms (Nakken 1992; Olsen 1979; Ona and Godo 1990; Ona and Toresen 1988). Vessel sound source levels in the audible range for fish are typically 150–170 dB re 1 µPa/Hz (Richardson et al. 1995). Based upon the reports in the literature and the predicted sound levels from these vessels, there may be some avoidance by fish in the immediate area.

Pile driving has more potential to affect fish given the higher source levels and rapid rise times. Fish with swim bladders are particularly sensitive to underwater impulsive sounds due to swim bladder resonance; as the pressure wave passes through a fish, the swim bladder is rapidly squeezed as the high-pressure wave, and then under pressure component of the wave, passes through the fish. The swim bladder may repeatedly expand and contract at the high SPL, creating pressure on the internal organs surrounding the swim bladder. There have been several thorough reviews of the literature on the effects of pile driving on fish (Hastings and Popper 2005; Popper and Hastings 2009). The Fisheries Hydroacoustic Working Group (2008) provided criteria agreed to by the Federal Highway Administration, NOAA Fisheries, USFWS, and various state agencies. Another working group (Popper et al. 2014) provided the guidelines in Table 30.

Table 30: Guidelines for Assessing Acoustical Impacts to Fish from Pile Driving

Type of Fish	Mortality and Potential Mortal Injury	Recoverable Injury	TTS	Masking	Behavior
No swim bladder	>219 dB SEL_{cum} or >213 dB_{peak}	>216 dB SEL_{cum} or >213 dB_{peak}	>>186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder not involved in hearing	210 dB SEL_{cum} or >207 dB_{peak}	203 dB SEL_{cum} or >207 dB_{peak}	186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder involved in hearing	207 dB SEL_{cum} or >207 dB_{peak}	203 dB SEL_{cum} or >207 dB_{peak}	186 dB SEL_{cum}	(N) High (I) High (F) Moderate	(N) High (I) High (F) Moderate

Several caged fish studies of the effects of pile driving have been conducted, and most have involved salmonids. Ruggerone et al. (2008) exposed caged juvenile coho salmon (3.7-5.3 inches [93–135 millimeters]) at two distance ranges (near 6-22 feet [1.8–6.7 meters] and distant 49 feet [15 meters]) to 1.6 feet (0.5-meter)-diameter steel piles driven with a vibratory hammer. Sound pressure levels reached 208 dB re 1 µPa peak, 194 dB re 1 µPa rms, and 179 dB re 1 μPa^2 s SEL, leading to a cumulative SEL of approximately 207 dB re 1 μPa^2 s during the 4.3-hour period. Observed behavioral responses of salmon to pile strikes were subtle; avoidance response was not apparent among fish. No gross external or internal injuries associated with pile driving sounds were observed. The fish readily consumed hatchery food on the first day of feeding (day 5) after exposure. The study suggests that coho salmon were not significantly affected by cumulative exposure to the pile driving sounds.

Hart Crowser, Inc. et al. (2009) similarly exposed caged juvenile (3.4-4.9 inches [86–124 millimeters], 10–16 grams) coho salmon to sheet pile driving in Cook Inlet using vibratory and impact hammers. Sound pressures measured during the acoustic monitoring were relatively low, ranging from 177 to 195 dB re 1 µPa peak, and cumulative SEL sound pressures ranging from 179.2 to 190.6 dB re 1 μPa^2 s. No measured peak pressures exceeded the interim criterion of 206 dB. Six of the 13 tests slightly exceeded the SEL criterion of 187 dB for fish over 2 grams. No short-term or long-term mortalities of juvenile hatchery coho salmon were observed in exposed or reference fish, and no short- or long-term behavioral abnormalities were observed in fish exposed to pile driving sound pressures or in the reference fish during post-exposure observations.

The California Department of Transportation (Caltrans 2010) exposed juvenile steelhead (*Onchorhynchus mykiss*) to a variety of peak SPLs and SELs at various distances (35–150 meters) from driving 7.2-foot (2.2-meter)-diameter cast-in-steel-shell piles driven immediately adjacent to the Mad River. Peak SPLs ranged from 69–188 dB re 1 µPa and cumulative SELs ranged from 179–194 dB re 1 μPa^2 s. No physical trauma was observed. Hematocrit and plasma cortisol levels were not significantly related to exposure to sound generated by pile driving.

The barges/tugs offloading the modules are likely to have no more effect on fish than temporary habitat displacement/avoidance while the activity is conducted. Information in the literature indicates that pile driving could potential result in injury or mortality to fish, but the results of *in situ* studies on salmonids indicates that such effects are unlikely.

9.3. Invasive Species

Vessels can impact habitat quality for marine mammals through the introduction of aquatic invasive organisms. Construction vessel traffic would arrive from Asia and could potentially transport non-native tunicates, green crab (*Carcinus maenas*), and Chinese mitten crab (*Eriocheir sinensis*) (ADF&G 2002), which impact food webs and can outcompete native invertebrates, resulting in habitat degradation.

All vessels brought into the State of Alaska or federal waters are subject to United States Coast Guard (USCG) 33 CFR 151 regulations, which are intended to reduce the transfer of aquatic invasive organisms. Ballast water requirements are defined by federal regulations (33 CFR 151.2025) that prohibit discharge of untreated ballast water into the waters of the U.S. unless the ballast water has been subject to a mid-ocean ballast water exchange (at least 200 nautical miles offshore). Vessel operators are also required to remove “fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with local, state, and federal regulations” (33 CFR 151.2035(a)(6)). Adherence to the USCG 33 CFR 151 regulations would be expected to reduce the likelihood of project-related vessel traffic introducing aquatic invasive species.

9.4. Potential Impacts from Habitat Contamination

9.4.1. Petroleum Release

Large and small quantities of hazardous materials, including diesel fuel and gasoline, would be handled, transported, and stored following the state and Federal regulations as well as procedures described in the Spill Prevention, Control, and Countermeasure (SPCC) Plan. In the unlikely event there is a release of oil, fuel, wastewater or other contaminants from Project activities that reach marine waters, it could result in direct impacts to the health of exposed marine mammals. Individual marine mammals could show acute irritation or damage to their eyes, blowhole or nares, and skin; fouling of baleen, which could reduce feeding efficiency; and respiratory distress from the inhalation of vapors (Geraci and St. Aubin 1990). Long-term impacts from exposure to contaminants to the endocrine system could impair health and reproduction (Geraci and St. Aubin 1990). Ingestion of contaminants could cause acute irritation to the digestive tract, including vomiting and aspiration into the lungs, which could result in pneumonia or death (Geraci and St. Aubin 1990).

Indirect impacts from spills or leaks, although unlikely to occur, could lead to contamination of lower-trophic-level prey, which could reduce the quality and/or quantity of marine-mammal prey. If such an event were to occur, individuals that consume contaminated prey might experience health effects (Geraci and St. Aubin 1990).

10. DESCRIPTION OF IMPACT FROM LOSS OR MODIFICATION TO HABITAT

The anticipated impact of the loss or modification of habitat on the marine mammal populations involved.

Project activities that could potentially impact marine mammal habitats include temporary disturbance primarily through increases in underwater SPLs from pile driving and temporary habitat loss from construction activities.

10.1. Habitat Disturbance and Alteration

Habitat disturbance and alteration from screeding and construction of the West Dock and causeway upgrades would likely have a negligible impact on marine mammal prey species and the fitness of marine mammals. Screeding may temporarily impact the benthic resources within the project area. However, benthic organisms naturally occur in low densities nearshore in the activity area and have a patchy distribution.

Water quality disturbance would be localized and temporary. A study conducted during pile driving measured water quality before, during, and after pile removal and pile replacement (Roni and Weitkamp 1996) and found the activity had “little or no effect on dissolved oxygen, water temperature, and salinity”, and turbidity (measured in nephelometric turbidity units [NTU]) at all depths. Turbidity at sites nearest to the construction activity was typically less than 1 NTU higher than stations farther from the construction area throughout construction. No marine mammals would be expected to be close enough to the planned pile driving activities in Prudhoe Bay to experience turbidity.

Winter construction activities would begin prior to March 1 and would be conducted over grounded ice. Ringed seals typically establish birthing lairs after March 1 so commencement of construction activities before this date would prevent pregnant seals from constructing lairs in areas that would subsequently be disturbed. Ringed seal density is low in areas where water depths are less than 10 feet (3 meters), and it is unlikely that ringed seals would be encountered in the grounded ice work area. Ice roads constructed over marine habitats would melt during breakup or be carried away in broken ice and then melt.

Habitat disturbance and alteration resulting from project activities could have a few highly localized, short-term effects to a few marine mammals, however, the amount of habitat affected in the IHA geographic region would be small compared to that available to marine mammal species. Thus, any potential effects are expected to be localized and minor, affecting a small number of individuals with no population-level effects.

10.2. Impacts from Sound on Food Sources

There are no important feeding areas within the activity area and it is not a high use area for marine mammals. Some animals may be temporarily displaced by Project activities; however, the area of effect would be relatively small compared to the available areas known for prey abundance and higher marine mammal densities. Any missed feeding opportunities would be minor based on the fact that other, better feeding areas exist elsewhere. No marine mammal species would be excluded from any habitat required for their livelihood.

Fish are a primary dietary component of some marine mammal species in the Beaufort Sea. Impact pile driving can produce sound pressure waves that can injure and kill small fish (as cited in NMFS 2005). In contrast to impact pile driving, vibratory pile driving does not produce the same percussive sound waves that are harmful to fish and has not resulted in any known fish kills (USFWS 2004). Vibratory hammer studies by Carlson (1996) in Oregon and Nedwell et al. (2003) in the United Kingdom have confirmed that fish are little impacted by this hammering method.

Ensonification from the activities should have no more than a negligible effect on marine mammal habitat because:

- No studies have demonstrated that anthropogenic noise affects the life stages, condition, or amount of marine mammal food resources (i.e., fish, invertebrates, eggs), except when exposed to sound levels within a few meters of the source or in a few very isolated cases.
- Where fish have been observed responding to anthropogenic noise, the effects were temporary and of short duration (Popper et al. 2005). Behavioral responses were short-term and fish returned to their pre-disturbance behavior once the activity ceased. The proposed activities would have little, if any, impact on marine mammals' ability to feed on fish in the area where work is planned.
- Each individual project activity area covers a small percentage of the potentially available habitat used by marine mammals in the Beaufort Sea, allowing marine mammals to move away from any project area-specific program sounds to feed, rest, migrate or conduct other elements of their life history.

The activities included in the IHA are not expected to have any permanent habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations because operations would be limited in duration, location, timing, and intensity.

11. MEASURES TO REDUCE IMPACTS TO MARINE MAMMALS

The availability and feasibility [economic and technological] of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

11.1. Mitigation and Conservation Measures

Aspects of the proposed West Dock modifications that have the potential to incidentally harass marine mammals are the airborne and underwater noise generated by vibratory and impact pile installation. The mitigation and monitoring program combine active monitoring of the area of operations and implementation of mitigation measures designed to minimize Project impacts to the species, stocks, habitat, and subsistence use of marine mammals.

11.1.1. Protected Species Observers

Protected Species Observers (PSO) would be stationed onsite and conduct observations during in-water pile driving and screeding activities. Monitoring would be conducted by qualified and experienced PSOs. PSO protocols and requirements are outlined in more detail in the Marine Mammal Monitoring and Mitigation Plan (4MP) provided in Appendix A. In summary:

1. Two PSOs would monitor the Level A and Level B harassment zones during in-water construction operations, specifically impact pile installation. Four PSOs would rotate throughout the day such that each PSO would observe for no more than 4 hours at a time and no more than 12 hours in a 24-hour period. To provide full coverage of the larger Level B zone during vibratory driving of sheet piles, two PSOs would be stationed at two locations (east and west sides of STP) at the same time with rotations.
2. PSOs would be located at vantage points to monitor the Level A and Level B harassment zones, when conditions allow. Elevated platforms may be used as appropriate, to maximize the potential for viewing marine mammals entering the harassment zones.
    a. When work is occurring at DH4, PSOs would be stationed at the STP on an elevated platform to view towards the east, north, and west, as water depth to the south (towards shore) is too shallow for marine mammals. The highest estimated Level A distance for species in this area is 5,166 feet (1,575 meters) for low frequency cetaceans, which are not expected to be inside the barrier islands. The phocid Level A distance is 2,766 feet (843 meters); seals can generally be detected at this range with the elevated platform and binoculars. The highest estimated Level B distance is 2.9 miles (4,642 meters) for vibratory driving of sheet piles and 0.62 miles (1,000 meters) for impact pile driving. The Level B zones for impact pile driving are viewable with high powered binoculars and an elevated platform. The Level B zones for vibratory pile driving of sheet piles is generally not viewable for seals or smaller cetaceans. PSOs may be stationed on a vessel to increase viewing range or NMFS may use an “assumed take” calculation to account for marine mammals not detected by PSOs.

   b. When work is occurring at the barge bridge, PSOs would be stationed at the north edge of the bridge. The bridge is elevated enough to provide good viewing. This area is very shallow, so it is unlikely there will be marine mammals in the Level A or B area during this work.

3. PSOs would have the ability to effectively communicate with Project personnel to provide real-time information on marine mammals and will have the authority, within the framework of safe operations, to request appropriate mitigation responses to avoid takes of marine mammals.
4. If a listed marine mammal occurs within the Level A or Level B harassment zones or is otherwise harassed, harmed, injured, or disturbed, the occurrence would be reported to NMFS.
5. PSOs would have direct communication with the Construction Project Manager (PM) and will regularly review shutdown procedures. The Construction PM would brief the construction crew on sighting and shutdown protocols, and crew sightings would be relayed to the PSO.
6. The primary duties of the PSOs would be to observe, document, and mitigate for events related to marine mammals and PSOs would have no construction-related duties.
7. PSOs would also implement a test of effectiveness of night vision devices (NVDs) and/or infrared (IR) technologies for nighttime and low visibility monitoring. More details are provided in the 4MP.

11.1.2. In-Water Activity Mitigation Measures

The majority of DH4 construction and associated activities are planned for the open water season (June-October); however, no pile driving would occur during the Nuiqsut whaling season (August 25-September 15). PSO protocols for in-water activity monitoring are outlined in more detail in the 4MP provided in Appendix A. In summary:

1. **Pre-activity Monitoring:** PSOs will begin observing for marine mammals 30 minutes before soft-start or in-water pile installation.
   a. If a marine mammal for which take is not authorized is sighted within the Level A or B harassment zones, a soft start would not begin until the PSO has determined that the animal has exited the zones or has not been re-sighted for 30 minutes.
   b. If a marine mammal for which Level B take is authorized is sighted within the Level B harassment zone after the 30-minute monitoring period but before soft start, the Contractor would either begin soft start with documentation of take, or delay the soft start to avoid take. Soft start or pile driving would not start if a marine mammal is within the Level A harassment zone.

2. **Soft Start:** A soft start technique would be used at the beginning of each impact pile installation, or if there has been cessation of pile driving for a period of 30 minutes or longer, to allow marine mammals to exit the area before pile driving reaches full energy.
   a. For impact pile driving, an initial set of three strikes from the hammer at about 40 percent energy is followed by a 30-second waiting period, and then two subsequent three-strike sets.

Impact pile driving at full power may commence, provided marine mammals remain absent from the monitoring zone.

b.

3. **Shut Down Zones:** The following shut down zones are proposed for the different species groups, based on estimates to the Level A thresholds.

   a) For low frequency cetaceans (bowhead and gray whales)

      i. 3,937 feet (1,200 meters) when using the impact hammer to install 11.5 or 14-inch H piles

      ii. 5,249 feet (1,600 meters) when using the impact hammer to install 48-inch piles

   b) For mid-frequency cetaceans (beluga whales)

      i. 164 feet (50 meters) when using the impact hammer to install 11.5 or 14-inch H piles and 48-inch piles

   c) For seals

      i. 2,133 feet (650 meters) when using the impact hammer to install 11.5 or 14-inch H piles

      ii. 2,789 feet (850 meters) when using the impact hammer to install 48-inch piles

4. **Shutdown Procedures:** The PSOs would continuously monitor the Level A and Level B harassment zones during pile installation and would have direct contact with the designated Construction PM to coordinate shutdowns, as necessary.

   a. If a marine mammal appears likely to enter the Level B harassment zone, the PSO would notify the Construction PM, who would either immediately shut down pile driving before the marine mammal enters the zone, avoiding a Level B take, or document the marine mammal as a Level B take upon entry into the zone. PSOs would document the reason to shut down or not shut down. If the decision is made to continue pile installation while a marine mammal is within the Level B harassment zone, that pile segment may be completed, unless the animal approaches and is likely to enter the Level A harassment zone. At that point, the Construction PM would immediately shut down pile driving operations. Pile installation would be shut down to avoid take for marine mammal species for which take is not authorized.

   b. Following a lapse of pile driving for more than 30 minutes, the PSO would authorize soft start for impact pile driving procedures after confirming that marine mammals have not been observed in the Level B harassment zone for at least 30 minutes immediately prior to resumption of operations.

   c. Following a shutdown of less than 30 minutes due to a marine mammal sighting in the Level B harassment zone, pile installation may commence when the PSO confirms that the marine mammal was observed exiting the zone or has not been observed in the zone for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds).

5. **Shutdown for Weather/Low Visibility:** Pile installation would only occur when the Level A and Level B harassment zones can be adequately monitored.
6. PSOs Post-**Activity Monitoring:** would observe marine mammals for 30 minutes after pile driving is completed for the day.
7. **Nighttime Monitoring:** The Applicant proposes to test NVDs and IR technology to detect marine mammals during periods of darkness or low visibility as part of this project. These technologies have had limited access, but there are aspects of this project that may be conducive to testing these methods. PSOs would be on a stable, elevated platform with surrounding sources of industry lighting with target species that are either hauled out on land or ice.
8. Pile driving would not be conducted during the Nuiqsut whaling season (August 25-September 15).

11.1.3. Ice-Covered Season Mitigation Measures

Seabed preparation at the barge bridge would be conducted over grounded ice during the winter months. Grounded ice conditions are expected to occur at the breach on or before February 1 and seabed prep would begin as soon as ice conditions allow to minimize potential impacts on marine mammals. Ringed seals typically establish birthing lairs after March 1, and the commencement of construction activities before this date would prevent pregnant seals from constructing lairs in disturbed areas. Ringed seal density is low in areas where water depths are less than 10 feet (3 meters), and it is very unlikely that ringed seals would be encountered in the grounded ice work area.

The majority of DH4 construction and associated activities are a planned for the open water season (June-October). However, if work is not completed during this time due to logistical or other constraints, a contingency time period the following year for dolphin installation is March through April and May 1 through June 30 for construction of the barge bridge abutments. Should pile installation occur during this contingency time period, a subsistence advisor would survey areas within a buffer zone of DH4 where water depth is greater than 10 feet (3 meters) to identify potential ringed seal structures before activity begins. Structures would be avoided by a minimum of 500 feet (150 meters) and workers would have completed wildlife interaction avoidance training as part of their orientation program. The DH4 location has a depth of -12 feet (-3.7 meters) MLLW and, like the breach, grounded ice is expected during the winter. This combined with the initiation of seabed preparation before March 1 greatly reduces the likelihood of encountering ringed seals during winter pile driving. NVDs and IR technology would also be testing during this period for monitoring of seals.

12. MEASURES TO REDUCE IMPACTS TO SUBSISTENCE USERS

Where the proposed activity would take place in or near a Traditional Arctic Subsistence Hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.

Regulations at 50 CFR 216.104(a)(12) require applicants for activities that take place in Arctic waters to provide a Plan of Cooperation (POC) or information that identifies what measures have been taken and/or would be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes. The POC for this Project is attached as Appendix B.

NMFS has defined "unmitigable adverse impact" in 50 CFR 216.103 as: "an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Alaska LNG has funded several studies on subsistence and traditional knowledge of communities that may be impacted by the Project (Alaska LNG 2015, 2016). Alaska LNG Project also funded a study to document the harvest and use of wild resources by residents of several communities in arctic Alaska which included Utqiaġvik and Nuiqsut (Brown et al. 2016). Information from those studies is presented in Section 8 of this document. In summary, the villages of Utqiaġvik, Nuiqsut, and Kaktovik are located more than 70 miles (112 kilometers) away from the proposed Project Area and subsistence use of the immediate area surrounding West Dock is low as it is an industrial area with limited access. Activities associated with Alaska LNG's current construction program are not likely to have an unmitigable adverse impact on the availability of bowhead or beluga whales or any species of seals for taking for subsistence uses.

The AEWC has historically held quarterly meetings that have included a summer meeting in Anchorage, a fall meeting in Fairbanks, and a mini-convention in Utqiaġvik in early February. AGDC has attended several of these meetings since 2015 and has made presentations, including at the mini-convention in Utqiaġvik, in February, 2017. Alaska LNG hosted a technical workshop at the Anchorage meeting in summer 2018. This workshop includes a presentation of technical details on Alaska LNG and discussion of impacts and potential mitigation measures. AGDC plans to continue coordination through the construction season.

Alaska LNG has also engaged with whalers or family members of whalers in attendance at other meetings on the North Slope (e.g., with meetings involving NSB Department of Wildlife) or meetings with Native Corporations (e.g., Kuukpik). Although these meetings were not always specifically directed towards whalers, the topic of whaling and subsistence regularly occurred.

Residents of the NSB have shown significant interest in the Alaska LNG Project over the past five years (Table 31). After an initial round of public scoping meetings held by the FERC, the Alaska LNG Project Team held open house meetings to further address the NSB residents' questions. It is important to note that

community meetings have been held as part of the Alaska LNG project through its many project ownerships; we have included meetings specific only to the AGDC Alaska LNG Project.

Table 31. Overview of Alaska LNG Meetings with Subsistence Users.

Date	Meeting Subject
January 14, 2015	Nuiqsut Open House & Workshop
July 14, 2015	Nuiqsut Community Meeting
December 4, 2015	NSB Mayor Charlotte Brower letter to FERC
October 29, 2015	Nuiqsut Public Scoping Meeting
July 24, 2018	Alaska Eskimo Whaling Commission Meeting
January 16, 2019	Alaska Eskimo Whaling Commission Meeting
July 30, 2019	Alaska Eskimo Whaling Commission Meeting

It is imperative that the AEWC and Nuiqsut Whaling's Captain Association is consulted in regard to projects that involve marine activities on Alaska's North Slope. As stated by NSB Mayor Charlotte Brower in a letter to FERC:

> "Communities of the North Slope and beyond depend upon the subsistence harvest of the Bowhead Whale and the sharing of its harvested products for their cultural, nutritional, and spiritual well-being. The Borough supports the work of the Alaska Eskimo Whaling Commission (AEWC) to ensure the ability to hunt is not harmed by industrial and other activities."

AGDC has engaged with the AEWC since 2015 and provided project updates during scoping and throughout the regulatory process. In July 2018, the Alaska LNG Project team presented an in-depth project overview and held thorough discussions with the Commissioners during an AWEC meeting in Fairbanks. See Appendix B (Plan of Cooperation) for the meeting minutes and project presentation. The most recent AEWC meeting was held in July 2019, during which components of the draft EIS that addressed mitigation plans, conflict avoidance, and minimization of impacts to marine mammals were discussed.

Table 322 identifies significant meetings held with North Slope communities and stakeholder groups, as well as documentation; additional details and records are provided in Appendix B.

Table 32. Summary of Stakeholder Meetings Held From 2015-2019.

Date	Location	Organization	Purpose
January 13, 2015	Nuiqsut, AK	Nuiqsut Open House and Workshop	Community meeting held to discuss Alaska LNG Project and answer community questions.
January 27, 2015	Anchorage, AK	Alaska LNG Project Team	Letter that summarized notes from public meetings held in October - November 2014 including Utqiagvik, AK
May 1, 2015	Barrow, AK	Barrow Community Meeting	General overview of the project with focus on the North Slope Borough.
May 14, 2015	Utqiagvik, AK	North Slope Borough	Letter that provided background information to FERC on the North Slope Borough, and recommendations on what the environmental analysis should address, including impacts to subsistence and marine mammals. The letter discusses offshore impacts, conflict avoidance. and mitigation measures.
July 14, 2015	Nuiqsut, AK	Nuiqsut Community Meeting	Community meeting to discuss Alaska LNG Project and answer community questions.
October 28, 2015	Barrow, AK	Barrow Public Scoping Meeting	Public scoping meeting to hear community concerns.
October 29, 2015	Nuiqsut, AK	Nuiqsut Public Scoping Meeting	Public scoping meeting to hear community concerns.
February 8, 2017	Barrow, AK	Alaska Eskimo Whaling Commission	Provided the AEWC with a project update.
April 25, 2017	Nuiqsut, AK	Native Village of Nuiqsut	Letter that notified application for the Alaska LNG Project was submitted to FERC.

Date	Location	Organization	Purpose
May 16, 2017	Barrow, AK	Barrow Community Meeting	Community meeting to discuss Alaska LNG Project and answer community questions.
March 14, 2018	Anchorage, AK	North Slope Borough Planning Department	Meeting to establish a working relationship between the NSB Planning Department and AGDC along with identification of issues and necessary NSB permits for the project.
April 19, 2018		Native Village of Nuiqsut	Letter that provided a copy of the FERC EIS schedule and map.
May 9, 2018	Utqiagvik, AK	North Slope Borough	Meeting during which project issues and incidental take regulations were discussed.
May 14, 2018	Utqiagvik, AK	Utqiagvik Community Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
May 15, 2018	Nuiqsut, AK	Nuiqsut Community Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
July 24, 2018	Fairbanks, AK	Alaska Eskimo Whaling Commission	AGDC provided a project update then answered questions from Alaska Eskimo Whaling Commissioners
October 17, 2018	Anchorage, AK	Alaska Eskimo Whaling Commission	Attended the fall meeting of the Commission to provide a project update.
January 16, 2019	Anchorage, AK	Alaska Eskimo Whaling Commission	Attended the quarterly meeting to engage with AEWC Commissioners and provide informal project update.

Date	Location	Organization	Purpose
July 30, 2019	Utqiagvik, AK	Alaska Eskimo Whaling Commission	Provided the AEWC with a project update. Due to an unforeseen accident Mr. Richards was not able to attend. His presentation identified how the draft EIS addressed marine mammals, mitigation plans, conflict avoidance along with AGDC commitments.
September 9, 2019	Utqiagvik, AK	FERC Public Comment Meeting on DEIS	Community meeting that gathered public comment on the draft EIS issued by FERC. One individual showed up but did not formally testify.
September 10, 2019	Nuiqsut, AK	FERC Public Comment Meeting on DEIS	Community meeting that gathered public comment on the draft EIS issued by FERC.
September 15, 2019	Anchorage, AK	Alaska LNG Project Team	Summary, by community, of comments made at the FERC public meetings.

Alaska LNG will continue to engage stakeholders including the NSB, AEWC, and Nuiqsut Whaling Captains Association, as the project progresses. This effort will include meeting attendance and regular, transparent correspondence. Detailed records will be captured for all communication and consultations with local subsistence communities that involve the planned Alaska LNG program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR 216.104(a) (12) (i), (ii), and (iv)).

Alaska LNG plans to continue to engage stakeholders and Native community members as appropriate. Alaska LNG will detail communications and consultations with local subsistence communities concerning its planned program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR 216.104(a) (12) (i), (ii), and (iv)).

12.1. Subsistence Mitigation Measures

Mitigation measures proposed to reduce impacts to subsistence users are provided in the following list. The following mitigation measures were raised by community members at the aforementioned meetings as well as those that are considered industry standard.

- Alaska LNG has developed a detailed POC, provided in Appendix B, as part of this Project in accordance with the MMPA which identifies and documents potential conflicts and associated measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence use.
- Outcomes of POC meetings will be documented.
- Alaska LNG continues to document its contacts with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups. This documentation is provided in the POC, Appendix B.
- Alaska LNG will routinely engage with local communities and subsistence groups. These groups will be consulted on mitigation measures to limit impacts prior to construction activities. Multiple user groups are often consulted simultaneously as larger coalition meetings such as the Arctic Safety Waterways Committee meetings. Local communities and subsistence groups identified by Alaska LNG include:
    - AEWC
    - Arctic Safety Waterways Committee
    - Arctic Coalition of Marine Mammals
    - The Ice Seal Committee
    - The Alaska Beluga Whale Committee
    - The Alaska Nannut Co-Management Council
    - Indigenous People's Council for Marine Mammals
    - The North Slope Borough Department of Wildlife
    - The North Slope Borough Planning Department
    - Kuukpik Corporation
    - Inupiat Community of the Arctic Slope
- Alaska LNG will develop a Communication Plan and will implement this plan before initiating construction operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts.
- A project informational mailer with a request for community feedback (traditional mail, e-mail, phone) will be sent to community members prior to construction.
- Following the construction season, Alaska LNG intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.

- The AEWC works annually with industry partners to develop a Conflict Avoidance Agreement (CAA). This agreement implements mitigation measures that allow industry to conduct their work in or transiting the vicinity of active subsistence hunters, in areas where subsistence hunters anticipate hunting, or in areas that are in sufficient proximity to areas expected to be used for subsistence hunting that the planned activities could potentially adversely affect the subsistence bowhead whale hunt through effects on bowhead whales while maintaining the availability of marine mammals for subsistence hunters. One important aspect of the CAA are time and area closures. Alaska LNG is considering whether it would enter into a CAA or similar agreement with the AEWC. Such agreements are voluntary and are not mandated by regulation. Alaska LNG is, however, committing to the following restrictions on pile driving in anticipation of the Nuiqsut whaling season, understanding the exact whaling dates may change:
    - Pile driving activities at West Dock would not occur during sensitive periods in an effort to eliminate noise and vessel traffic
    - Keep vessels landward of Cross Island during the Nuiqsut whaling (August 25-September 15).

13. MONITORING AND REPORTING

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.

During the Project, the Applicant proposes to implement a marine mammal monitoring and mitigation strategy that would avoid or minimize impacts to marine mammals. Additional details regarding the marine mammal monitoring program are provided in the 4MP (Appendix A), developed concurrently with this application, which would be implemented during in-water activities. Standard monitoring mechanisms are summarized in this section.

13.1. Marine Mammal Monitoring

Proposed Project construction activities have the potential to incidentally harass marine mammals through airborne and underwater noise generated by vibratory and impact pile driving and some construction activities through ice. Marine mammal monitoring would occur during pile driving and other construction activities that have the potential to disturb marine mammals. During monitoring, the Applicant would collect data on marine mammal sightings and any behavioral responses to activities associated with the Project. PSOs would be trained in marine mammal identification and behaviors. Observations would occur at the best available and practicable vantage point to monitor the Level A and B harassment zones for marine mammals. The PSOs would not have construction-related responsibilities while conducting monitoring for marine mammals.

Trained PSOs would be responsible for monitoring the shutdown and disturbance zones and would record detailed information about any implementation of shutdowns, including distance of the animal to the

activity, behaviors and potential reactions of the animal, and a description of project-specific actions enacted. The shutdown and disturbance zones are summarized in Table 33.

Table 33. Level A and Disturbance Zones.

Activity	Level A Exclusion Zone (m)			Level B Monitoring Zone (m)
	Low Frequency Cetaceans	Mid Frequency Cetaceans	Phocids	
Impact of 11.5 or 14-inch H-pile	1,200	50	650	650
Impact of 48-inch pile	1,600	50	850	2,200
Vibratory of 14-inch pile	10	10	10	1,000
Vibratory of sheet piles	20	10	10	4,700

PSOs would collect marine mammal and other observational data before and during pile driving activities, including:

- General data:
  - Date and time that monitoring effort begins and ends
  - Environmental conditions (e.g., visibility, sea state, glare)
  - Construction activities occurring throughout the monitoring period
- Specific pile-driving data:
  - Description of the pile driving activities, including the size and type of pile
  - The installation method used (vibratory or impact) for each pile and the duration
- Pre-activity and during activity observational data:
  - Species, numbers, and age and sex classifications, when possible
  - Marine mammal behaviors and potential reactions to project activities
  - Location of the animal, distance and direction from the animal to the sound source
  - Mitigation measures implemented
  - Times when pile driving or other in-water construction is delayed due to weather conditions, presence of marine mammals within shutdown zones, etc.

13.2. Reporting

The results of the marine mammal monitoring program would be submitted in a draft report to NMFS within 90 days of completion of activities necessitating an IHA. The results would be summarized in graphic form and include summary statistics and time histories of impact sound values for each pile.

The technical report will include:

- Summaries of sound-producing equipment utilized and the sound-producing activity start and end dates and duration
- Summary of monitoring effort and environmental conditions
- Analyses of environmental conditions that affect the detectability of marine mammals, including sea state, visibility, and glare
- Species composition, occurrence, and distribution of marine mammal sightings, including numbers and age and sex classifications, when possible
- Analyses of the effects of pile driving
- Numbers and distribution of sightings during periods with and without pile driving
- Sighting rates of marine mammals during periods with and without pile driving
- Initial sighting distances, types of movements, and observed behaviors versus construction activity
- Descriptions of work shutdowns
- Refined exposure estimates based on the number of marine mammals observed during pile driving

14. RESEARCH COORDINATION

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

To minimize the likelihood that impacts would occur to the species, stocks, and subsistence use of marine mammals, Project activities would be conducted in accordance with applicable federal, state, and local regulations. In addition, the Applicant would cooperate with other marine mammal monitoring and research programs taking place on the North Slope to coordinate research opportunities when feasible. The Applicant would also assess mitigation measures that can be implemented to eliminate or minimize any impacts from these activities.

Marine mammal monitoring would be conducted to collect information on presence of marine mammals within the disturbance and injury zones for this Project. Results of monitoring efforts from the Project would be provided to NMFS in a draft summary report within 90 days of the conclusion of monitoring. This information could be made available to regional, state, and federal resource agencies, universities, and other interested private parties upon written request to NMFS. The monitoring data would inform NMFS and future permit applicants about the behavior and adaptability of pinnipeds and cetaceans for future projects of a similar nature.

Alaska LNG would continue to work with various external entities, possibly including other energy companies, agencies, universities, the AEWC, and other organizations, in its efforts to manage, understand, and fully communicate information about environmental impacts related to Project activities. Alaska LNG plans to involve Iñupiat personnel as well as biologists from the NSB, and elsewhere as appropriate, in the monitoring and research programs proposed here. This would provide more opportunities for exchange of traditional and western scientific knowledge.

Alaska LNG would draft monitoring reports and make them available to the NSB, the AEWC, and BOEM, if desired. Comments received as a result of the review processes will provide additional opportunities for input from and coordination with other groups with interests and experience in the area.

Prior to the start of the start of the Project, Alaska LNG would identify other monitoring programs and research efforts near the Project so that information on species sightings can be shared to minimize impacts. Potential opportunities for coordination include the ASAMM, surveys being conducted by the NSB Department of Wildlife Management through their scientific or subsistence efforts, as well as other industry PSO monitoring programs.

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APPENDIX A

Marine Mammal Monitoring and Mitigation Plan

Public

Marine Mammal Monitoring and Mitigation Plan

For

Construction of the Alaska LNG Project in Prudhoe Bay, Alaska

February 24, 2020

AKLNG-6010-REG-GRD-REC-00005

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REVISION HISTORY

Rev	Date	Description	Originator	Reviewer	Approver
0	Feb. 24, 2020	4MP for IHA for Use	S. Wisdom	Lisa Haas	Frank Richards
Approver Signature*					

*This signature approves the most recent version of this document.

MODIFICATION HISTORY

Rev	Section	Modification

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ACRONYMS AND ABBREVIATIONS

4MP .....Marine Mammal Monitoring and Mitigation Plan
AEWC.....Alaska Eskimo Whaling Commission
AGDC .....Alaska Gasline Development Corporation
BPXA.....British Petroleum (Alaska), Inc.
dB re 1 µPa .....decibels referenced to one microPascal
DH2 .....Dock Head 2
DH3 .....Dock Head 3
DH4 .....Dock Head 4
ESA .....Endangered Species Act
FR .....Federal Register
GTP .....Gas Treatment Plant
IHA.....Incidental Harassment Authorizations
IR .....infrared
Lpk.....peak level
LNG.....liquefied natural gas
MMPA .....Marine Mammal Protection Act
NMFS.....National Marine Fisheries Service
NOAA.....National Oceanic and Atmospheric Administration
NVD .....Night Vision Devices
PBTL.....Prudhoe Bay Transmission Line
PBU.....Prudhoe Bay Unit
PM .....Project Manager
POC.....Plan of Cooperation
PSO .....Protected Species Observer
PTTL.....Point Thompson Transmission Line
PTS.....permanent threshold shift
PTU .....Point Thomson Unit
QA/QC .....quality assurance and quality control
rms .....root-mean-square
SEL .....sound exposure level
SPL.....sound pressure level
STP.....Seawater Treatment Plant
TTS.....temporary threshold shift

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1. DESCRIPTION OF ACTIVITIES

1.1. Purpose of the Plan

The Alaska Gasline Development Corporation (AGDC) is the project sponsor and "Applicant" for the Alaska LNG Project (Project), and hereby requests the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to issue an incidental harassment authorization (IHA) pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) for the non-lethal unintentional taking of small numbers of marine mammals incidental to construction activities in Prudhoe Bay, Alaska for the Project over a one-year period beginning July 1, 2021 through June 30, 2022.

The Alaska LNG Project is expected to produce noise levels that could exceed Level B (disturbance) harassment thresholds established by NMFS for marine mammals under the MMPA (70 Federal Register [FR] 1871-1875). Level B harassment means any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but that does not have the potential to injure a marine mammal or marine mammal stock in the wild. For certain species only (seals and bowhead whales), the Alaska LNG Project is expected to produce noise that could exceed Level A (injury) levels. Level A harassment means any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. The Applicant seeks authorization for the potential taking through potential injury (Level A) of small numbers of bowhead whale, ringed seal, spotted seal, and bearded seal in the Beaufort Sea. These takes are less than 1 percent of the population of each species and may have no more than a minor effect on individual animals or no effect on the populations of these four species.

AGDC is requesting an IHA for the take of small numbers of marine mammals, by Level A and B harassment, incidental to the Alaska LNG Project, which involves construction activities including modifications to the existing West Dock causeway and associated dock heads in Prudhoe Bay, Alaska. This Marine Mammal Monitoring and Mitigation Plan (4MP) has been prepared in support of the IHA.

Bowhead whales (*Balaena mysticetus*), gray whales (*Eschrichtius robustus*), beluga whales (*Delphinapterus leucas*), ringed seals (*Phoca hispida*), spotted seals (*Phoca largha*), and bearded seals (*Erignathus barbatus*) may be encountered near the construction activities in the Prudhoe Bay area. A small number of Level B takes is requested for these six species of marine mammals. A small number of Level A takes is requested for four species (1 bowhead whale and seals). Marine mammals are protected under the MMPA; the Western Arctic stock of bowhead whales is listed as endangered and the Alaska stocks of ringed and bearded seals are also listed as threatened under the Endangered Species Act (ESA). The overall goal of the 4MP is to comply with the MMPA and ESA during in-water pile installation and other associated construction activities conducted during the Alaska LNG Project. Please refer to the IHA application for detailed information on the Project, potential effects on marine mammals and their habitat, and mitigation measures.

1.2. Project Location

AGDC plans to construct one integrated liquefied natural gas (LNG) Project (Figure 1) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and for in-state deliveries of natural gas. The Project includes a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 807-mile (1,299-kilometer) natural gas pipeline (Mainline); a gas treatment plant (GTP) within the PBU on the North Slope; an approximately 63-mile (101-kilometer) gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and an approximately 1-mile (1.6-kilometer) gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). These facilities are essential to export natural gas in foreign commerce and would have a nominal design life of 30 years.

The proposed Project construction activities in Prudhoe Bay for which an IHA is being requested consist of modifications to the existing West Dock causeway and associated dock heads. Aspects of these proposed West Dock modifications that have the potential to incidentally harass marine mammals are: the airborne and underwater noise generated by vibratory and impact pile driving and some construction activities through ice. The Geographic Region for these activities covers a total of approximately 155 square miles or 99,275 acres (402 square kilometers) surrounding the West Dock causeway, a proposed temporary barge bridge, and a proposed barge marshalling area (Figure 1, Figure 2).

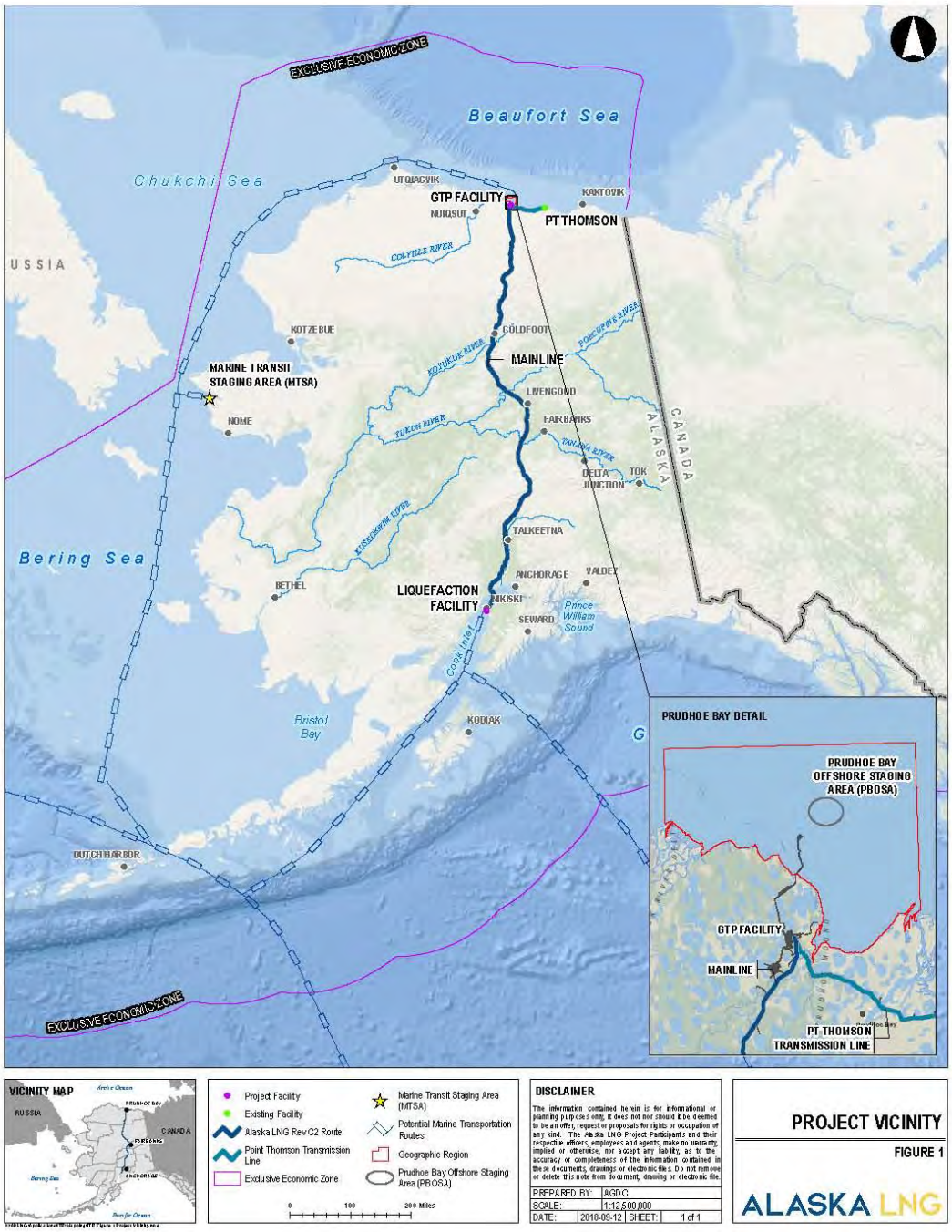

Figure 1: Alaska LNG Project Vicinity Map

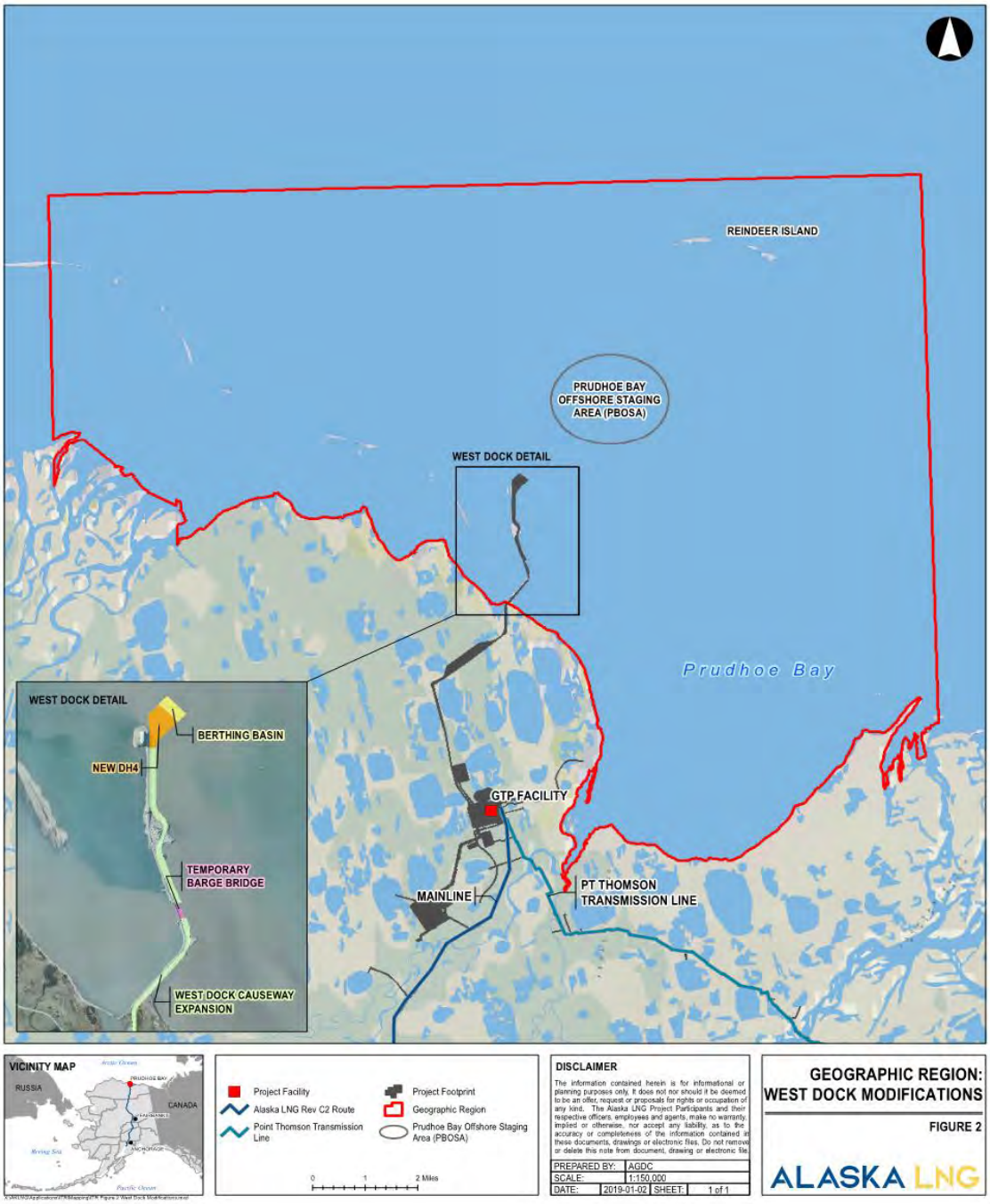

Figure 2: Geographic Region: West Dock Modifications

1.3. Description of Alaska LNG Activities

This 4MP pertains to the pile driving activities associated with the first year of construction of the Project in the Prudhoe Bay area that would take place in the marine environment and potentially result in the incidental harassment of marine mammals, as defined by the MMPA. Other activities are included for reference only. Alaska LNG components with activities to be included in the IHA are summarized in the 2021 Year of Table 1. Activities denoted as occurring during years 2022 to 2027 of Table 1 do not require an IHA.

Table 1: Planned Alaska LNG Activities within the Geographic Region

Project Component	Activity	Year		
		2021	2022	2023-2027
Causeway Widening	Haul and deposit gravel	*		
DH4 Construction	Gravel hauling and deposition	*		
	Install sheet pile walls (pile driving)	*		
	Install mooring dolphins (pile driving)	*		
	Install bag armor	*		
	Excavate overfill / re-compact gravel		*	
	Prepare seabed / level berths (screeding)		*	*
Barge Bridge and Abutments	Haul and deposit gravel	*		
	Install bulkhead (pile driving)	*		
	Install mooring dolphins (pile driving)	*		
	Prepare barge bridge seabed pad		*	*
	Install / remove barge bridge		*	*
Sealift	Vessel transit to Prudhoe Bay		*	*
	Offload materials / modules at DH4		*	*

These activities would occur on and around West Dock, an existing causeway located on the northwest shore of Prudhoe Bay, Alaska, within the PBU, and operated by BP Exploration (Alaska) Inc. (BPXA). West Dock is a multipurpose facility, commonly used to offload marine cargo to support Prudhoe Bay oilfield development. The West Dock causeway, which extends approximately 2.5 miles (4 kilometers) into Prudhoe Bay from the shoreline, is a solid-fill gravel causeway structure constructed in multiple phases between 1974 and 1981. There are two existing loading docks along the causeway, referred to as Dock Head 2 (DH2) and Dock Head 3 (DH3), and a seawater treatment plant (STP) at the seaward terminus of the structure (Figure 2). A 650-foot (198-meter) breach with a single lane bridge was installed in the causeway between DH2 and DH3 during 1995 and 1996 due to concerns that the solid causeway was impacting coastal circulation and marine resources.

The proposed Alaska LNG GTP would be constructed with large pre-fabricated modules that can only be transported to the North Slope with barges (sealift). An accessible and well-functioning dock facility would be required in Prudhoe Bay to receive these large modular components and as such, upgrades to dock and causeway infrastructure at West Dock are required for offloading the modules, and for transporting the modules to the GTP construction site.

Development of the dock facility would require construction of a new dock head referred to as Dock Head 4 (DH4) with 12 mooring dolphins. The gravel causeway between the proposed DH4 site and the onshore road system is too narrow for module transport and must be widened in several areas. The existing bridge over the aforementioned breach is also too narrow for module transport and is not capable of supporting the weight of the project modules. A temporary barge bridge is therefore proposed to accommodate transport of the modules over the breach. New sheet pile and gravel abutments would be constructed along the east side of the existing bridge, and four mooring dolphins would be installed. Two barges would then be placed along these mooring dolphins and between the abutments to form a temporary bridge for module transport.

1.4. Applicable Noise Criteria

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "…any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "…any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering."

For Level A harassment, the NOAA Technical Memorandum NMFS-OPR, and associated revisions, provide guidelines for assessing the onset of temporary threshold shifts (TTS) and permanent threshold shifts (PTS) from anthropogenic sound. These guidelines separate marine mammals into five functional hearing groups, consider source types as impulsive (e.g., seismic, pipe driving, sub-bottom profiler) or non-impulsive (tugs towing rigs, drilling, water jet, hydraulic grinder), and require analyses of the distance to the peak received sound pressure level (SPL, L_{pk}) as well as the 24-hr cumulative sound exposure level (SEL_{24h}) in order to more accurately estimate potential impacts.

The current Level B disturbance threshold for marine mammals is 160 decibels referenced to one microPascal (dB re 1 µPa) root mean square (rms) for impulsive sound and 120 dB re 1 µPa rms for non-impulsive sound. NMFS has also established an airborne disturbance threshold of 90 dB re 20 µPa (un-weighted) for harbor seals and 100 dB re 20 µPa for all other pinnipeds. The NMFS disturbance guidelines are summarized in Table 2. For purposes of this section, underwater SPLs are reported as dB re 1 µPa and all airborne thresholds are reported as dB re 20 µPa.

Table 2: Marine Mammal Injury and Disturbance Thresholds for Sound

Marine Mammals	Disturbance (Level A) Threshold		Injury (Level B) Threshold		Airborne (Level B) Threshold
	Impulsive	Non-Impulsive	Impulsive	Non-Impulsive	
Low-Frequency Cetaceans (bowhead, gray whale)	219 dB L_{pk} 183 dB SEL	199 dB SEL	160 dB rms	120 dB rms	N/A
Mid-Frequency Cetaceans (beluga whale)	230 dB L_{pk} 185 dB SEL	198 dB SEL	160 dB rms	120 dB rms	N/A
High-Frequency Cetaceans (true porpoises)	202 dB L_{pk} 155 dB SEL	173 dB SEL	160 dB rms	120 dB rms	N/A
Phocid Pinnipeds (true seals)	218 dB L_{pk} 185 dB SEL	201 dB SEL	160 dB rms	120 dB rms	90 dB
Otariid Pinnipeds (sea lions and fur seals)	232 dB L_{pk} 203 dB SEL	219 dB SEL	160 dB rms	120 dB rms	100 dB

1.4.1. Level A and B Harassment Zones

Distances to the harassment thresholds vary by functional hearing group, pile size, duration of installation, and pile-installation method. Table 3 provides distances to Level A underwater thresholds; Table 4 provides distances to Level B underwater thresholds; and Table 5 provides distances to Level B airborne thresholds. At the request of NMFS, these estimates for underwater sound are based on the use of practical spreading transmission loss (15 log R), which assumes 4.5 dB loss for every doubling of distance. Based on the shallow water in this area, it is likely that the rate of propagation will be greater than 15 log R, so these estimates to the thresholds are conservative.

Table 3: Calculated Distances[1] to Level A Underwater Thresholds

Activity	High Frequency Cetaceans			Mid-Frequency Cetaceans[1]			Low Frequency Cetaceans [2]			Phocids		
	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive	Impulsive		Non-Impulsive
	202 pk	155 SEL	173 SEL	230 pk	185 SEL	198 SEL	219 pk	183 SEL	199 SEL	218 pk	185 SEL	201 SEL
11.5-inch H pile (impact)	7.7.4	1,422.3	NA	0.1	42.5	NA	0.5	1,194.0	NA	0.6	639.0	NA
14-inch H pile (impact)	25.1	1,193.3	NA	0.3	35.6	NA	1.9	1,001.8	NA	2.2	536.1	NA
14-inch H pile (vibratory)	NA	NA	2.96	NA	NA	0.2	NA	NA	2.0	NA	NA	1.2
48-inch pipe pile (impact)	34.2	1,876.4	NA	0.5	56.0	NA	2.5	1,575.2	NA	2.9	843.0	NA
19.69-inch Sheet pile (vibratory)	NA	NA	24.6	NA	NA	1.5	NA	NA	16.7	NA	NA	10.1
25-inch Sheet pile (vibratory)	NA	NA	24.6	NA	NA	1.5	NA	NA	16.7	NA	NA	10.1

[1] Distances are represented in meters.

[2] Mid-frequency cetaceans include the beluga whale

[3] Low frequency cetaceans include the gray whale and the bowhead whale

Note: Peak (pk) sound levels are reported as dB re 1 µPa; sound exposure levels (SEL) sound levels are reported as dB re 1 μPa^2-s. Calculated assuming 15 log R.

Table 4. Calculated Distances to Level B Underwater Thresholds

Activity pile type (hammer type)	Impulsive 160 dB rms (meters)	Non-Impulsive 120 dB rms (meters)
11.5-inch H-pile (impact)	341.5	NA
14-inch H-pile (impact)	631.0	NA
14-inch H-pile (vibratory)	NA	1,000
48-inch pipe pile (impact)	2,154.4	NA
19.69-inch Sheet pile (vibratory)	NA	4,641.6
25-inch Sheet pile (vibratory)	NA	4,641.6

Distances are represented in meters.

Root mean square (rms) sound levels are reported as dB re 1 µPa.

Table 5. Calculated Distances to Level B Airborne Thresholds

Activity	Pinnipeds 100 dB rms (meters)
Impact pipe driving	16.8
Vibratory pipe driving	16.8
Vibratory sheet pile driving	11.2
Bulldozer	1.8
Backhoe	1.2

Distances are represented in meters.

Root mean square (rms) sound levels are reported as dB re 20 µPa.

1.5. Marine Mammal Monitoring and Mitigation Program

AGDC would implement a land-based marine mammal monitoring and mitigation program using experienced and trained Protected Species Observers (PSOs) during in-water construction activities. Marine mammal monitoring and mitigation methods have been designed to meet the expected requirements and objectives specified in the IHA permit that would be issued by NMFS. The 4MP would also incorporate other future stipulations in agreements between the AGDC and other agencies or groups. The AGDC recognizes some details of the monitoring and mitigation plan may change upon receipt of the IHA from NMFS.

The specific objectives of the monitoring and mitigation program are to provide:

- The basis for avoiding and minimizing potential impacts to marine mammals;
- The information needed to estimate the number of takes of marine mammals by harassment;
- Data on the occurrence, distribution, and activities of marine mammals in the areas where project activities were conducted;
- Information to compare the distances, distributions, behaviors, and movements of marine mammals relative to the project activities; and
- Test the use of night vision and infrared technology for nighttime and low visibility monitoring.

Details on PSO qualifications, monitoring methodology, mitigation measures, and reporting are provided in the following sections.

2. MARINE MAMMAL MONITORING OVERVIEW

2.1. Monitoring Zones

NMFS has provided the following required shut down zones for the project (Table 6).

Table 6. Level A Exclusion and Level B Monitoring Zones

Activity	Level A Exclusion Zone (m)			Level B Monitoring Zone (m)
	Low Frequency Cetaceans	Mid Frequency Cetaceans	Phocids	
Impact of 11.5 or 14-inch H-pile	1,200	50	650	650
Impact of 48-incj pile	1,600	50	850	2,200
Vibratory of 14-incj pile	10	10	10	1,000
Vibratory of sheet piles	20	10	10	4,700

Distances are represented in meters.

2.2. Monitoring Methods

2.2.1. Daytime Monitoring

Two PSOs would monitor the required monitoring zones (Table 6) during in-water construction operations, specifically impact pile installation. In total, four PSOs would rotate throughout the day such that each PSO would observe for no more than 4 hours at a time and no more than 12 hours in a 24-hour period. To provide full coverage of the larger Level B zone during vibratory driving of sheet piles, two PSOs would be stationed at two locations at the same time with rotations. One station would be on the east side of the STP and one station would be on the west side of the STP. Figure 3 shows the DH4 location for PSOs, but only shows one location due to scale of the figure, as well as the different exclusion and monitoring zones for DH4 work.

PSOs would be located at vantage points to monitor the monitoring zones, when conditions allow. Elevated platforms would be used to maximize potential for viewing marine mammals. The PSO observation site(s) would be determined prior to the commencement of construction activities.

When work is occurring at DH4, PSOs would be stationed at the STP on an elevated platform to view towards the east, north, and west, as water depth to the south (towards shore) is too shallow for marine mammals (Figure 3). The highest estimated Level A distance for low frequency cetaceans is 5,166 feet (1,575 meters); those species are not expected to be inside the barrier islands due to the shallow water depths. The phocid Level A distance is 2,766 feet (843 meters); seals can generally be detected at this range. The highest estimated Level B distance is 2.9 miles (4,642 meters) for vibratory driving of sheet piles and 1.3 miles (2,154 meters) for impact pile driving. The Level B zones for impact pile driving are generally viewable with high powered binoculars and sufficient viewing height. The greater Level B zone

for vibratory pile driving is generally not viewable for pinnipeds or smaller cetaceans from an elevated land-based platform. PSOs may be stationed on a vessel to increase viewing range or NMFS may use an "assumed take" calculation to account for marine mammals not detected by PSOs.

When work is occurring at the barge bridge, PSOs would be stationed at the north edge of the bridge. The bridge is elevated enough to provide good viewing. This area is very shallow, so it is unlikely there would be marine mammals in the Level A or B harassment area during this work. Figure 3 shows the barge bridge PSO location, the zones would be shifted to be centered on the barge bridge location.

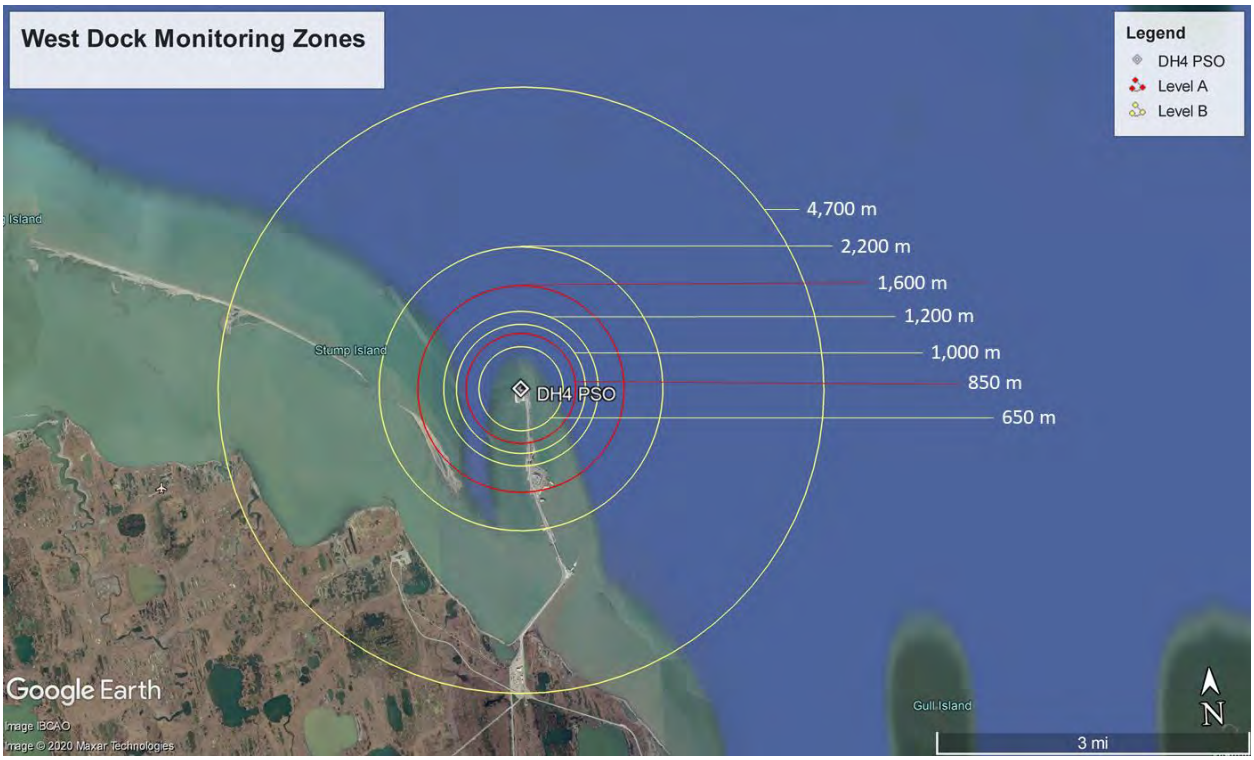

Figure 3: PSO location and monitoring zones from Dock Head 4

PSOs would monitor the shutdown zones and surrounding waters during pile driving activities and for 30 minutes prior to soft-start or in-water pile installation, as well as 30 minutes after pile driving cessation. If necessary, PSOs would initiate shutdown procedures as described in Section 2.7.3.

The observation station(s) would be equipped with 7x50 reticle binoculars, a spotting scope, and means of data entry (laptop, tablet, hard copy forms or another acceptable data entry device). During daylight hours, PSOs would systematically scan the water surface alternating between the naked eye, reticle binoculars, and spotting scope.

2.2.2. Nighttime and Low Visibility Monitoring

Consistent with expectations for working in the Arctic, AGDC has added a research component to the monitoring program. For construction activities occurring during the winter months or during other

periods of darkness, we propose the PSOs monitor with night vision devices (NVDs) and/or infrared (IR) sensors. NVDs utilize image intensifying technology by amplifying ambient light from the moon or stars, for example. The devices are typically portable, lightweight, and significantly more cost-effective than infrared camera systems. NVDs may be handheld or mounted to headgear, and they may be monocular or binocular units. As an offshore marine mammal mitigation tool, NVDs have had limited success. Data indicate that visual observations during daylight hours are much more effective than monitoring efforts conducted with NVDs (Harris et al. 1997, 1998; Moulton and Lawson 2002; Hartin et al. 2011), however the extensive dark hours on the North Slope in the winter means work must be conducted outside of daylight hours.

Infrared sensors have successfully detected the warm bodies of ice seals glowing brightly against the cold sea ice (Conn et al. 2014; Young et al. 2019). Marine mammals in the water may be more difficult to detect due to their blubber layer. However, Weissenberger and Zitterbart (2012) were able to detect walrus that surfaced within 0.93 miles (1.5 kilometers) of the survey vessel, and large whale blows at distances of 5 miles (8 kilometers) with an infrared camera system. The average infrared detection distance for walrus was 0.5 mile (805 meters) and 1.5 miles (2,400 meters) for cetaceans. Compared to visual observations, sea state and visibility impeded infrared detectability to about the same extent. For cetacean species in Atlantic Canada, thermal-infrared imagery captured approximately 70% of sightings documented by PSOs within 1.9 miles (3 kilometers) of the shore-based observation site when the sea state was ≤ 6 (Holst et al. 2017).

The night vision and IR technology has improved since these studies were conducted and certain parameters of this project may be conducive to testing out the effectiveness of using this technology to improve monitoring in this area. In particular, PSOs would be based on a stable, elevated platform with ambient light from surrounding industry while scanning relatively small monitoring zones instead of on a moving vessel. Further, the species of most likely to be present during project work during either ice cover or open water season are seals, which are either hauled out ice, land, or at the surface of the water.

NVDs were used during the 2019 Hilcorp Alaska Lower Cook Inlet Seismic Survey, after which PSOs reviewed each device's effectiveness regarding visibility and ease of use. PSOs were provided ambient light and IR monocular scopes, and ambient-light binoculars. While the monocular scopes were the most effective for viewing the monitoring zones, they were the least ergonomically practical, and the binoculars had a restrictively narrow field of view. The most significant feedback was that none of the NVDs were ergonomically ideal for overnight use. For the Alaska LNG project, we will strive to provide high-quality, comfortable ambient-light and IR-capable binoculars for PSO overnight use. Binoculars are commonly used for daytime marine mammal monitoring programs, and their use at night would allow for the highest degree of consistency with natural daylight observation patterns.

2.2.2.1. Objectives

Our primary objective for the nighttime and low visibility evaluation is to characterize NVD capability parameters for this project's location and lighting conditions. In particular, we aim to explore the following:

1) object detection at varying in-water distances using ambient light and IR devices;
2) animal detection and identification by comparing visibility from handheld NVDs to stationary device recordings; and
3) qualitative reviews of each device from a PSO perspective in categories including ergonomics, feasibility, safety, and detection and identification confidence.

2.2.2.2. Methods

Our evaluation would be performed in the field where variable conditions exist, including: light, weather, and PSO-dependent qualities (e.g., vision strength, fitness level, and observing experience). PSOs would be stationed at DH4 for all NVD assessments, and would monitor from a stable, elevated platform with ambient light from surrounding industry on a rotational schedule as described in Section 2.2. PSOs would be provided NVD binoculars that include infrared illuminators (similar to Figure 4), which would allow for comparison between night vision technology and night vision technology enhanced with IR capability.

Figure 4: Night Vision Binoculars with Infrared Illuminator (Model shown is Night Owl NOXB-5 Explorer Pro 5X)

Preliminary Testing

Prior to the project start, PSO personnel would obtain NVD binoculars and conduct preliminary field testing to confirm visibility and ergonomic success. PSO personnel would assess the subjective comfort of each NVD compared to Fujinon 7 x 50 binoculars, which are among standard equipment issued to PSOs for daytime observation. Comfort would be assessed by the following: eye-to-device contact point (e.g., material quality, potential for friction against skin, feasibility for using clear safety glasses with eye piece),

eye-strain relative to the duration tested, and equipment weight. Additionally, a brief object detection test would be performed, during which PSO personnel will observe traffic cones placed at 32.8-feet (10-meter) intervals up to 164 feet (50 meters) in a parking lot, at hourly intervals between civil twilight and night. The location of the parking lot would be selected based on ambient light conditions that are similar to those at DH4. PSO personnel would evaluate detection success for each traffic cone, and rate visibility when toggling between ambient and IR modes.

Objective 1

PSOs would assess object detection at distance intervals from the observing platform. AGDC would facilitate the placement of single polyform A-series buoys at 820-feet (250-meter) intervals north of DH4 up to 2.92 miles (4,700 meters). Upon every hour from civil twilight to night, PSOs on watch would view the buoys with each NVD device mode and independently record success or failure for detection at each distance. This detection verification process would occur approximately every three days in order to explore visibility under varying weather conditions.

Objective 2

Two IR video cameras similar to the model pictured in Figure 5 would be stationed at DH4 facing northeast and northwest in order to capture the entire forward visible range. The IR video cameras would be activated at civil twilight and deactivated at dawn. PSOs would simultaneously observe the monitoring zones using the provided NVDs. At the end of nighttime watch, the time recorded for each sighting would be cross-referenced against the video footage for marine mammal identification confirmation.

Figure 5: Digital infrared Video Recorders (Model shown is Ordro AC7)

Objective 3

After the first full night of observation, PSOs would be provided a questionnaire pertaining to the functionality and ergonomics of the NVDs. PSOs would be asked to rate each NVD in categories including:

overall comfort, eye strain, marine mammal detectability, marine mammal identification success, and effectiveness of platform ambient light.

2.3. Observer Qualifications and Training

The PSO team would be comprised of an experienced Field Lead PSO and three experienced PSOs. The Field Lead PSO would be required to have significant marine mammal monitoring experience with previous construction experience in Alaska and PSOs would have previous marine mammal experience. PSOs would be familiar with the marine mammals of the area and would complete a project-specific training session on operational activities, marine mammal monitoring protocol, permit stipulations and mitigation measures, and data collection protocol. The training session would be provided shortly before the anticipated start of the season and conducted by marine mammologists with extensive crew lead experience from previous marine mammal monitoring programs in the Alaskan Arctic. Prior to start of the monitoring program, NMFS would be provided CVs of each PSO for approval.

Primary objectives of the training include:

- Review of the 4MP for this project, including any amendments adopted or specified by NMFS, or other agreements in which the AGDC may elect to participate
- Review of marine mammal sighting, identification, and distance estimation methods
- Review operation of specialized equipment (e.g., reticle binoculars, spotting scopes)
- Review of data recording and data entry systems, including procedures for recording data on marine mammal sightings, environmental conditions, project activities and mitigation measures, and entry error control
- Review of mitigation procedures

At a minimum, PSOs would meet the following qualifications:

- Demonstrated ability to conduct field observations and collect data according to assigned protocols
- Ability to collect the required marine mammal observation data
- Documented marine mammal monitoring experience or training, or an undergraduate degree in biological science or a related field
- Visual acuity (correction is permissible) sufficient to allow detection and identification of marine mammals (binoculars may be necessary for species identification)
- Sufficient training, orientation, or experience with construction operations to conduct observations safely
- Ability to communicate with project personnel about marine mammals observed in the area
- Ability to coordinate shutdown procedures with the Construction Project Manager (PM), when necessary
- PSOs would be independent observers and would not be engaged in construction activities
- PSOs must have writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-

water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior.

The Field Lead PSO would also have the following qualifications:

- Previous experience working in Alaska, preferably the Arctic, as a PSO
- Previous experience managing a PSO field team
- Previous experience coordinating with industrial activities, with a requirement for construction activities

2.4. Equipment

Monitoring equipment includes:

- Portable radios and cell phones for communication
- Hand-held binoculars (7X magnification or better) with built-in reticles
- Spotting scope (25X magnification or better)
- Electronic data collection system and necessary hardware
- NVDs and IR equipment for nighttime monitoring and evaluation

PSOs would also have the PSO handbook with definitions for data entry, maps of the project area and monitoring zones, and contact lists on hand electronically or hard copy at the observation station(s).

2.5. PSO Handbook

A PSO handbook with specifics of the Alaska LNG Project would be prepared and distributed to PSOs during training. The handbook would provide guidance and reference information to trained PSOs and would contain maps, illustrations, photographs, copies of important documents, and descriptive text. The following topics would be covered in the PSO Handbook:

- Summary description of the project, marine mammals and underwater sound energy, the 4MP, the NMFS IHA, and other regulations/permits/agencies
- Monitoring and mitigation objectives and procedures, including Level A and Level B harassment zones (Table 6)
- Responsibilities of staff and construction crew regarding the 4MP
- Instructions for staff and construction crew regarding the 4MP
- Data recording procedures, including codes and coding instructions, common coding mistakes
- Use of specialized field equipment (e.g., reticle binoculars, spotting scope)
- Reticle binocular distance scale
- Table of wind speed, Beaufort wind force, and sea state codes
- Data storage and backup procedures
- List of marine mammal species that might be encountered and identification, behavior, and natural history information

- Safety precautions while on-site
- Crew and/or personnel discord, conflict resolution among PSOs and crew
- Drug and alcohol policy and testing
- Scheduling of watches
- Communications
- List of field gear provided
- Suggested literature or literature cited
- Field reporting requirements and procedures

2.6. Communications

A clear chain of command and communication system would be in place to help PSOs, the construction crew, and any other personnel onsite understand roles and responsibilities. Anticipated roles are highlighted below, although titles may change:

- ***Alaska LNG Construction Project Manager (Construction PM):*** The Construction PM communicates directly with the Field Lead PSO each day before pile installation begins. The Construction PM would communicate to the Field Lead PSO the plan for that day, including start and stop times, the number of piles, sizes of piles, and method of installation. The Field Lead PSO would use this information to determine the appropriate harassment zones for that day. Mitigation action items would be discussed and adjusted, as needed, based on conditions.
- ***Field Lead PSO:*** In addition to daily operational communications with the Construction PM and typical PSO duties, the Field Lead would perform quality assurance and quality control (QA/QC) on data at the end of the day.
- ***PSO:*** PSOs are responsible for monitoring for marine mammals, collecting required data, QA/QC of their data, and reporting to the Field Lead PSO. PSOs are also responsible for understanding the mitigation measures and initiating implementation, as necessary, with the Construction PM.

2.7. Data Collection

Data regarding environmental conditions, marine mammal sightings, communications, and project activities would be collected electronically using a rugged hardware system (i.e., Toughbook or tablet) with data collection software (i.e., Excel or ArcGIS-based system). Hardcopy paper forms would be available as a backup, in case there are technical difficulties with equipment. Data collected on paper forms would consist of the same variables that are collected electronically.

Excellent record keeping and documentation is an essential part of this program. It is the responsibility of the observer to detail and document environmental and sighting data objectively, accurately, and professionally. High quality data are required for a number of reasons. Clear and concise data records ensure accurate data interpretation and facilitate post-season data QA/QC, analyses, and reporting. Survey data would also contribute to existing scientific knowledge, inform management decisions, and determine permit stipulations.

The data that would be collected are separated into three major categories: effort, sightings, and mitigation. The data fields are detailed in the following text and definitions and entry values are provided in Appendix A.

2.7.1. Effort

The PSOs would document monitoring effort, environmental conditions, and types of project activities. PSOs would document the start and stop times of monitoring. Environmental conditions would be documented at the beginning and end of every monitoring period and approximately every half hour, or as conditions change. Data collected would include PSO names, location of the observation station, time and date of observation, weather conditions, air temperature, sea state, cloud cover, visibility, glare, and ice coverage (if applicable). The PSOs would document the type of project activities, including type of pile installation, number of piles driven, as well as the time of startup (or soft start) and shutdown. PSOs would also document other, non-project-related activities that could disturb marine mammals in the area, such as the presence of vessels or aircraft.

2.7.2. Sightings

Marine mammals observed would be documented. The data collected would include a unique sighting ID number, start and end time of the sighting, species sighted, number of individuals (group size), age class (when discernible), sex class (when discernible), behavior and movement, distance at first observation, closest observed distance from project activities, and type of in-water project activity at the time of sighting. The PSO would also note any observed marine mammal behavioral changes or reactions that may be due to project activities.

PSOs would use binoculars and rangefinders to estimate distance to the marine mammal and proximity to the harassment zones. The initial distance of the sighting and closest point of approach would be recorded as the PSO tracks the path of animal. Behaviors, including potential reactions to project activities or other human activities in the area, would be recorded during each sighting. Potential indicators of a negative response to noise include abrupt dives or dispersal, change in swimming speed or direction, and an animal approaching and then departing the area. Other activities that the marine mammal could be responding to would also be documented when possible.

2.7.3. Mitigation

Communications between the PSO and Construction PM related to mitigation requests, as well as implemented mitigation measures, would be documented. Times would be recorded when: a soft start begins, pile installation reaches full energy, an animal is observed to enter the Level A and/or Level B harassment zones, the PSO has requested a shutdown, an animal has exited the harassment zone, the PSO notifies the Construction PM that the area has been cleared for operations to resume, and operations resume. The PSO would document shutdown and non-shutdown decisions with reasons for each decision.

2.8. Mitigation Measures

2.8.1. In-Water Activity Mitigation Measures

The majority of DH4 construction and associated activities are planned for the open water season (June-October); however, no pile driving would occur during the Nuiqsut whaling season (August 25-September 15). In summary:

1. Pre-activity Monitoring: PSOs would begin observing for marine mammals 30 minutes before soft-start or in-water pile installation.
    a. If a marine mammal is sighted within the Level A harassment zones, a soft start would not begin until the PSO has determined that the animal has exited the zone or has not been re-sighted for 30 minutes.
    b. If a marine mammal is sighted within the Level B harassment zone after the 30-minute monitoring period but before soft start, the Contractor would either begin soft start with documentation of take, or delay the soft start to avoid take. Soft start or pile driving would not start if a marine mammal is within the Level A harassment zone.
2. Soft Start: A soft start technique would be used at the beginning of each impact pile installation or if there has been cessation of pile driving for a period of 30 minutes or longer to allow marine mammals to exit the area before pile driving reaches full energy.
    a. For impact pile driving, an initial set of three strikes from the hammer at about 40 percent energy is followed by a 30-second waiting period, and then two subsequent three-strike sets. Impact pile driving at full power may commence, provided marine mammals remain absent from the monitoring zone.
3. Shutdown Zones: Based on the estimated sound levels determined for pile installation, shut down zones were established for each functional hearing group (Table 6). Effort would be made to shut down before a marine mammal enters the shutdown zone, however, Level A take of a species would not occur unless the individual crosses into the respective Level A isopleth as defined in Table 3.
4. Shutdown Procedures: The PSOs would continuously monitor the Level A and Level B harassment zones during pile installation and would have direct contact with the designated Construction PM to coordinate shutdowns, as necessary.
    a. If a marine mammal appears likely to enter the Level B harassment zone, the PSO would notify the Construction PM, who would either immediately shut down pile driving (using safe shutdown procedures) before the marine mammal enters the zone, avoiding a Level B take, or document the marine mammal as a Level B take upon entry into the zone. PSOs would document the reason to shut down or not shut down.

    If the decision is made to continue pile installation while a marine mammal is within the Level B harassment zone, that pile segment may be completed, unless the animal

approaches and is likely to enter the Level A harassment zone. At that point, the Construction PM would immediately shut down pile driving operations (using safe shutdown procedures). Pile installation would be shut down to avoid take for marine mammal species for which take is not authorized.

b. Following a lapse of pile driving for more than 30 minutes, the PSO would authorize soft start procedures for impact pile driving after confirming that marine mammals have not been observed in the Level B harassment zone for at least 30 minutes immediately prior to resumption of operations.

c. Following a shutdown of less than 30 minutes due a marine mammal sighting in the Level B harassment zone, pile installation may commence when the PSO confirms that the marine mammal was observed exiting the zone or has not been observed in the zone for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds).

d. In the event of shutdown or delay of activity resulting from marine mammals in the shutdown zone, their behavior will be monitored and documented until they leave the designated zone.

5. Shutdown for Weather/Low Visibility: Pile installation would only occur when the Level A and Level B harassment zones can be adequately monitored.

6. Post-activity Monitoring: PSOs would observe marine mammals for 30 minutes after pile driving is completed for the day.

7. Pile driving would not be conducted during the Nuiqsut whaling season (August 25-September 15).

If the entire Level B harassment zone is not visible, AGDC would determine if in-water pile installation would continue or shut down. Conditions such as low light, darkness, high sea state, fog, ice, rain, glare, or other conditions may prevent effective marine mammal monitoring of the entire Level B harassment zone. In some cases, NMFS may allow for an “assumed take” when the Level B zone is not visible so that work can continue. If the number of takes is not approaching the allowable number, the AGDC may elect to continue work during that period to complete the work needed for that day. Conversely, if the number of takes is approaching the allowable number, the AGDC may elect to stop work during that period. Pile installation would not be reinitiated until the entire Level B harassment zone is visible. If shutdown occurs for 30 minutes or more, startup procedures would be implemented prior to resumption of pile installation. This includes the 30-minute monitoring period to clear the zone and soft start procedures. The PSOs would document instances when shutdown is due to environmental conditions.

To avoid the potential for collision with a marine mammal during in-water work involving use of vessels (e.g., barges, tugboats, work boats, and skiffs), if a marine mammal approaches within 165 feet (50 meter) of the vessel, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

The Field Lead PSO and the Construction PM would maintain a running tally of Level B takes that occur for each species. If the maximum authorized number of Level B takes is reached or exceeded for the authorized period, in-water pile installation would be shut down immediately using safe shutdown procedures. In addition, NMFS would be notified immediately and a revised plan would be developed before in-water pile installation is resumed. To assist PSOs and construction crews, a protocol for the specific steps that should be used to communicate, decide, execute, and document a shutdown and re-start would be developed at the pre-field training session based on the issued IHA, final monitoring zones, and communication preferences. This protocol would be displayed and made available to appropriate personnel in hard copy or electronically.

2.8.2. Ice-Covered Season Mitigation Measures

Seabed preparation at the barge bridge would be conducted over grounded ice during the winter months. Grounded ice conditions are expected to occur at the breach on or before February 1 and seabed prep would begin as soon as ice conditions allow to minimize potential impacts on marine mammals. Ringed seals typically establish birthing lairs after March 1, and the commencement of construction activities before this date would prevent pregnant seals from constructing lairs in disturbed areas. Ringed seal density is low in areas where water depths are less than 10 feet (3 meters), and it is very unlikely that ringed seals would be encountered in the grounded ice work area.

The majority of DH4 construction and associated activities are a planned for the open water season (June-October). However, if work is not completed during this time due to logistical or other constraints, a contingency time period the following year for dolphin installation is March through April and May 1 through June 30 for construction of the barge bridge abutments. Should pile installation occur during this contingency time period, a subsistence advisor would survey areas within a buffer zone of DH4 where water depth is greater than 10 feet (3 meters) to identify potential ringed seal structures before activity begins. Structures would be avoided by a minimum of 500 feet (150 meters) and workers would have completed wildlife interaction avoidance training as part of their orientation program. The DH4 location has a depth of -12 feet (-3.7 meters) MLLW and, like the breach, grounded ice is expected during the winter. This combined with the initiation of any winter work before March 1 greatly reduces the likelihood of encountering ringed seals during winter pile driving.

2.9. Subsistence Mitigation Measures

Mitigation measures proposed to reduce impacts to subsistence users are provided in the following list. These mitigation measures include those that are considered industry standard as well as those that were raised by community members at the aforementioned meetings.

- Alaska LNG has developed a detailed Plan of Cooperation (POC), provided as Appendix B to the IHA application, as part of this Project in accordance with the MMPA which identifies and documents potential conflicts and associated measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence use.
- Outcomes of POC meetings will be documented.

- Alaska LNG continues to document its contacts with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups. This documentation is included in the AGDC stakeholder database.
- Alaska LNG will routinely engage with local communities and subsistence groups. These groups will be consulted on mitigation measures to limit impacts prior to construction activities. Multiple user groups are often consulted simultaneously in larger coalition meetings such as the Arctic Safety Waterways Committee meetings. Local communities and subsistence groups identified by Alaska LNG include:
    - Alaska Eskimo Whaling Commission (AEWC)
    - Arctic Safety Waterways Committee
    - Arctic Coalition of Marine Mammals
    - The Ice Seal Committee
    - The Alaska Beluga Whale Committee
    - The Alaska Nannut Co-Management Council
    - Indigenous People's Council for Marine Mammals
    - The North Slope Borough Department of Wildlife
    - The North Slope Borough Planning Department
    - Kuukpik Corporation
    - Inupiat Community of the Arctic Slope
- Alaska LNG will develop a Communication Plan and will implement this plan before initiating construction operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts.
- A project informational mailer with a request for community feedback (traditional mail, e-mail, phone) will be sent to community members prior to construction.
- Following the construction season, Alaska LNG intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.
- The AEWC works annually with industry partners to develop a Conflict Avoidance Agreement (CAA). This agreement implements mitigation measures that allow industry to conduct their work in or transiting the vicinity of active subsistence hunters, in areas where subsistence hunters

anticipate hunting, or in areas that are in sufficient proximity to areas expected to be used for subsistence hunting that the planned activities could potentially adversely affect the subsistence bowhead whale hunt through effects on bowhead whales while maintaining the availability of marine mammals for subsistence hunters. One important aspect of the CAA are time and area closures. Alaska LNG is considering whether it would enter into a CAA or similar agreement with the AEWC. Such agreements are voluntary and are not mandated by regulation. Alaska LNG is, however, committing to the following restrictions on pile driving in anticipation of the Nuiqsut whaling season, understanding the exact whaling dates may change:

- Pile driving activities at West Dock would not occur during sensitive periods in an effort to eliminate noise and vessel traffic
- Vessels will be kept landward of Cross Island during the Nuiqsut whaling (August 25-September 15).

3. REPORTING

The results of the monitoring program, including estimates of takes, would be presented in weekly, monthly, and technical reports (90-day and final). The reports would summarize project operations, monitoring effort, species and numbers of marine mammals sighted, exposures, and implementation of mitigation measures. The technical reports (90-day and final, Section 3.3) would address the requirements established by NMFS in the IHA, and would be provided to NMFS and AGDC. Unless specified in the IHA, weekly and monthly reports would be submitted to AGDC only.

3.1. Weekly Reports

Each weekly report would contain the following information:

- Monitoring effort (date, start time, end time)
- Summary of environmental conditions (sea state, visibility, glare, etc.)
- Marine mammal sightings (species, number of individuals)
- Age classification (when discernible)
- Behaviors and potential reactions (correlated with project activities or monitoring zones)
- Marine mammal takes by species
- In-water activities before and during marine mammal sightings
- Project shutdowns (date, duration, reason for shutdown)

3.2. Monthly Reports

A monthly report would be submitted to provide a summary of weekly report information and identify any trends or ongoing issues.

3.3. Technical Reports: 90-Day Monitoring and Final Reports

The results of the marine mammal monitoring program, including estimates of "take by harassment", would be presented in the 90-day and final technical reports. Reports would address the requirements established by NMFS and would include:

- Summaries of monitoring effort – total hours and distribution of marine mammals throughout the study period accounting for sea state, visibility, and other factors affecting detectability of marine mammals
- Analyses of the effects of various factors influencing detectability of marine mammals, such as sea state, number of observers, and fog/glare
- Species composition, occurrence, and distribution of marine mammal sightings, including date, group size, and age classification (when discernable)
- Analyses of the effects of the Alaska LNG Project:
    - Sighting rates of marine mammals during periods with and without project activities (and other variables that could affect detectability)
    - Initial sighting distances versus project activity
    - Closest point of approach versus project activity
    - Observed behaviors and types of movements versus project activity
    - Numbers of sightings/individuals seen versus project activity
    - Distribution around the action area versus project activity
    - Summary of implemented mitigation measures
    - Estimates of "take by harassment"
- If applicable, a summary of any injured or dead marine mammals discovered
- All datasheets and raw sighting data will be submitted as a separate file the to the Final Report

3.4. Notification of Injured or Dead Marine Mammals

In the event that the AGDC discovers an injured or dead marine mammal and the Field Lead PSO determines that the cause of the injury or death is unknown, the AGDC would immediately report the incident to the same list of authorities with the same information described above. Pile installation may continue while NMFS reviews the circumstances of the incident. NMFS would work with the AGDC to determine whether modifications to the activities are appropriate.

In the unanticipated event that pile installation clearly causes the take of a marine mammal for which authorization has not been granted, such as a serious injury or mortality, the AGDC would immediately cease pile installation and report the incident to:

- Chief of the Permits and Conservation Division
- Office of Protected Resources
- NMFS and its designees
- Alaska Regional Stranding Coordinators

The report would include the following information:

- Date, time, and location (latitude/longitude) of the incident
- Detailed description of the incident
- Description of vessel involved (if applicable), including the name, type of vessel, and vessel speed before and during the incident
- Status of sound source use in the 24 hours preceding the incident
- Environmental conditions (wind speed and direction, wave height, cloud cover, and visibility)
- Description of marine mammal observations in the 24 hours preceding the incident
- Species identification, description, and fate of animal(s) involved
- Photographs or video footage of animals or equipment (if available)

Pile installation shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with the AGDC to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The Alaska LNG Project may not resume activities until notified by NMFS via letter, email, or telephone.

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APPENDIX A

Marine Mammal Effort, Sighting, and Mitigation Data Fields

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Table A-1: Effort Data Fields

Data Field	Definition and Values
Date	Day, month, year of the record
Time	Time of observation
Observation Site	Location where observations are being conducted
Observer	Observer first and last name
Watch	Level of effort (watch start, continuous watch, watch end, off watch)
Activity	Current operational activity (type of pile installation and number of piles driven)
Duration	Start and stop times of startup and shutdown processes
Beaufort Sea State	Sea surface conditions (0 to 12)
Glare	Severity (none, light, moderate, severe) and location (clockface)
Visibility	Distance visible for marine mammal detection
Air temp	Degrees Celsius
Ice coverage	Type (no ice present, new, brash, or pancake ice and floes) and amount (0-100%) of ice cover
Precipitation	Precipitation type (rain, light rain, drizzle, snow, fog)
Cloud Cover	Cloud percent (0-100%)
Light	Light, twilight, dark
Sightability	Overall evaluation of environmental conditions as related to detectability of a marine mammal (excellent, good, fair, poor)
Notes	Additional comments not otherwise captured

Table A-2: Sighting Data Fields

Data Field	Definition and Values
Date	Day, month, year of this record
Initial Time	Time of initial sighting
Final Time	Time which sighting was last observed
Latitude	Sighting latitude
Longitude	Sighting longitude
Observer	Observer first and last name
Sighting ID	Unique sighting ID number for each sighting
Species	Species Identification (Bowhead Whale, Gray Whale, Beluga Whale, Ringed Seal, Spotted Seal, Bearded Seal)
Group Size	Number of individuals observed
Juveniles	Number of juveniles present (if discernible)
Number Calves/Pup/Neonate	Number Calves/Pup/Neonates present (if discernible)
Sighting Cue	Feature first observed (head, fluke, dorsal fin, body, splash, blow, birds, other)
Optics Type	Naked eye, binoculars, spotting scope
Reticle	Reticle value from binoculars
Distance	Distance to sighting (km)
Closest Point of Approach (CPA)	Closest distance animal observed
Where At	From the perspective of a clock face, the location of the sighing relative to the observer
Where To	From the perspective of a clock face, the direction the animal is heading
Behavior 1	Primary behavior (avoiding predation, blowing, bow riding, breaching, bubbling, calving, dead, diving, feeding observed, feeding suspected, fluking, haulout, lobtail, looking, mating observed, mating suspected, milling, other, resting, side scanning, sinking, snorkeling, socializing, spyhopping, startling, surface active, swimming, tail slapping, tail waving, travelling, unknown, vocalizing)
Behavior 2	Secondary behavior (avoiding predation, blowing, bow riding, breaching, bubbling, calving, dead, diving, feeding observed, feeding suspected, fluking, haulout, lobtail, looking, mating observed, mating suspected, milling, other, resting, side scanning, sinking, snorkeling, socializing, spyhopping, startling, surface active, swimming, tail slapping, tail waving, travelling, unknown, vocalizing)
Reaction	Potential reaction to project activities (none, avoidance, approach, change direction, change speed, dive, splash, unknown)
Pace	Pace of movement (moderate, none, slow, unknown, vigorous)
Activity	Current operational activity (type of pile installation and number of piles driven)
Notes	Additional comments not otherwise captured

Table A-3: Mitigation Data Fields

Data Field	Definition and Values
Date	Day, month, year of this record
Soft Start Time Start	Time soft start begins
Soft Start Time End	Time soft start ends
Shutdown Request Time	Time shutdown requested by PSO
Shutdown Implemented Time	Time shutdown implemented
Shutdown/Non-Shutdown	Decision made by Construction POC and reason
Level B Zone Entry	Time which sighting entered Level B exposure zone
Level B Zone Exit	Time which sighting exited Level B exposure zone
Level A Zone Entry	Time which sighting entered Level A exposure zone
Level A Zone Exit	Time which sighting exited Level A exposure zone
Clearing Start Time	Time PSO started clearing the harassment zones for initiation of pile driving
Clearing Completed Time	Time PSO determined the area was clear and contacted the Construction POC

APPENDIX B

Plan of Cooperation

Public

Plan of Cooperation for the IHA Construction of the Alaska LNG Project in Prudhoe Bay, Alaska

February 7, 2020

AKLNG-6020-CMI-PLN-DOC-00001

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REVISION HISTORY

Rev	Date	Description	Originator	Reviewer	Approver
A	11/19/18	POC for Prudhoe Bay IHA	W. Hetrick		
B	2/8/19	Revised POC for IHA	W. Hetrick		
C	3/27/19	Revised POC for IHA	W. Hetrick	AGDC	
D	2/7/20	Revised POC for IHA	S. Wisdom	AGDC	
0	Feb 7, 2020	For Use	S. Wisdom	L. Haas	F. Richards
Approver Signature*					

*This signature approves the most recent version of this document.

MODIFICATION HISTORY

Rev	Section	Modification

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

4MP ..... Marine Mammal Monitoring and Mitigation Plan
AEWC..... Alaska Eskimo Whaling Commission
AGDC ..... Alaska Gasline Development Corporation
ASAP ..... Alaska Standalone Pipeline
BPXA..... British Petroleum (Alaska), Inc.
CAA..... Conflict Avoidance Agreement
CFR ..... Code of Federal Regulations
DH2 ..... Dock Head 2
DH3 ..... Dock Head 3
DH4 ..... Dock Head 4
FERC ..... Federal Energy Regulatory Commission
GTP ..... Gas Treatment Plant
IHA..... Incidental Harassment Authorization
NEPA..... National Environmental Policy Act
NMFS..... National Marine Fisheries Service
NSB..... North Slope Borough
PBU..... Prudhoe Bay Unit
POC ..... Plan of Cooperation
SEIS..... Supplemental Environmental Impact Statement
STP..... Seawater Treatment Plant
USACE..... U.S. Army Corps of Engineers
USFWS..... U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

A Plan of Cooperation (POC) is a necessary requirement for receipt of an incidental harassment authorization (IHA) to mitigate the potential for conflicts between the proposed activity and traditional subsistence activities (50 Code of Federal Regulations [CFR] §18.124(c)(4) and 50 CFR §216.104(a)(12)). The POC must identify the measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, both the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) require an applicant to communicate and consult with local subsistence communities concerning proposed activity, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR §18.128(d) and 50 CFR §216.104(a) (12) (i), (ii), (iv)).

This POC is intended to outline the Alaska Gasline Development Corporation (AGDC) Alaska LNG Project (Project's) planned stakeholder engagement and to describe the measures Alaska LNG will take to minimize potential adverse effects that the proposed construction program may have on the availability of marine mammals for subsistence use. Alaska LNG Project's IHA application and Marine Mammal Monitoring and Mitigation Plan (4MP) describe the monitoring and mitigation measures that will be implemented during the construction program to prevent conflicts with substance activities.

Alaska LNG has documented its contacts with the North Slope communities, as well as the substance of its communications with subsistence stakeholder groups.

1. DESCRIPTION OF ACTIVITIES

1.1. Description of Alaska LNG Activities

A description of the entire Alaska LNG Project is provided in Resource Report No.1[1] in the Environmental Report submitted to Federal Energy Regulatory Commission (FERC) and Sections 1 and 2 of the IHA application to NMFS. Alaska LNG Project components with activities included in the IHA are summarized in Table 1 and shown in Figure 1.

Table 1. Planned Alaska LNG Project Activities within the Geographic Region

Project Component	Activity	Year		
		2021	2022	2023-2027
Causeway Widening	Haul and deposit gravel	*		
DH4 Construction	Gravel hauling and deposition	*		
	Install sheet pile walls (pile driving)	*		
	Install mooring dolphins (pile driving)	*		
	Install bag armor	*		
	Excavate overfill / re-compact gravel		*	
	Prepare seabed / level berths (screeding)		*	*
Barge Bridge and Abutments	Haul and deposit gravel	*		
	Install bulkhead (pile driving)	*		
	Install mooring dolphins (pile driving)	*		
	Prepare barge bridge seabed pad		*	*
	Install / remove barge bridge		*	*
Sealift	Vessel transit to Prudhoe Bay		*	*
	Offload materials / modules at DH4		*	*

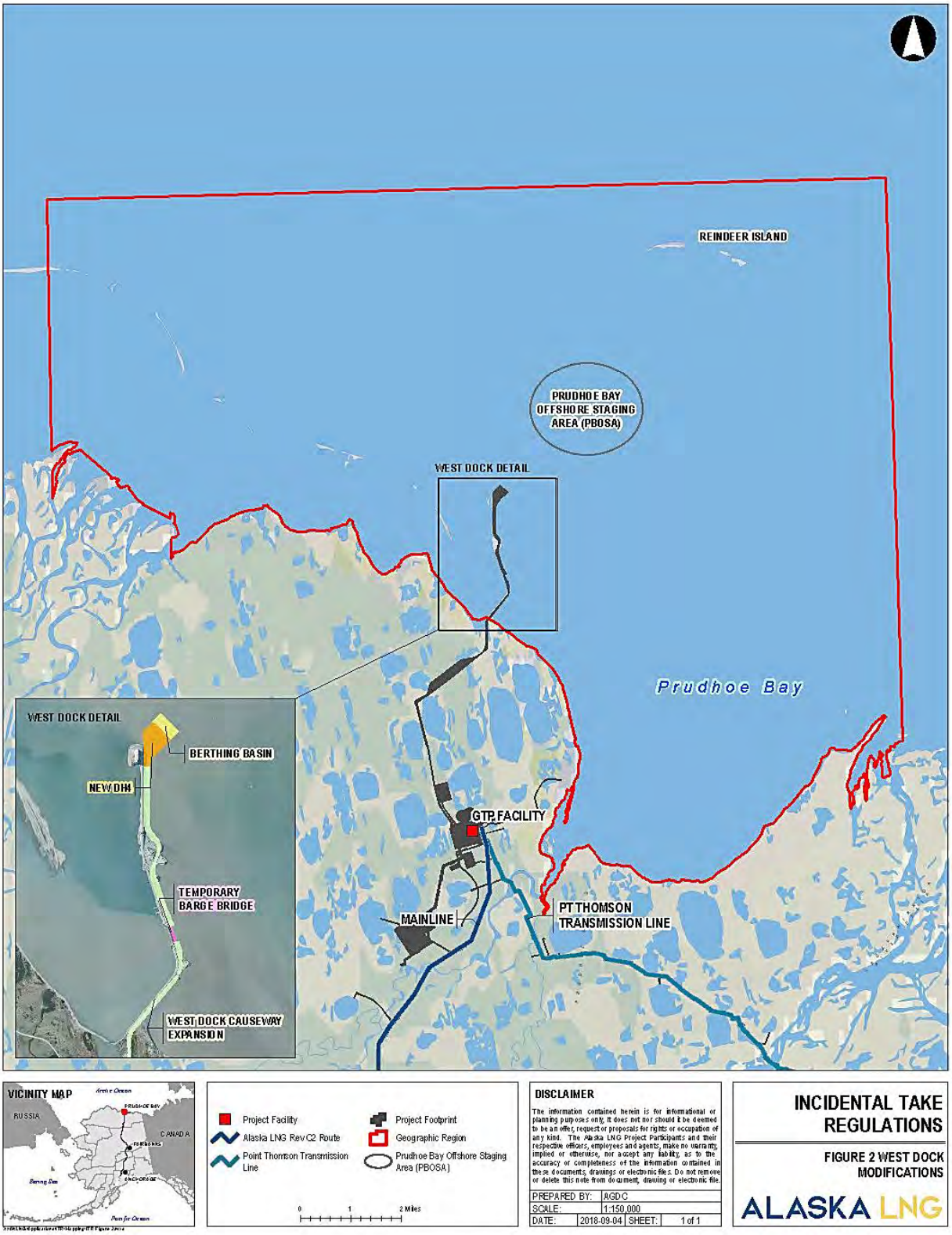
The above activities would occur on and around West Dock, an existing causeway located on the northwest shore of Prudhoe Bay, Alaska, within the PBU, and operated by BP Exploration (Alaska) Inc. (BPXA). West Dock is a multipurpose facility, commonly used to offload marine cargo to support Prudhoe Bay oilfield development. The West Dock causeway, which extends approximately 2.5 miles (4 kilometers) into Prudhoe Bay from the shoreline, is a solid-fill gravel causeway structure. There are two existing loading docks along the causeway, referred to as Dock Head 2 (DH2) and Dock Head 3 (DH3), and a seawater treatment plant (STP) at the seaward terminus of the structure. A 650-foot (198-meter) breach with a single lane bridge was installed in the causeway between DH2 and DH3 during 1995 and 1996.

The proposed Alaska LNG Gas Treatment Plant (GTP) would be constructed with large pre-fabricated modules that that can only be transported to the North Slope with barges (sealift). An accessible and well-functioning dock facility would be required in Prudhoe Bay to receive these large modular components. Upgrades to dock and causeway infrastructure at West Dock are required for offloading the module to facilitate and transport the modules to the GTP construction site.

[1] The draft EIS was issued June 2019 and the final EIS is expected to be issued March 2020.

Development of the dock facility would require construction of a new dock head referred to as Dock Head 4 (DH4). The gravel causeway between the proposed DH4 site and the onshore road system is too narrow for module transport and must be widened in several areas. The existing bridge breach is also too narrow for module transport and is not capable of supporting the weight of the project modules. A temporary barge bridge is therefore proposed to accommodate transport of the modules over the breach. New sheet pile and gravel abutments would be constructed along the east side of the existing bridge, and four mooring dolphins would be installed. Two barges would then be placed along these mooring dolphins and between the abutments to form a temporary bridge for module transport. Sealifts and barge bridge installation/removal would occur each of six consecutive years to accommodate the large and more numerous modules associated with this project. The following text describes these activities in more detail.

Figure 1: Geographic Region: West Dock Modifications



1.2. Description of Subsistence Communities

The proposed construction activities would occur closest to the marine subsistence use area used by Nuiqsut. However, the communities of Utqiaġvik and Kaktovik are also discussed in this section as Utqiaġvik and Nuiqsut are located on or near the coast and harvest various species of marine mammals.

1.2.1. Subsistence Uses and Potential Impacts

A summary of subsistence uses and potential impacts for each identified community is discussed below. A detailed discussion on the subsistence uses per species by the communities discussed in this document can be found in Section 8 of the IHA application. In addition, Appendix U of the Draft Environmental Impact Statement (DEIS) developed by FERC provided the preliminary ANILCA Section 810 evaluation of the potential for the project to impact subsistence resources. The assessment noted, "Impacts to the availability of marine mammals could be moderate to major but would be effectively mitigated. Marine mammals could be displaced from traditional use areas and travel routes due to noise and shipping traffic. Displacement of marine mammals would be mitigated and minimized during critical time periods by coordinating with local communities and whaling associations to identify areas within which construction activities should be avoided (see AKLNG draft EIS section 4.14.2.6, General Impact Assessment, page 4.18). As a result, impacts to the availability of marine mammals for subsistence use are expected to be minor and temporary."

Nuiqsut is located on the west bank of the Nechelik Channel on the lower Colville River Delta, about 25 miles (40 kilometers) from the Arctic Ocean and approximately 150 miles (242 kilometers) southeast of Utqiaġvik. Nuiqsut subsistence users utilize an extensive search area, spanning 16,322 square miles (square kilometers) across the central Arctic slope (Brown et al. 2016). Marine mammal hunting is primarily concentrated in two areas: 1) Harrison Bay, between Atigaru Point and Oliktok Point, including a northward extent of approximately 50 miles (80 kilometers) beyond the Colville River Delta (Brown et al. 2016); and 2) east of the delta between Prudhoe and Foggy Island bays which includes an area of approximately 100 square miles surrounding the Midway Islands, McClure Island and Cross Island (Brown et al. 2016). The community of Nuiqsut has subsistence-harvest areas adjacent to the proposed construction area, however, West Dock is not a common hunting area nor is it visited regularly by Nuiqsut subsistence hunters primarily because of industrial history. The harvest of marine mammals (bowhead whale, bearded, ringed, and spotted seals) accounted for 46% of the total wild foods harvested in edible pounds for Nuiqsut in 2014 (Brown et al. 2016).

Potential for impacts to Nuiqsut subsistence users would primarily be associated with barge activity, which could potentially interfere with summer seal and fall bowhead whale hunting (Alaska LNG 2016). Barge traffic would occur over six sequential years from July through September. Although barging activities would not cease during Nuiqsut's fall bowhead whale hunting activities, the potential for impact would be greatly reduced by keeping Project vessels landward of Cross Island during the August 25-September 15 period, avoiding the high use areas offshore of the island during the whaling season in most years (Alaska LNG 2017). Noise associated with barging could deflect bowhead whales as they migrate through Nuiqsut's fall whaling grounds or cause temporary disturbances of seals, making successful harvests more

difficult. In the area east of Nuiqsut, construction of the mainline and GTP would occur only over winter seasons and would therefore have limited impacts on resource availability for Nuiqsut harvesters (Alaska LNG 2016).

Utqiaġvik is the northernmost community in the United States and is located 320 miles (515 kilometers) north of the Arctic Circle. Utqiaġvik's subsistence-harvest areas are to the west of the project area. Residents reported continuous search areas along the coast from Wainwright east to Admiralty Bay, a distance of approximately 115 miles (185 kilometers; Brown et al. 2016). Hunters reported searching as far as 40 miles (64 kilometers) out to sea, likely in pursuit of bowhead whales. Smaller search and harvest areas for marine mammals were reported near and to the west of Wainwright (Brown et al. 2016). Potential impacts to Utqiaġvik subsistence users would primarily occur during the construction period when barging activity could interfere with summer seal, walrus, and fall bowhead whale hunting (Alaska LNG 2016). Barge traffic would occur over six sequential years from July through September, and barging activities would not cease during fall bowhead whale hunting activities (Alaska LNG 2017). Noise from barging could deflect bowhead whales as they migrate through Utqiaġvik's fall whaling grounds or cause temporary disturbances of seals and walrus, making successful harvests more difficult (Alaska LNG 2016).

Kaktovik is the easternmost village in the North Slope Borough. Kaktovik is located on the north shore of Barter Island, situated between the Okpilak and Jago rivers on the Beaufort Sea coast. Kaktovik's subsistence-harvest areas are to the east of the project area and target marine mammal species migrating eastward during spring-summer occur seaward of the project area. Because of the distance from Kaktovik, Kaktovik's limited use of waters offshore of Prudhoe Bay, and because any impacts would occur in an already-developed area, it is unlikely that the proposed activities would have any effects on the use of marine mammals for subsistence by residents of Kaktovik (Alaska LNG 2016).

2. MEASURES TO REDUCE IMPACTS TO SUBSISTENCE USERS

Mitigation measures proposed to reduce impacts to subsistence users are discussed in Section 11 of the IHA application and provided in the list below. The measures were developed to be consistent with industry standards and to address concerns raised by community members at the stakeholder meetings.

- Alaska LNG has developed this POC in accordance with the MMPA, which identifies and documents potential conflicts and associated measures that will be taken to minimize potential adverse effects on the availability of marine mammals for subsistence use.
- Outcomes of subsequent POC meetings will be included as updates attached as addenda.
- Alaska LNG continues to document its contacts with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups.
- Alaska LNG will routinely engage with local communities and subsistence groups. These groups will be consulted on mitigation measures to limit impacts prior to construction activities. Multiple user groups are often consulted simultaneously as larger coalition meetings such as the Arctic Safety Waterways Committee meetings. Local communities and subsistence groups identified by Alaska LNG include:

- Alaska Eskimo Whaling Commission (AEWC)
- Arctic Safety Waterways Committee
- Arctic Coalition of Marine Mammals
- The Ice Seal Committee
- The Alaska Beluga Whale Committee
- The Alaska Nannut Co-Management Council
- Indigenous People's Council for Marine Mammals
- The North Slope Borough (NSB) Department of Wildlife
- The North Slope Borough Planning Department
- Kuukpik Corporation
- Inupiat Community of the Arctic Slope

- Alaska LNG will develop a Communication Plan and will implement this plan before initiating construction operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts.
- A project informational mailer with a request for community feedback (traditional mail, e-mail, phone) will be sent to community members prior to construction.
- Following the construction season, Alaska LNG intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.
- The AEWC works annually with industry partners to develop a Conflict Avoidance Agreement (CAA). This agreement implements mitigation measures that allow industry to conduct their work in or transiting the vicinity of active subsistence hunters, in areas where subsistence hunters anticipate hunting, or in areas that are in sufficient proximity to areas expected to be used for subsistence hunting that the planned activities could potentially adversely affect the subsistence bowhead whale hunt through effects on bowhead whales while maintaining the availability of marine mammals for subsistence hunters. One important aspect of the CAA are time and area closures. Alaska LNG is considering whether it would enter into the CAA or similar agreement with the AEWC and will discuss and evaluate a CAA in the aforementioned meetings. Such agreements are voluntary and are not mandated by regulation. Alaska LNG is, however, committing to the following no pile driving dates in anticipation of the Nuiqsut whaling season, understanding the exact whaling dates may change:

- Pile driving activities at West Dock would not occur during sensitive periods in an effort to eliminate noise and vessel traffic
- Keep vessels landward of Cross Island during the Nuiqsut whaling (August 25-September 15).

3. COMMUNITY MEETINGS SUMMARY

Residents of the NSB have shown significant interest in the Alaska LNG Project over the past five years (

Table 2). After an initial round of public scoping meetings held by the FERC, the Alaska LNG Project Team held open house meetings to further address the NSB residents' questions. It is important to note that community meetings have been held as part of the Alaska LNG project through its many project ownerships; below we have listed only meetings specific only to the AGDC Alaska LNG Project.

Table 2. Overview of Alaska LNG Meetings With Subsistence Users

Date	Meeting Subject
January 14, 2015	Nuiqsut Open House & Workshop
July 14, 2015	Nuiqsut Community Meeting
December 4, 2015	NSB Mayor Charlotte Brower letter to FERC
October 29, 2015	Nuiqsut Public Scoping Meeting
July 24, 2018	Alaska Eskimo Whaling Commission Meeting
January 16, 2019	Alaska Eskimo Whaling Commission Meeting
July 30, 2019	Alaska Eskimo Whaling Commission Meeting

The AEWC and Nuiqsut Whaling's Captain Association will be consulted in regard to projects that involve marine activities on Alaska's North Slope. As stated by NSB Mayor Charlotte Brower in a letter to FERC:

> "Communities of the North Slope and beyond depend upon the subsistence harvest of the Bowhead Whale and the sharing of its harvested products for their cultural, nutritional, and spiritual well-being. The Borough supports the work of the Alaska Eskimo Whaling Commission (AEWC) to ensure the ability to hunt is not harmed by industrial and other activities."

AGDC has engaged with the AEWC since 2015 and provided project updates during scoping and throughout the regulatory process. In July 2018, the Alaska LNG Project team presented an in-depth project overview and held thorough discussions with the Commissioners during an AWEC meeting in Fairbanks. See Appendix A for the meeting minutes and project presentation. The most recent AEWC meeting was held in July 2019, during which components of the draft Environmental Impact Statement (EIS) that addressed mitigation plans, conflict avoidance, and minimization of impacts to marine mammals were discussed. A copy of this presentation can be found in Appendix B.

Table 3 identifies significant meetings held with North Slope communities and stakeholder groups, as well as documentation; additional details and records are provided in Appendix C.

Table 3. Summary of Stakeholder Meetings Held From 2015-2019.

Date	Location	Organization	Purpose
January 13, 2015	Nuiqsut, AK	Nuiqsut Open House and Workshop	Community meeting held to discuss Alaska LNG Project and answer community questions.
January 27, 2015	Anchorage, AK	Alaska LNG Project Team	Letter that summarized notes from public meetings held in October - November 2014 including Utqiagvik, AK
May 1, 2015	Barrow, AK	Barrow Community Meeting	General overview of the project with focus on the North Slope Borough.
May 14, 2015	Utqiagvik, AK	North Slope Borough	Letter that provided background information to FERC on the North Slope Borough, and recommendations on what the environmental analysis should address, including impacts to subsistence and marine mammals. The letter discusses offshore impacts, conflict avoidance. and mitigation measures.
July 14, 2015	Nuiqsut, AK	Nuiqsut Community Meeting	Community meeting to discuss Alaska LNG Project and answer community questions.
October 28, 2015	Barrow, AK	Barrow Public Scoping Meeting	Public scoping meeting to hear community concerns.
October 29, 2015	Nuiqsut, AK	Nuiqsut Public Scoping Meeting	Public scoping meeting to hear community concerns.
February 8, 2017	Barrow, AK	Alaska Eskimo Whaling Commission	Provided the AEWC with a project update.
April 25, 2017	Nuiqsut, AK	Native Village of Nuiqsut	Letter that notified application for the Alaska LNG Project was submitted to FERC.

Date	Location	Organization	Purpose
May 16, 2017	Barrow, AK	Barrow Community Meeting	Community meeting to discuss Alaska LNG Project and answer community questions.
March 14, 2018	Anchorage, AK	North Slope Borough Planning Department	Meeting to establish a working relationship between the NSB Planning Department and AGDC along with identification of issues and necessary NSB permits for the project.
April 19, 2018		Native Village of Nuiqsut	Letter that provided a copy of the FERC EIS schedule and map.
May 9, 2018	Utqiagvik, AK	North Slope Borough	Meeting during which project issues and incidental take regulations were discussed.
May 14, 2018	Utqiagvik, AK	Utqiagvik Community Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
May 15, 2018	Nuiqsut, AK	Nuiqsut Community Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
July 24, 2018	Fairbanks, AK	Alaska Eskimo Whaling Commission	AGDC provided a project update then answered questions from Alaska Eskimo Whaling Commissioners
October 17, 2018	Anchorage, AK	Alaska Eskimo Whaling Commission	Attended the fall meeting of the Commission to provide a project update.
January 16, 2019	Anchorage, AK	Alaska Eskimo Whaling Commission	Attended the quarterly meeting to engage with AEWC Commissioners and provide informal project update.

Date	Location	Organization	Purpose
July 30, 2019	Utqiagvik, AK	Alaska Eskimo Whaling Commission	Provided the AEWC with a project update. Due to an unforeseen accident Mr. Richards was not able to attend. His presentation identified how the draft EIS addressed marine mammals, mitigation plans, conflict avoidance along with AGDC commitments.
September 9, 2019	Utqiagvik, AK	FERC Public Comment Meeting on DEIS	Community meeting that gathered public comment on the draft EIS issued by FERC. One individual showed up but did not formally testify.
September 10, 2019	Nuiqsut, AK	FERC Public Comment Meeting on DEIS	Community meeting that gathered public comment on the draft EIS issued by FERC.
September 15, 2019	Anchorage, AK	Alaska LNG Project Team	Summary, by community, of comments made at the FERC public meetings.

Alaska LNG will continue to engage stakeholders including the NSB, AEWC, and Nuiqsut Whaling Captains Association, as the project progresses. This effort will include meeting attendance and regular correspondence. Records of communication and consultation with local subsistence communities regarding the Alaska LNG program will be maintained, along with descriptions of potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR 216.104(a) (12) (i), (ii), and (iv)).

4. REFERENCES

Alaska LNG. 2017. Resource Report No. 3, Appendix F – Marine Mammal Protection Act Assessment Report. Rev: 0, April 14, 2017. DOC NO: USAI-P2-SRZZZ-00-000007-000. 106 pages.

Alaska LNG. 2016. Resource Report No. 5, Appendix D – Final Subsistence and Traditional Knowledge Studies Report. Rev: 0, April 14, 2017. DOC NO: USAI-PE-SRREG-00-000005-000. 1079 pages.

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APPENDIX A

Meeting Summary

DATE	ORGANIZATION	LOCATION	PARTCIPANTS	PURPOSE
January 13, 2015	Nuiqsut Open House and Workshop	Nuiqsut, AK	Adrienne Rosecrans, Alice Ipalook, Bruce Nukapigak, Carolyn Ahkiviana, Clarence H Anapkana, Daniel Gales, Don Eller, Dora Ahkiv iana, Dora Leavitt, Dorcas Jane Tagarook, Dorcus Nashookpuk, Ed Nakapigak Jr., Flora Gerke, Flora Ipalook, Hazel Kunalene, Isaac Nukapigak, James Taalak, Jeremiah Ahmakak, John Ipalook, John Nicholls, Jonah Nukapigakm Joseph Akpik, Kyle Brower, Lettie Ahnupkana, Lloyd Ipalook, Lucy Nukapigak, Lydia Sovalik, Martha Itta, Peter Tagarook Jr., Rachel Nukapigak, Roger Ahnupkana, Ryan Lee Oyagak, Sam Kunalene, Steven Nunaknana, Vera Tagarook, Wendy Brower	Community meeting held to discuss Alaska LNG Project and answer community questions.
January 27, 2015	Alaska LNG Project Team	Anchorage, AK	Charlie Kominas, Jim Martin, Kimberly Bose	Letter that summarized notes from public meetings held in October-November 2014 including Utqiagvik, AK.
May 1, 2015	Barrow Community Meeting	Barrow, AK	Adrienne Rosecrans, Bart Ahsogeak, John Q Adams, Ned Arey Sr., Rhoda Ahmaogak	General overview of the project with focus on the North Slope Borough.

DATE	ORGANIZATION	LOCATION	PARTCIPANTS	PURPOSE
May 14, 2015	North Slope Borough	Utqiagvik, AK	Mayor Charlotte Brower, Kimberly D. Bose	Letter that provided background information to FERC on the North Slope Borough, and recommendations on what the environmental analysis should address, including impacts to subsistence and marine mammals. The letter discusses offshore impacts, conflict avoidance. and mitigation measures.
July 14, 2015	Nuiqsut Community Meeting	Nuiqsut, AK	Abraham Stine, Jr., Adeline Galla, Angel Rabon, Carl Brower, Claire Joseph, Clarence H Anapkana, Cornella Sovalik, Dora Leavitt, Eli Nukapigak, Emily Smyth, Steve Eric Leavitt, Eunice Pausanna, Eva Welch, Hazel Kunaknana, James Taalak, Javier Fente, Jeremiah Ahmakak, Jimmy Kasak, Joseph Akpik, Lauren Newton, Leon Matumean, Lettie Ahnupkana, Lloyd Ipalook, Lottie Evikana, Lydia Sovalik, Marlene Ipalook, Martha Pausanna, Robert Nukapigak, Roger Ahnupkanam Tasha Edwards Micheal, Wendy Brower	Community meeting to discuss Alaska LNG Project and answer community questions.
October 28, 2015	Barrow Public Scoping Meeting	Barrow, AK	Jim Martin, Michael Nelson	Public scoping meeting to hear community concerns.
October 29, 2015	Nuiqsut Public Scoping Meeting	Nuiqsut, AK	Jim Martin, Mark Jennings, George Sielak, Edward Nukapigak, Irene Mekiana, Robert Nukapigak, Archie Ahkiviana	Public scoping meeting to hear community concerns.
February 8, 2017	Alaska Eskimo Whaling Commission	Barrow, AK	Rosetta Alcantra	Provided the AEWC with a project update.

DATE	ORGANIZATION	LOCATION	PARTCIPANTS	PURPOSE
April 25, 2017	Native Village of Nuiqsut	Nuiqsut, AK	Martha Itta	Letter that notified application for the Alaska LNG Project was submitted to FERC.
May 16, 2017	Barrow Community Meeting	Barrow, AK	Percy Aileen, Brian Thomas, Leanna Maeu, Brad Bodfish, James Judkius	Community meeting to discuss Alaska LNG Project and answer community questions.
March 14, 2018	North Slope Borough Planning Depaertment	Anchorage, AK	Gordon Brower, John Bergerson, Matt Dunn	Meeting to establish a working relationship between the NSB Planning Department and AGDC along with identification of issues and necessary NSB permits for the project.
April 19, 2018	Native Village of Nuiqsut		Martha Itta	Letter that provided a copy of the FERC EIS schedule and map.
May 9, 2018	North Slope Borough	Utqiagvik, AK	Billy Adams, Craig George, Leandra deSousa, Leslie Pierce, Nicole Kanayurak, Qaiyaan Harcharkem, Raphaela Stimmelmayr, Taqulik Hepa, Todd Sformo	Meeting during which project issues and incidental take regulations were discussed.
May 14, 2018	Utqiagvik Community Meeting	Utqiagvik, AK	AGDC Sponsored Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
May 15, 2018	Nuiqsut Community Meeting	Nuiqsut, AK	AGDC Sponsored Meeting	Community meeting during which the Alaska LNG Project was discussed and community questions were answered.
July 24, 2018	Alaska Eskimo Whaling Commission	Fairbanks, AK	Arnold Brower; Billy Adams, Craig George, Crawford Patkotak, Edmond Apassingok, Enoch Adams Jr., George Kaleak Sr., George Noongwook, John Hopson Jr., Julius Rexford, Raymond Seetook, Roald Ozenna Jr., Russel Lane, Sheldon Brower	AGDC provided a project update then answered questions from Alaska Eskimo Whaling Commissioners.

DATE	ORGANIZATION	LOCATION	PARTCIPANTS	PURPOSE
October 17, 2018	Alaska Eskimo Whaling Commission	Anchorage, AK	Arnold Brower, Enoch Adams Jr., Harry Brower, Thomas Napageak Je.	Attended the fall meeting of the Commission to provide a project update.
January 16, 2019	Alaska Eskimo Whaling Commission	Anchorage, AK	Arnold Brower, Charles Hopson, Crawford Patkotak, Billy Adams, Todd Sformo,	Attended the quarterly meeting to engage with AEWC Commissioners and provide informal project update.
July 30, 2019	Alaska Eskimo Whaling Commission	Utqiagvik, AK	Frank Richards	Provided the AEWC with a project update. Due to an unforeseen accident Mr. Richards was not able to attend. His presentation identified how the draft EIS addressed marine mammals, mitigation plans, conflict avoidance along with AGDC commitments.
September 9, 2019	FERC Public Comment Meeting on DEIS	Utqiagvik, AK	Brad Chastain, Jim Martin, Lisa Haas, Gordon Brower	Community meeting that gathered public comment on the draft EIS issued by FERC. One individual showed up but did not formally testify.
September 10, 2019	FERC Public Comment Meeting on DEIS	Nuiqsut, AK	Lisa Haas, Brad Chastain, Jim Martin	Community meeting that gathered public comment on the draft EIS issued by FERC.
September 15, 2019	Alaska LNG Project Team	Anchorage, AK	AGDC Document	Summary, by community, of comments made at the FERC public meetings.

APPENDIX B

Meeting Minutes and Presentation

Alaska LNG

MINUTES OF MEETING/RECORD OF TELEPHONE CONVERSATION

Project Name:	Nuiqsut Open House
Meeting Type:	Meeting/Workshop
Meeting Subject:	Alaska LNG Open House project presentation.
Date of Meeting:	01/13/2015
Document Control Number:	USAI-PE-SAMOM-00-000063-000
ATTENDED BY:	**ORGANIZATION:**
	n/a

AGENDA ITEMS:

Item	Agenda Item	Description
1	Stakeholder Issue	Would the pipeline be buried? What kind of material would be used for the pipeline? What is the life of the pipeline? Is the pipeline breakable? Would there be corrosion inhibitors with the pipeline? What is the design life?
2	Stakeholder Issue	Why did the State of Alaska support lowering the taxes the producers must pay? What will the State of Alaska do about LNG taxation? Any estimates on the cost of the gas? Are the partners all willing to commit the funds necessary to build this? Will the State have tap into the permanent fund to help pay their share? The State of Alaska is losing oil revenue; I don't want the State of Alaska to start tapping into our PFD fund. How will the government finance its 25% share of the project?
3	Stakeholder Issue	Will this project be following the NEPA process? Who leads the regulatory process for the project? Is the EPA involved? How do the stakeholders perceive the state?
4	Stakeholder Issue	Where would the pipeline be located? NW and SW Alaska need gas too, not just the Mat-Su. Recommend shifting the pipeline west so that Nome, Kotzebue, Bethel, and Anaktuvuk Pass, and eastern NSB villages can get gas. The State of Alaska should open up the western side of Alaska and include Bethel, Nome, and Red Dog Mine. These communities would greatly benefit from our natural resources. Consider having the LNG plant in Nome and help support the NSB with LNG taxation.
5	Stakeholder Issue	oncern over communities near the project, including combined impacts of 40 years of oil production. Land use planning is important. Planning is important for infrastructure projects associated with project revenue streams and appropriate allocation to communities in the North Slope. How would North Slope villages benefit? Take care of brothers and sisters in the NSB.
6	Stakeholder Issue	What is the ROW? Is it near current ROWs? Is it in the road ROW?
7	Stakeholder Issue	Questions on the corridor crossing native allotments.
8	Stakeholder Issue	We are reluctant to support the development of the LNG if our other villages in the NSB will not have the opportunity to have natural gas in their community. Our villages are struggling financially with the high cost of heating oil compared to gas.
9	Stakeholder Issue	Is Governor Walker supportive of this project? Where does the State of Alaska stand on this project? Make available copies of the MAGP committee's interim report to the governor.
10	Stakeholder Issue	Concern over earthquake design.
11	Stakeholder Issue	Development/construction of the pipeline will deeply affect the porcupine caribou herd, especially during herd migration periods. Prefer buried pipeline because of caribou crossings. Concern with what a gas leak would do to flora and fauna.
12	Stakeholder Issue	When will the social impacts affecting the communities be addressed? Severe social impact. Worried about gas leaks affecting way of life.

ALASKA GASLINE DEVELOPMENT CORP.	Meeting Minutes AEWC – Quarterly Meeting	AKLNG-6020-REG-MTG-REC-00074 ASAP-22-MTG-REG-REC-00037 Date: 1/16/2019
	CONFIDENTIAL	Page 1

Meeting Details			
Functional Team	AGDC	**Date of Meeting**	1/16/2019
Meeting Subject	AEWC Quarterly Meeting (January – Anchorage)		

Attendees (* = via phone)

Name	Organization	Name	Organization
Kalb Stevenson	AGDC		

Minutes Distribution

Name	Organization	Name	Organization
AGDC			

Agenda Items

Item	Agenda Item(s)	Leader	Time
1	Agenda attached		
2			

Action Items

Item	Action Items/Topics	Actions Assigned To	Due Date
1	Meeting opening and introductions – informal AGDC Updates to AEWC Commissioner Arnold Brower, Jr. and meet w/ Barrow Whaling Captain President, Charles Hopson, and Barrow AEWC commissioner, Crawford Patkotak		
2	PPR – Oil Spill Response in Communities (Kevin Kennedy)		
3	Conoco Phillips – Willow Prospect Update (bathymetry & ice den survey)		
4	Break – AGDC Updates to TGS, Conoco; Meet w/ Billy Adams (Barrow Whaling Captain and NSB Wildlife staff) and Todd Sformo (NSB Wildlife); meet Jenny Ovens (AEWC); meet and greet w/ PPR on oil spill response details		
5	TGS – Seismic Program W/ Troy Nelson; AEWC discussion on Conflict Avoidance Agreement		
6	Arctic Port Access Route Study (PARS) – open discussion of USCG Plans for Arctic PARS and public comment period		
7	Met w/ Jessica LeFevre, AEWC Legal Counsel, on Arctic PARS, shipping, IMO regs, and potential impacts of shipping lanes to industry utilizing Prudhoe Bay		
8	Hilcorp - met w/ Jim Weingardner and discussed project updates and Arctic PARS shipping lanes		

Meeting Notes:

Wednesday, January 19, 2019

AEWC Quarterly Meeting – Interactions and Attendance of Presentations

8:30 – 9:00am (pre-meeting interactions)
Prior to the start of the Wednesday morning session, K. Stevenson (AGDC) provided a verbal update on the Alaska LNG project to some AEWC staff and commissioners, including Crawford Patkotak (AEWC Vice Chair and Barrow Commissioner) and Arnold Brower, Jr. (AEWC Executive Director) and greeted Charles Hopson (AEWC Barrow Association President). During these informal communications, K. Stevenson informed AEWC representatives that while the State of Alaska and the Alaska Gasline Development Corporation (AGDC) are under new leadership with a newly elected governor, four new AGDC board members appointed, and a new AGDC president appointed by the board, AGDC's mission to develop North Slope natural gas safely and responsibly remains. K. Stevenson stated that the direction for AGDC under the new leadership includes continuing to pursue obtaining a FERC license for Alaska LNG, marketing Alaska's LNG overseas, and forming cooperative partnership with producers already operating on Alaska's North Slope, potentially to assist in developing the Project.

9:00 – 10:30am (early morning sessions)

A presentation on Oil Spill Response in Alaskan Coastal Communities was provided by PPR. Representatives described progress and experience in research treating oil spills and providing local communities with training and infrastructure that could potentially be required to address spills in arctic conditions. The representative described ongoing discussions with the U.S. Coast Guard and the need for trained first responders in villages. Questions were raised by AEWC Barrow Association President, Charles Hopson, and Barrow Whaling Association Captain, Todd Wright, on slush ice, usefulness of paid training, use of equipment / aging equipment, and possible USCG policy changes to allow citizens to clean up spills.

A presentation was then provided by ConocoPhillips Alaska on the Willow Prospect near Nuiqsut and the alternatives considered for barging in modules and transporting by ice road to buildout the expanded facilities. There was discussion of bathymetry collected, concepts of frozen-in barges vs. building gravel islands, planned surveys, ice roads, and reports on stakeholder interactions. Advantages and disadvantages of potential alternative module offload sites and ice roads were presented, such as Atigaru Pt., Lonely Pt., Oliktok Dock, and others.

10:30 – 10:45 (Break)

During a break in the meeting, K. Stevenson (AGDC) greeted North Slope Borough (NSB) Dept. of Wildlife staff, including Billy Adams (Assistant to the Director of NSB Wildlife) and Dr. Todd Sformo (NSB Wildlife Biologist) and greeted Jenny Evans (AEWC Development / Communications Director). K. Stevenson provided brief updates on the Alaska LNG project, as appropriate.

10:45 – Noon (late morning sessions)

The late morning session began with a presentation from seismic exploration and mapping company, TGS, which will be doing work this fall in Harrison Bay. The company provided an overview of its program and forthcoming summer field work, PSOs, and expected sound output. Questions came from the whaling commissioner from Kaktovik and Charles Hopson on the timing of work, the sound output from the seismic equipment, and what potential impacts of seismic blasts are expected to be to marine mammals, fish, and invertebrates. The TGS representative answered the

questions and described a passive acoustic monitoring process that would be used for additional protection while conducting seismic activity. TGS described its safety zones and mitigation efforts. The commissioner from Kaktovik expressed concern from blast noise deflecting whales further out to sea around the time that hunting would occur.

The USCG was not able to attend a meeting on a planned Arctic Port Access Route Study (PARS) which is intended to be developed, similar to the Bering Sea PARS, to establish enforceable shipping lanes for vessels falling under International Maritime Organization (IMO). However, Jessica Lefevre (AEWC Legal Counsel) led a discussion on this topic, including number of foreign vessels traversing the Arctic, important subsistence areas, and the public comment period that the USCG will be opening as it develops the Arctic PARS.

12 – 1pm (Break)

K. Stevenson (AGDC) informally discussed details of the Arctic PARS with Jessica Lefevre (AEWC Legal Counsel) and provided an update on AGDC's intended vessel routes through the Arctic.

Hilcorp's presentation on the Liberty prospect (Jim Winegarner) was deferred to the afternoon session.

Alaska LNG

MEETING NOTES

[X] Meeting	**Project Name:**	Alaska LNG
	Meeting Name:	Nuiqsut Community Meeting
	Date of Meeting:	7/14/15
[ ] Telephone	**Number:**	

ATTENDEES:

Number of Attendees Who Signed-In:	26

Name	Affiliation	Name	Affiliation
Lisa Gray	Alaska LNG	Clarence Ahnupkana	Nuiqsut
Tasha Edwards	Alaska LNG	Carl S. Brower	Nuiqsut
Emily Smith	Alaska LNG	Wendy Brower	Nuiqsut
Claire Joseph	Alaska LNG	Leon Matumeak	Nuiqsut
Eva Welch	Alaska LNG	Jeremiah Ahmakak	Nuiqsut
Patty Murphy	Alaska LNG	Eunice Pausanna	Nuiqsut
Lauren Newton	Alaska LNG	Roger Ahnupkana	Nuiqsut
Angel Rabon	Alaska LNG	Henel Kinaknen	Nuiqsut
Tim Kramer	Alaska LNG	Michelle Mille	Nuiqsut
Miles Baker	AGDC	Adeline Galler	Nuiqsut
Javier Fuente	Point Thomson	Dora Leavitt	Nuiqsut
Mark Brundage	Point Thomson	Lydia Sovalik	Nuiqsut
		Robert Nukapigak	Nuiqsut
		Eric Leavitt	Nuiqsut
		Dorcas Kittick	Nuiqsut
		Lottie A. Ahnupkana	Nuiqsut
		Martha Pausanna	Nuiqsut
		James Taalak	Nuiqsut
		Eli Nukapigak	Nuiqsut
		Lottie M. Evikana	Nuiqsut
		Marlene Ipalook	Nuiqsut
		Abraham Stine Jr.	Nuiqsut
		Lloyd Ipalook Jr.	Nuiqsut
		Joseph Akpik	Nuiqsut
		Cornelia Sovalik	Nuiqsut
		Jimmy Kasak	Nuiqsut

Please see the sign-in sheet for the complete list of attendees.

AGENDA ITEMS:

Item	Agenda Item(s)	Leader	Duration
1	PowerPoint Presentation	Lisa Gray	20 minutes

Nuiqsut Community Meeting

2	Questions from Attendees	Lisa Gray	1 hour 20 minutes

ACTION ITEMS:

Item	Action Item(s)	Action By	Date Req.
1	Take concern about Porcupine Caribou Herd back to the project team.	Claire Joseph	Q1 2016
2	Bring a pipeline engineer to the next meeting.	Lisa Gray	Q2 2016
3	Alaska LNG will ask the Alaska Department of Transportation and Public Facilities (ADOT&PF) why the haul road (Dalton Highway) washed out.	Alaska LNG	Q1 2016

KEY ISSUES:

1	**Project design/description – general:** Where would the pipeline be above ground and where would it be buried? Is the majority of the pipeline going to be buried? What is the design for the pipe? Some of us might be thinking the pipe would have gasoline.
2	**Project design/description – Pt. Thomson gas transmission line:** Can you point out Point Thomson on the map? How far is it from the ocean? What is the height of the pipeline?
3	**Project design/description – project feasibility:** Who would buy the gas? I would like an economic study done by Alaska Native Regional Corporations. Other parts of Alaska must grow besides the Southcentral area.
4	**Project design/description – logistics:** How would the pipe get here? Where would the LNG facility potentially be designed?
5	**Project location – general:** The project could route from Point Thomson to Fairbanks. What about routing to Nome and other places in west-central Alaska? It would shorten the route to go to western Alaska and export to Asia from there. It would shorten the time to recoup the state's investment. We could provide gas to Bethel from the port in Nome.
6	**Project schedule – construction:** How long is the construction going to be?
7	**Local gas supplies, off-take points – general:** Is Fairbanks going to get natural gas? Does Fairbanks support this project? What about the villages outside the North Slope and south of the mountains? Nuiqsut is the smallest community, so we have to help our neighbors. Nikiski and Anchorage have gas, but what about people in western Alaska or people in the Bethel area?
8	**Local gas supplies, off-take points – local gas distribution:** What about centralizing in Fairbanks? It could provide economic growth for Fairbanks and Fairbanks could be an export hub.
9	**Field studies – general:** When people write studies and gather data, do they come up here and look at our land?
10	**Field studies – sociocultural sciences:** Are there archaeological sites on the North Slope? Why are the archaeological sites secret?
11	**Local content – employment general:** Would workers come from all over the United States for this project? It was that way for TAPS. We need education.
12	**Environmental effects – physical impacts, general:** Did the Dalton Highway (Haul Road) wash out from drainage being affected by pipelines and other infrastructure? Would this project impact drainage and hydrology?
13	**Environmental effects – permafrost degradation:** Is the project going to impact the permafrost? The permafrost is going to melt from all this structure. Would there be thermistors in the ground to prevent the permafrost from melting?
14	**Environmental effects – spill prevention and response:** What happens if the buried pipeline breaks underground? What about the permafrost in a spill? Would the pipeline leak on the grass, and then would the caribou (who eat the grass) and us (who eat the caribou) be affected by a spill?

Nuiqsut Community Meeting

15	**Environmental effects – subsistence impacts:** I am concerned about how many years we have not seen the Porcupine Herd because of the spider web of pipelines. Can you do studies to keep track of the caribou? We have heard caribou are stuck on the other side at the Melanie Point Pipeline, and being on the state side, they only require five feet minimum height. It impacts their calving and insect relief efforts. No more caribou for us; the migration is always displaced. How would a leak impact caribou? Would a leak cause disease in the caribou? Caribou eat grass, and we eat caribou. How would construction and its timing and length affect caribou? So many villages depend on the caribou migrations and the return of the caribou.
DISCUSSION ITEMS:	
1	Q: Can you point out Point Thomson on the map? A: Yes, this is not a very good map for Point Thomson, is it? This map is more specific to the Alaska LNG Project, but we are still here to answer questions about Point Thomson. Q: What is the height of your pipeline? A: Seven feet from the bottom. Q: Last time you presented that the pipeline was going to be mostly underground. Can some of it be underground? A: The concern is that the surface runoff would be affected if the tundra is disrupted.
2	Q: How far is the pipeline from the ocean? A: About a mile. It parallels coast. A: As part of the monitoring efforts of Point Thomson, our pipeline is 22 miles, and I have videos I can show you from our cameras that track caribou walking right under the pipeline. They do not seem to mind it.
3	Q: I am concerned about how many years we have not seen the Porcupine Caribou Herd because of the spider web of your pipeline. A: We can take that back to the team.
4	Q: Can you do studies to keep track of the caribou from Prudhoe all the way to wherever those are? We have heard they are stuck on the other side at the Melanie Point Pipeline, and being on the state side, they only require five feet minimum height. It impacts their calving and insect relief efforts. A: The environmental impact statement (EIS) will study caribou from a cumulative perspective, and cumulative means what you are saying because there are a lot of pipelines; there is a lot of activity in general. How would the pipeline impact the caribou herds? That will be studied in the EIS. C: The project is going to be tremendous. C: No more caribou for us in Nuiqsut. C: The migration is always displaced.
5	Q: How long is the construction going to be? So many villages depend on the caribou migrations and their return. A: The construction takes into account things like caribou calving. If there were a caribou calving ground in the area of pipeline construction, the project would be required to do that construction in winter time. We would be required by the agencies involved in permitting the project. That kind of impact, and how we can lessen the impact, is part of what the project will consider for how we will construct the pipeline. The FERC is coming in early October or November to Nuiqsut. You can tell FERC this so they can be aware when evaluating the project.
6	Q: With the pipeline buried underground, what if the pipeline breaks? It will leak on the grass. What about if it leaks underground? What about the permafrost? A: This is a gas project. From Point Thomson to Prudhoe Bay and all the way down to Nikiski, it is gas. There are no liquids in the pipeline. It is methane gas. Methane is lighter than air, so when it gets out of what contains it, such as a pipeline, it wants to go upwards. There is no liquids in it; it would just be a gas moving upward. Methane would come out of the ground – about 75 percent from Prudhoe and 25 percent from Point Thomson. Most of the liquids are already out of that gas because they have already been brought out of the ground and shipped down the Trans-Alaska Pipeline System (TAPS). Most of what is left in these reservoirs is gas. At the gas treatment plant (GTP), it would just be bringing the gas in, and taking out the hydrogen sulfide (H_2S) to be put back into the ground. All that is going down the pipeline is methane gas. If the pipeline would have a leak, it would be methane gas wanting to go upwards into the atmosphere and into the air.
7	Q: [Question about the pipe.] A: It is a very high pressure pipeline. The pipe is almost three-fourths of an inch thick. It is very, very thick steel because it is a high pressure gas and we want to contain the gas.

Nuiqsut Community Meeting

8	Q: Caribou eat grass. Will a leak impact them? A: If there were a break and the gas escaped from underground, it would impact only the immediate area of the release. It is not at all like oil which spreads out more. Methane gas wants to go up into the atmosphere, like a helium balloon. C: Some of us might be thinking this is gasoline. A: Oh, thank you for that comment. It is not gasoline. It is methane gas in the pipeline, just like air. You can put it into a container or a pipeline, and it is gas, not gasoline, not a liquid. A leak would be similar to what happens when you boil water and it goes from being a water state to a gas state. That is what we are talking about here. Q: And that will not impact the caribou? A: If there was one or two caribou right there next to the pipeline, they might be bugged by it. However, it is not like oil. Q: Caribou eat grass, and we eat caribou. Will it give them a disease or anything like that? C: It will go up into the air. A: If there was a leak, the pipeline equipment would also shut down. A: There are safety systems built into the pipeline so that if there would be a release, the system would shut down. It would stop more gas from going through that part of the line.
9	Q: [Question about burying the pipeline.] A: The project engineers thought initially we could have the pipeline underground everywhere, but decided after looking at the engineering and talking to the agencies that from Point Thomson to Prudhoe Bay the pipeline will be above ground. The rest of it will be primarily below ground.
10	Q: How will the pipe get here? A: By barge primarily.
11	C: If you compare, ConocoPhillips is making 12-15 billion dollars a year. The return will come back in 10 years if we go the other way around. We are always comparing the cost. A: You have to find a buyer for the LNG. C: The Chinese, perhaps. A: Buyers in Asian markets would have to agree to pay what the project would need to make a profit after putting all that money into the project.
12	Q: Is Fairbanks going to get natural gas? Are they for this project? A: That question is about off-takes. Alaska LNG is building the main pipeline. The project can put flanges in the line and gas can be taken off it. The State of Alaska determines the off-takes. Miles Baker, here with the Alaska Gasline Development Corporation (AGDC), can talk about that. A: Miles Baker: Anchorage, Kenai, and the Mat-Su valley are already on natural gas from Cook Inlet, so one of the objectives of this project is to back that up. The community with the largest population right now not on natural gas is Fairbanks. There is a big initiative to build out the local distribution systems. The gas will probably be trucked from Cook Inlet to Fairbanks, so in 10 years from now when this project comes online— Q: What about the villages outside the North Slope and south of the mountains? A: Part of the state's objective is to increase the number of communities that get gas from this project. C: Nuiqsut is the smallest community, so we have to help our neighbors.
13	C: Maybe it will be safe, maybe it will not be safe. A: Alaska LNG takes safety very seriously. It is a priority for us. Alaska LNG takes environmental stewardship very seriously. The project has learned a lot of lessons from the past. About 75 percent of this team in the summer field studies are Alaskans, and it is very important to the Alaskans on the project team that we do the job right.
14	Q: Are there archaeological sites on the North Slope? A: I cannot tell you that. Q: How come? Why are the archaeological sites secret? A: It is because there are a lot of people in the world who would possibly come and steal artifacts and sell them on the black market.
15	Q: When people write studies and gather data, do they come up here and look at our land? Do they- A: Yes, a health impact assessment was done here in Nuiqsut. It was last year I believe, and a subsistence study was done here last winter. Q: Whoever writes knows how- A: The project had interviews with elders. I was not directly involved in that study, but if you want more specific information about it I can get it for you from someone who was more directly involved. I do know that elders and hunters were interviewed for those studies.

Nuiqsut Community Meeting

16	Q: Will workers come from all over the United States? That is where they came from before. A: I remember. Q: We have to have education. A: There is no reason anyone of working age who has qualifications and has stayed clean and sober cannot have a job on the construction of this project. Yes, there will still be employees from outside. Some of the skills are very specific for this project. For instance, the LNG. LNG facilities are not built in the United States. They have not been built in the United States for 20 years; we just do not do it. They are built in other places. So yes, there will be some outsiders.
17	Q: Where do they design LNG facilities? A: South Korea designs LNG facilities.
18	Q: Has the project ever looked at the western part of Alaska, including Nome, the Air Force base outside Fairbanks, Glennallen, and other places in west-central Alaska. What about those people? I would like to see the pipeline take off from Fairbanks and go directly west to Nome and the port there. For providing gas to Japan, it is a shorter route. This project could provide natural gas to Alaskans, and Alaskans are in the western part of the state, too. In the southern part of the state they have gas. Nikiski has gas and Anchorage also has gas. What about the people in the western part of Alaska, including the Bethel area? These are factors that have to be studied. It would shorten the pipeline route and shorten everything with the pipeline, and would bring the return in ten years' time selling gas to Japan and Korea and China faster. These are some of the things for the economic study I would like to introduce to your team. I have no idea if you did a study or not, but what about them? The Anchorage Bowl has grown enough. Other parts of Alaska have to grow. In your risk and cost, you are missing what return we are going to have. The return by going west would provide gas for Alaskans, a very central factor. I would like to see an economic study done by the regional corporations: Doyon, Arctic Slope, and Bering Straits. We could provide the Bethel area with gas from the port in Nome. These are the factors of growing Alaska. We have been concentrating so hard on Anchorage and elsewhere, that we have forgotten. A: The State of Alaska is conducting some of those studies. C: The project would get a return on the investment in time. Japan has been ready for gas for over ten years. They have been eyeballing that natural gas for the longest time. Japan would be the State of Alaska's customer. At the same time, the project could provide a logistic support system and army bases. A shift to the western part of Alaska would bring security and an economic base. It would cut the costs in half to go to Nome. We have to go say hello to our Eskimos over there, too. Thank you. A: Miles Baker with AGDC: Two things. The only reason the State of Alaska would invest in this project is to get a return, just like the other partners. The alignment, risk, and cost factors we have discussed will ensure this project moves forward. One of the things that has not been mentioned but will be done in the front-end engineering and design (FEED) stage is verifying the market for this gas. The project will be moving 3.5 billion cubic feet of gas. We cannot finance the project unless we have customers willing to buy that gas. The challenge in Alaska is that even our most optimistic projections – we are doing analysis right now – question if Bethel could get gas, or Nome could get gas, how much gas would they actually use? Adding all the demand in the State of Alaska calculates to an average use of about 250 million standard cubic feet a day. This project shifts 3.5 billion standard cubic feet. The challenge in getting gas to Alaskans is that people are very broadly dispersed, there is a small demand, and this is a very expensive project. The project has to secure the markets overseas in order to finance the project. Alaska's interest in this is: one, the revenue as an investor, and two, the gas for Alaskans. As a state, we are trying to reserve enough gas capacity such that we are not shipping all the gas the state owns through contracts overseas and not leaving enough gas to provide economic growth in Alaska. Those are the things the state is and will be looking at over the next 2-3 years of this project. Nothing will move into the FEED stage unless we are sure the markets are still there and the economics of the project work. The project will not move to construction unless contracts are secured, domestic gas sales are secured, and all that is going to have to be worked out before the project moves forward is done.

Nuiqsut Community Meeting

19	C: What about centralizing in Fairbanks? It could provide economic growth for Fairbanks. Fairbanks has a big enough economy to serve as a hub of the exports. Eventually, Fairbanks would have to be centralized for the the gas and then from there that would be a first phase. The project could route from Point Thomson to Fairbanks. Use our business service management and cut the cost enough to benefit the people. A: Miles Baker with AGDC: Fairbanks is a good example, a good test case. I think what you have seen in the last year or so, in the struggles with the separate proposed project the state funded to get gas to Fairbanks, that it is a challenge. Fairbanks has no local distribution, it is a relatively small demand, and it is expensive to get the pipes in there. Even with public underwriting, it is a challenge. Fairbanks is a good test case, and the state is looking at studying that right now. Fairbanks's target price would be about $15, they are currently paying about $30. However, the early cost estimates of this trucking project, for example, put the cost up around $21, not $15. Fairbanks is a big town, so when you start looking at communities that are even less in population and even more geographically dispersed, it is a challenge. The first thing we have to do is get the pipe built so we can get the gas off the North Slope and through the state. Then, AGDC has responsibility to look at the next phase, such as how to get gas to the proposed Donlin Gold mine and how to potentially get gas from the proposed Donlin Gold mine to Bethel. A: It is great that Miles Baker is here because then AGDC hears your ideas, but the project encourages people to also contact their state senators and representatives. We encourage you to contact Senator Donny Olson and Representative Ben Nageak. Your state legislators are really involved in this project. Please do not just give your input, but also go to them too.
20	Q: The pipeline was going to be above ground from Point Thomson to Prudhoe Bay? How about the majority of the line; has that changed? A: No, the majority of the gasline would be underground. The biggest potential problem as I understand is if the gasline parallels the shore, there could be potential impacts to the surface water flow to the ocean. Q: Is that why the haul road (Dalton Highway) washed out? A: No, but Alaska LNG will ask the Alaska Department of Transportation and Public Facilities (ADOT&PF) why the haul road (Dalton Highway) washed out.
21	Q: Is the majority of the pipeline going to be buried? A: Yes. Q: Is it going to impact the permafrost? A: The project is doing studies, and punching test holes in the ground. AGDC has done a lot of work and is sharing information with the project so we do not have to go back and impact where there have already been studies. A: The gas would be at the right temperature to make sure it does not affect permafrost. A: That is a very good point. There would be six compressor stations, one about every 100 miles. The job of the compressor station is to work with mother nature; if the gas would need to be cool in that part of the ground, the station would cool it. At the last two compressor stations, the gas would need to be a little bit warmer, so the compressor stations would warm it. The job of the compressor stations is to keep the gas as close to the surrounding environment in the ground as it can be.
22	Q: So the gasline would have thermistors in the ground at certain points? A: I do not know if that has been determined yet. Q: The permafrost is going to melt from all this structure. A: It would be kept at about 32 degrees. Q: It is still going to affect the permafrost somehow? Would there be thermistors in the ground to prevent the permafrost from melting? A: What I understand is they scoop out the ground, put in gravel, put pipe in the gravel, and there is pressure in the pipe. It is pressure and temperature that help keep the ground stable. I think a thermistor is something we would not know about right now. The project can bring a pipeline engineer to answer your question. A: The gas is basically conditioned on the North Slope. It is different than oil. Oil is hot. When it is going through the oil pipeline, that is a reason TAPS elevated it in this part of Alaska. TAPS is elevated to keep the hot oil from eating the permafrost. The gas assumes the ambient temperature of the ground. It is not going to be liquefied until it actually gets to the end. To your point, we are doing core sampling to identify those places along the gasline where there is frost heave and discontinuous permafrost. In those portions of the project, we have already ordered samples of specialized pipe. For those portions of the pipe that go through those areas, as it freezes and compresses, the pipe's going to withstand strain. The pipe itself would be able to move up and down and not break. The project is doing test welding right now. It is a whole separate permitting regime. The federal government is going to regulate just on that one piece.

Alaska LNG

MINUTES OF MEETING/RECORD OF TELEPHONE CONVERSATION

Project Name:	Nuiqsut Community Meeting 7/14/15
Meeting Type:	Meeting/Workshop
Meeting Subject:	Nuiqsut Community Meeting 7/14/15
Date of Meeting:	07/14/2015
Document Control Number:	USAI-PE-SAMOM-00-000102-000
ATTENDED BY:	**ORGANIZATION:**
	n/a

AGENDA ITEMS:

Item	Agenda Item	Description
1	Stakeholder Action Item	Take concern about Porcupine Caribou Herd back to the team
2	Stakeholder Issue	What is the height of your pipeline? Can some of it be underground? You said the pipeline was going to be above ground from Pt. Thompson to Prudhoe. How about the majority of the line, has that changed? Is the majority of the pipeline is going to be buried?
3	Stakeholder Issue	Can you point out Pt. Thompson on the map? How far is it from the ocean?
4	Stakeholder Issue	If you compare, ConocoPhillips is making 12-15 billion dollars a year, the return will come back in 10 years' time if we go the other way around. We are always comparing the cost. You get a return on the investment in time. Japan has been ready for gas over ten years. They have been eyeballing that natural gas for the longest time. They are the State of Alaska's customer. At the same time we can provide a logistic support system, army bases, the shift to the west would be the security and the economic base. We will cut the costs in half in Nome.
5	Stakeholder Issue	How will the pipe get here?
6	Stakeholder Issue	How long is the construction going to be?
7	Stakeholder Issue	Is Fairbanks going to get natural gas? What about the villages outside the North Slope, under the mountains? In the south they have gas, in Nikiski they have gas and in Anchorage. What about the people in the west side, the Bethel people? The return to go west, there it is, we are providing gas for Alaskans, a very central factor.
8	Stakeholder Issue	What about centralizing in Fairbanks? There it is economic growth for Fairbanks. Fairbanks has a big enough economy to serve as a hub of the exports. Eventually Fairbanks would have to be centralized, the gas, and then from there that would be a first phase. From Pt. Thompson to Fairbanks, use our BSM, cut the cost, everything; enough to benefit the people.
9	Stakeholder Issue	Are there archeological sites on the North Slope? Why are the archeological sites secret?
10	Stakeholder Issue	When people write studies do they come up here and look at our land?
11	Stakeholder Issue	Will workers come from all over the United States?
12	Stakeholder Issue	Is it going to impact the permafrost? The permafrost is going to melt from all this structure. It is still going to affect the permafrost somehow. Will they have thermosters in the ground to prevent the permafrost from melting?
13	Stakeholder Issue	With the pipeline buried underground, what if the pipeline breaks? It will leak on the grass. What about if it leaks underground? What about the permafrost?
14	Stakeholder Issue	I am concerned about how many years we have not seen the Porcupine Herd because of the spider web of your pipeline. Can you do studies to keep track of the caribou from Prudhoe all the way to wherever those are? We have heard they are stuck on the other side at the Melanie Pt. Pipeline, and being on the state side, they only require five feet minimum height. It impacts their calving and insect relief efforts. No more caribou for us, the migration is always

Item	Agenda Item	Description
		displaced. Caribou eat grass, will a leak impact them? But caribou eat grass, and we eat caribou. Will it give them a disease or anything like that?

ACTION ITEMS:			
Item	**Action Items/Topics**	**Assigned To**	**Due Date**

Alaska Eskimo Whaling Commission
2018 Summer Meeting
July 23 – 25

Alaska LNG Workshop

ALASKA GASLINE DEVELOPMENT CORP.

Workshop Goals

- **Goals for today's AEWC – Alaska LNG Workshop**
  - Inform
  - Listen
  - Discuss

- **The Alaska Gasline Development Corporation (AGDC) wants to work with AEWC to:**
  - Avoid and minimize impacts or conflict where possible
  - Work together towards practicable mitigation

Introduction to AGDC

The Alaska Gasline Development Corporation (AGDC):

- Public corporation owned by the State of Alaska.
- Empowered to expedite and develop infrastructure to bring North Slope natural gas to international and Alaska markets.
- Worked to develop in-state natural gas for Alaska since 2010

Introduction to AGDC

AGDC Advancing Two Projects - Only One Will be Built

- **Alaska LNG** – The Priority Project
  - AGDC took ownership in 2017.
  - 42” diameter, 807-mile long gasline from Prudhoe Bay to Nikiski.
  - Delivery of gas to international and Alaska markets.
  - Provides revenue and gas for the State of Alaska.
- **Alaska Stand Alone Pipeline (ASAP)** – The Back-up Project
  - “Gas for Alaskans” - AGDC took ownership in 2010
  - 36” diameter, 737-mile long gasline from Prudhoe to Willow are with a 30-mile lateral line to Fairbanks

Alaska LNG Project Overview

ALASKA GASLINE DEVELOPMENT CORP.

Gas Treatment Plant:

- Treat and compress 3.5 billion cubic feet (Bcf)/day.
- Remove all CO_2.

Pipeline:

- 807-mile (1,299 km) pipeline.
- 42-inch pipe.
- Established corridor.
- Delivers over 3.3 Bcf/d.

LNG Production Facility:

- 20 million tonnes per annum (MTPA).
- Two berths, capable of 217,000 m^3 vessels.

First gas 2024 – 2025.

Benefits to Alaskans: Rural Energy

ALASKA GASLINE DEVELOPMENT CORP.

20%

The Alaska Affordable Energy Fund

- 20% of revenue from the state's royalty gas.
- All Alaskans should benefit from the development of our gas resources.
- The State will receive a steady stream of revenue over the life of the project.
- The Alaska Affordable Energy Fund is a positive step to ensure we address high energy costs across the state for decades to come.

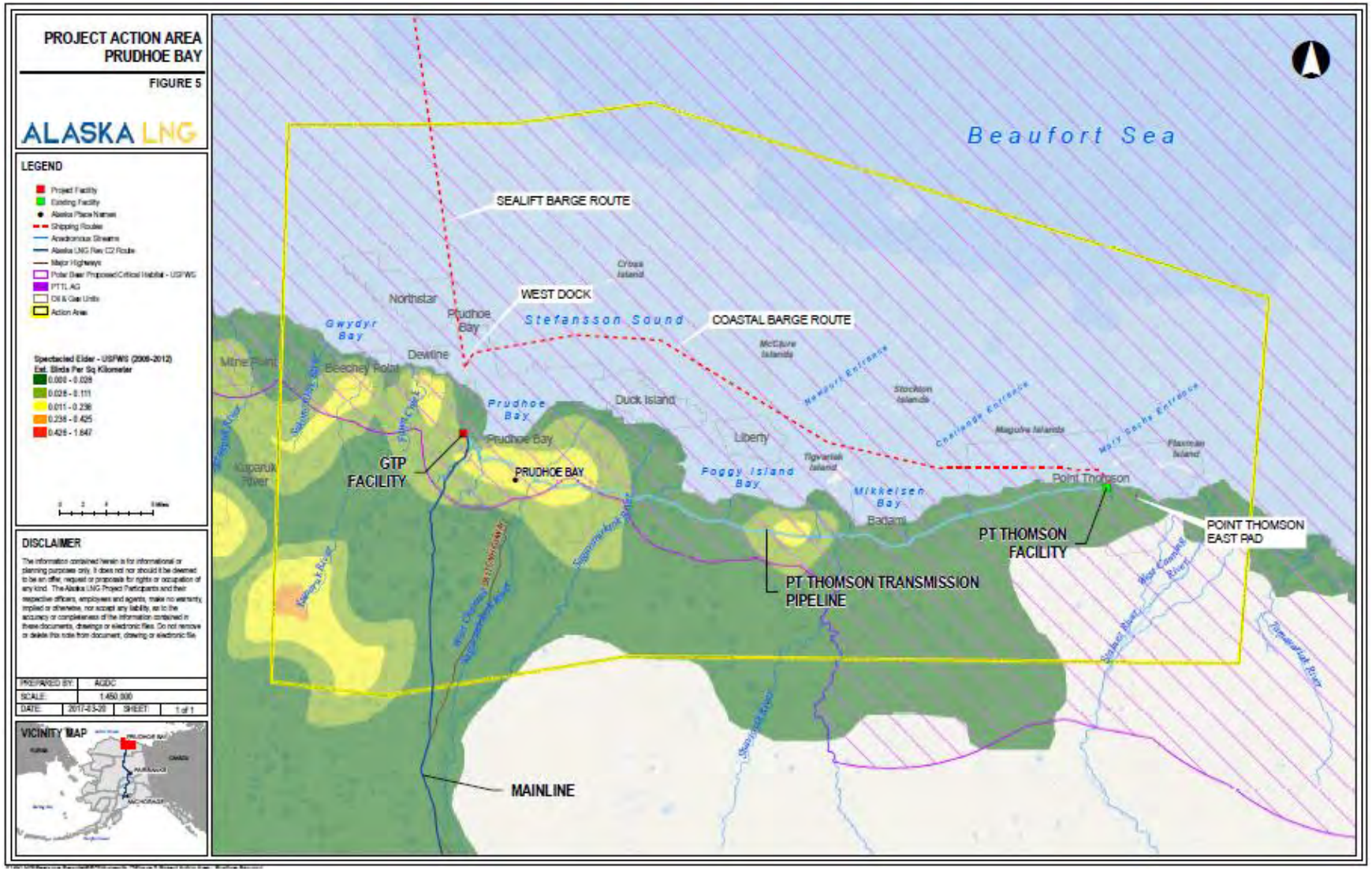
Vision: Economical energy for all of Alaska.

Alaska LNG – North Slope

- Gas Treatment Plant (GTP) composed of large modules weighing up to 9,400 s/tons to treat Prudhoe Bay gas
- 32” gas pipeline from Pt Thomson west to the GTP (Pt. Thomson Transmission Line, or ‘PTTL’)
- 42” mainline from GTP south to Brooks Range, Atigun Pass, and south to Cook Inlet
- West Dock causeway requires modification to receive modules
- Requires 12ft of water depth and use of furthest north portion of West Dock causeway
- Requires bypass of weight-limited causeway bridge, use of ballasted barges as temp. bridge

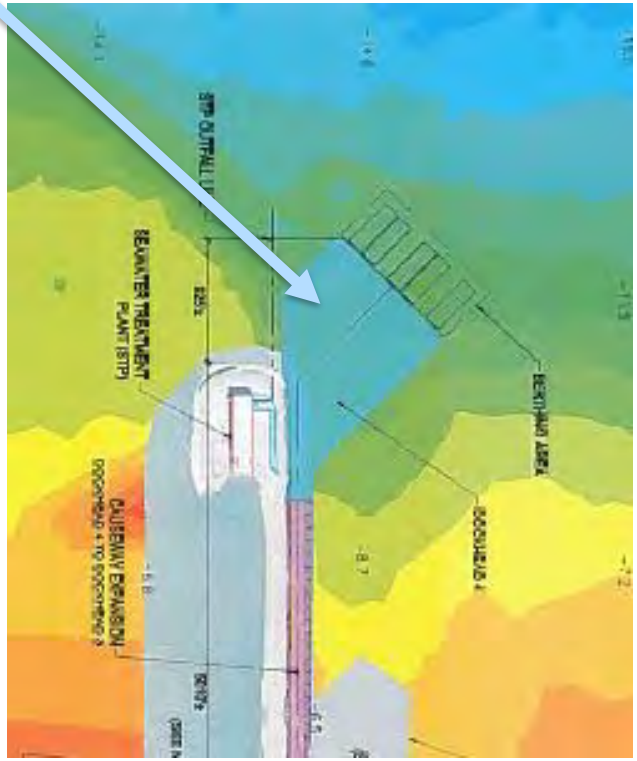
Project Action Area – Prudhoe Bay

ALASKA GASLINE DEVELOPMENT CORP.



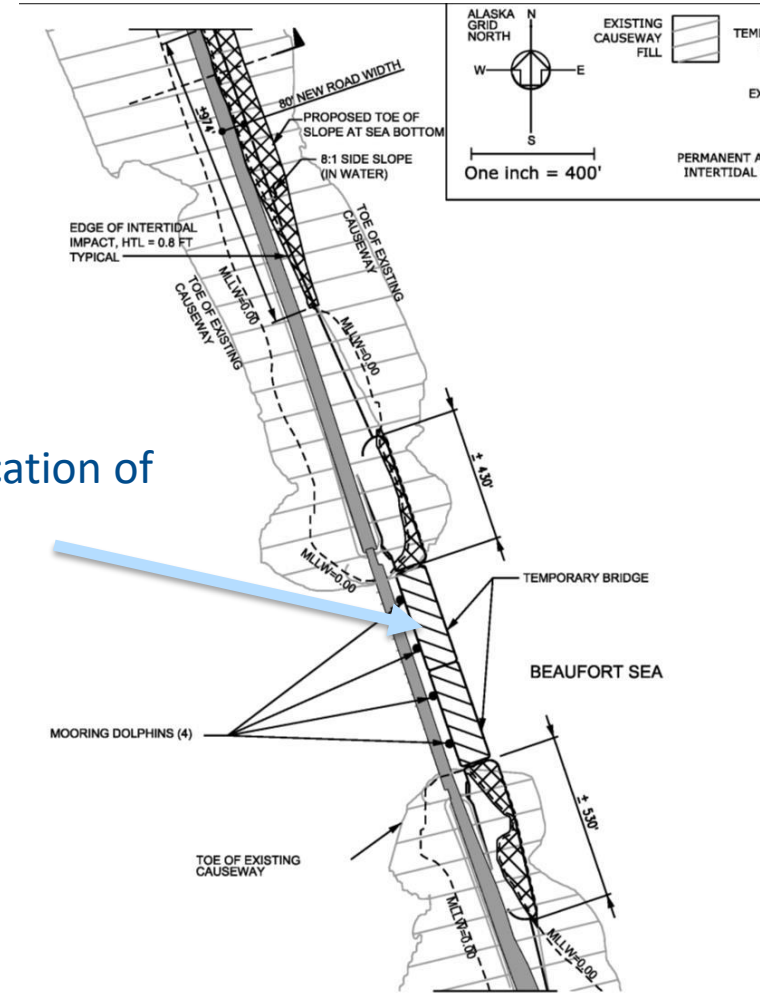
West Dock

Proposed Location of DH4

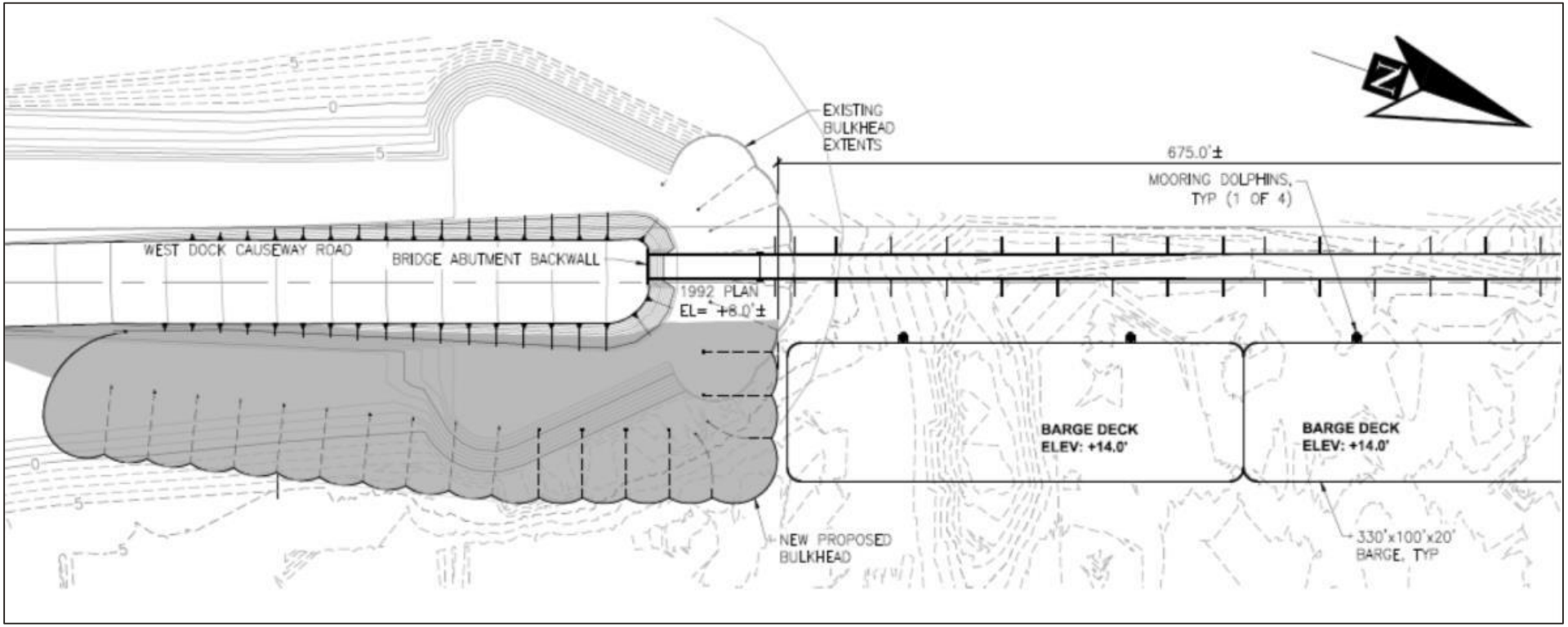


Temporary Barge Bridge

Proposed Location of Barge Bridge



Temporary Barge Bridge



Gas Treatment Plant and Pipeline

ALASKA GASLINE DEVELOPMENT CORP.

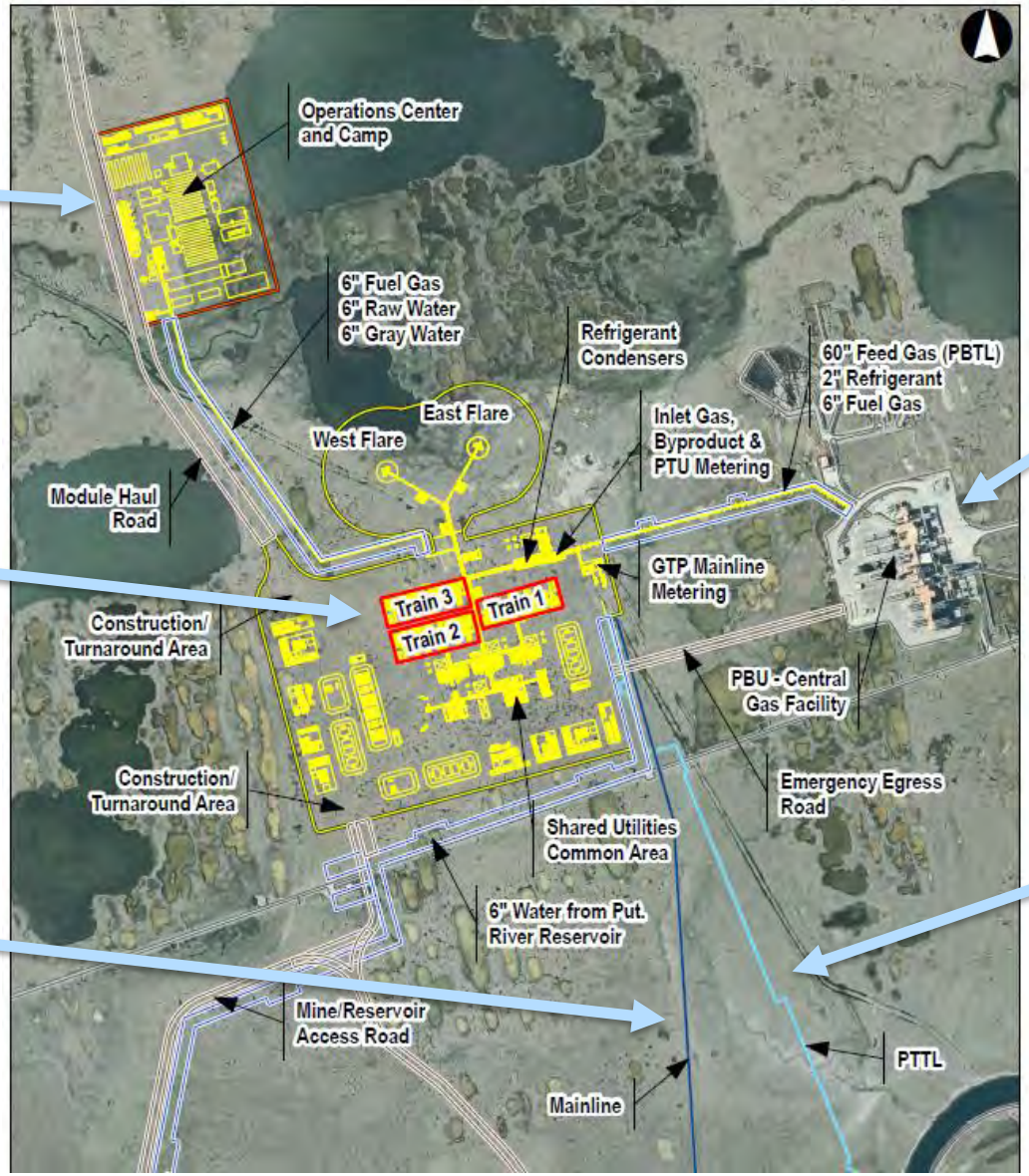
Proposed Location of GTP Camp and Operations Center

Proposed Location of GTP

Proposed Mainline

Existing Central Gas Facility

Proposed PTTL



Pile Driving

ALASKA GASLINE DEVELOPMENT CORP.

Impact and Vibratory Pile Driving

- **Activity Period:** 2021 – 2023
- **Season:** Year round, except from Aug 25 – Sept 15 (no activity)
- **Location:** DH4 and Barge Bridge Abutments / Mooring Dolphins

- **Mitigation:**
  - Activity will occur outside of the Nuiqsut subsistence window (Aug 25 – Sept 15) to protect bowhead and subsistence activity.
  - Protected Species Observers (PSOs) used during pile driving to monitor for ice seals and stop work when needed.
  - Work with NOAA Fisheries acoustic scientists to ensure appropriate setback zones

Gravel Fill

Gravel Fill Placement (DH4 / Barge Bridge)

- **Activity Period:** 2021 – 2023
- **Season:** Winter, over ice **Location:** DH4 and Barge Bridge Abutments / Mooring Dolphins

- **Mitigation:**
  - Placement in Winter; Sea ice to be ground down
  - Transport over sea ice roads from nearby source
  - Use of gravel fill at the end of causeway eliminates need for dredging / screeding

Vessel Activity

- **Average of 10.1 barges per year for six years**
  - 2 years of pre-construction deliveries
  - 4 years of module transport
- **Tugs and barges stage at Port Clarence awaiting ice-out at Barrow, then move to Prudhoe to offload w/ assist tugs.**
- **Some barges offload at Prudhoe, then move to Pt. Thomson**
- **Tugs and barges return to Dutch Harbor after offload.**

Barge Placement and Module Offload

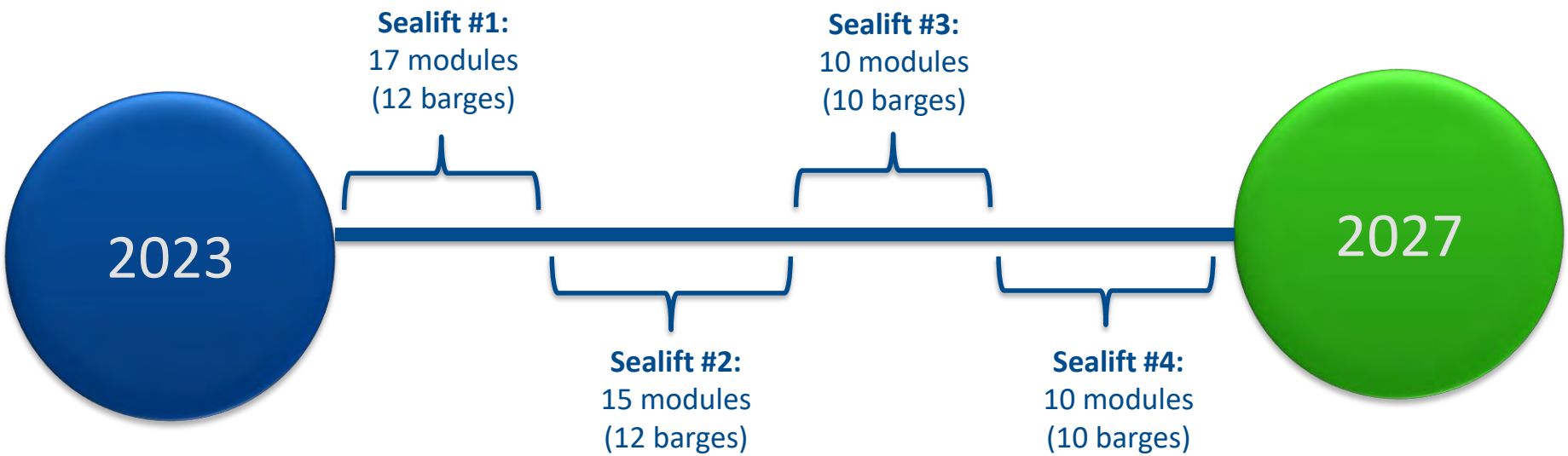
ALASKA GASLINE DEVELOPMENT CORP.

Module Offload – Docking and Transport from Causeway

- **Activity Period:** 2023 – 2028
- **Season:** Summer (July – September)
- **Location:** Adjacent to 650 ft breach

- **Mitigation:**
  - Barges placed prior to sealift but after migrating cisco passage.
  - Barge bridge contains openings / gaps for passage of local fish.
  - Barges would be removed at the end of each year's sealift.

Vessel Activity



Reduction in Barge Activity

- **(graph West Dock users info here, w/ 10 barges shown for AKLNG)**

Vessel Activity

ALASKA GASLINE DEVELOPMENT CORP.

Tug and Barge Transport and Offload of Modules

- **Activity Period:** 2023 – 2028
- **Season:** Summer (July – September)
- **Location:** Transport from Dutch Harbor to Prudhoe Bay and Return

- **Mitigation:**
  - Maintain established shipping routes
  - *(list vessel mitigations here from BA)*
  - Return vessels would not move east of Cross Island, but rather stay close to barrier islands
  - Maintain communication with Nuiqsut and Utquigvik whalers
  - Release vessels when Nuiqsut whalers not hunting (done for day or weathered in)

Permitting

The Federal Energy Regulatory Commission (FERC):

- Lead federal agency for the Alaska LNG project.
- Regulates the transmission and wholesale sale of electricity and natural gas in interstate commerce

Regulatory Timeline:

- FERC Application Submitted April 2017
- Draft EIS – March 2019
- Final EIS – December 2019
- FERC Authorization – March 2020

To date over 100,000 pages of information has been provided to FERC.

Permitting: Alaska LNG Progression

ALASKA GASLINE DEVELOPMENT CORP.

ALASKA LNG PERMITTING TIMELINE		
2014 – 2016 Producer Led Effort	$600 million of engineering, environmental, and science completed to advance permitting of Alaska LNG under Producer Led Effort.	
2017 and Beyond AGDC Led Effort	December 2016	AGDC takes the lead of Alaska LNG project
	April 2017	AGDC Files FERC Application
	August 2017	FAST Act Acceptance
	August 2017	Presidential Executive Order
	November 2017	Joint Development Agreement
	March 2018	FERC publishes EIS schedule
	March 2019	Draft EIS
	December 2019	Final EIS
	March 2020	FERC authorization

Questions?

ALASKA GASLINE DEVELOPMENT CORP.

www.agdc.us

Global Position

ALASKA GASLINE DEVELOPMENT CORP.

ALASKA'S ECONOMIC TIES ARE WITH ASIA.

- **Alaska is Asia's closest and most direct source of U.S. LNG.**
- **7 to 9 days shipping.**
- **Direct route; no third nation or canal.**

Alaska's political ties are with the United States, but our economic ties are with Asia. **- The Hon. Walter J. Hickel**

Joint Development Agreement

ALASKA GASLINE DEVELOPMENT CORP.

THE RIGHT COMPANIES
TO ADVANCE THE PROJECT.

SINOPEC 中国石化

中国投资有限责任公司
CHINA INVESTMENT CORPORATION

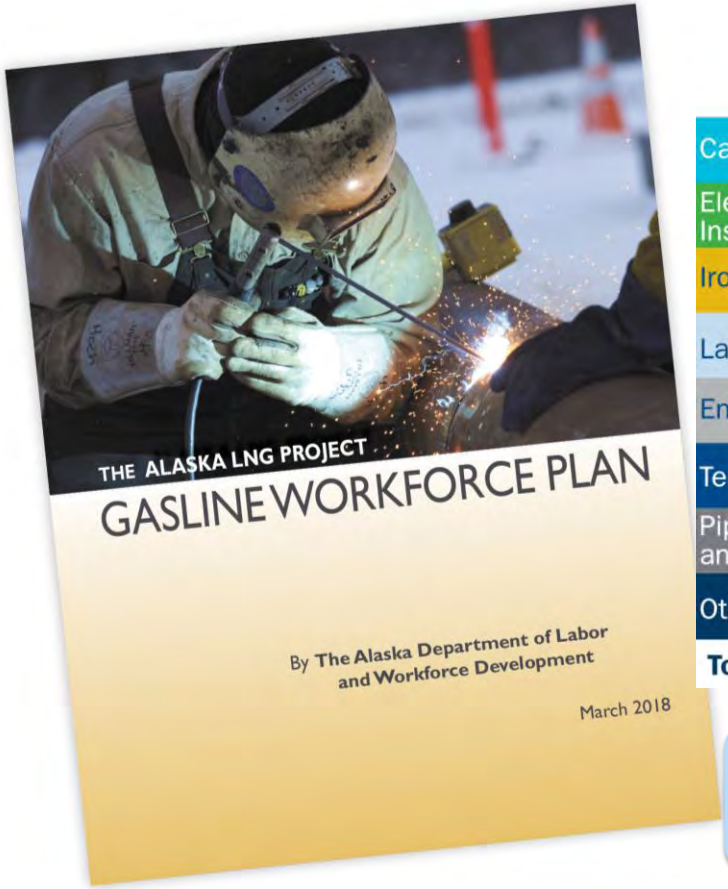
中国银行
BANK OF CHINA

ALASKA GASLINE DEVELOPMENT CORP.

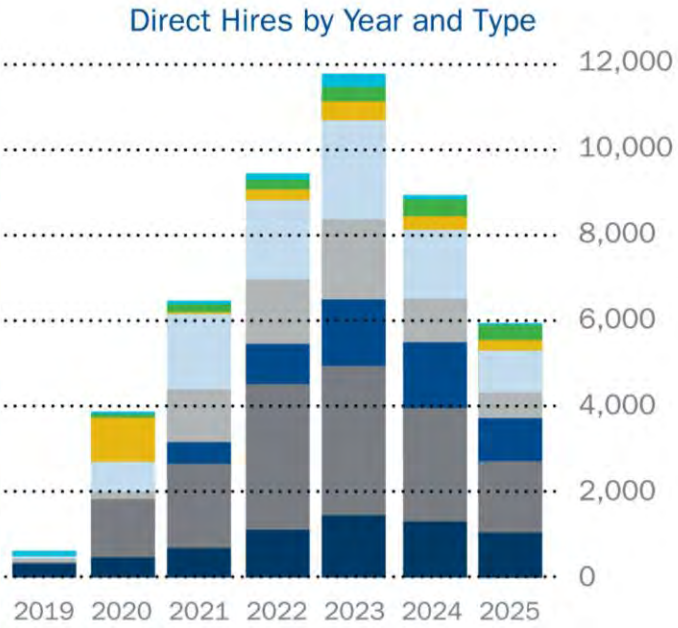
Benefits to Alaskans: Jobs

ALASKA GASLINE DEVELOPMENT CORP.

Employment During Construction:
Alaska LNG will directly employ almost 12,000.



Carpenters	295
Electricians and Instrument Fitters	397
Ironworkers	447
Laborers	2,311
Engineers	1,864
Teamsters	3,519
Pipefitters, Welders, and Insulators	1,566
Other	1,452
Total	**11,850**



Find your opportunity at agdc.us/careers.

Benefits to Alaskans: Access to Gas

ALASKA GASLINE DEVELOPMENT CORP.

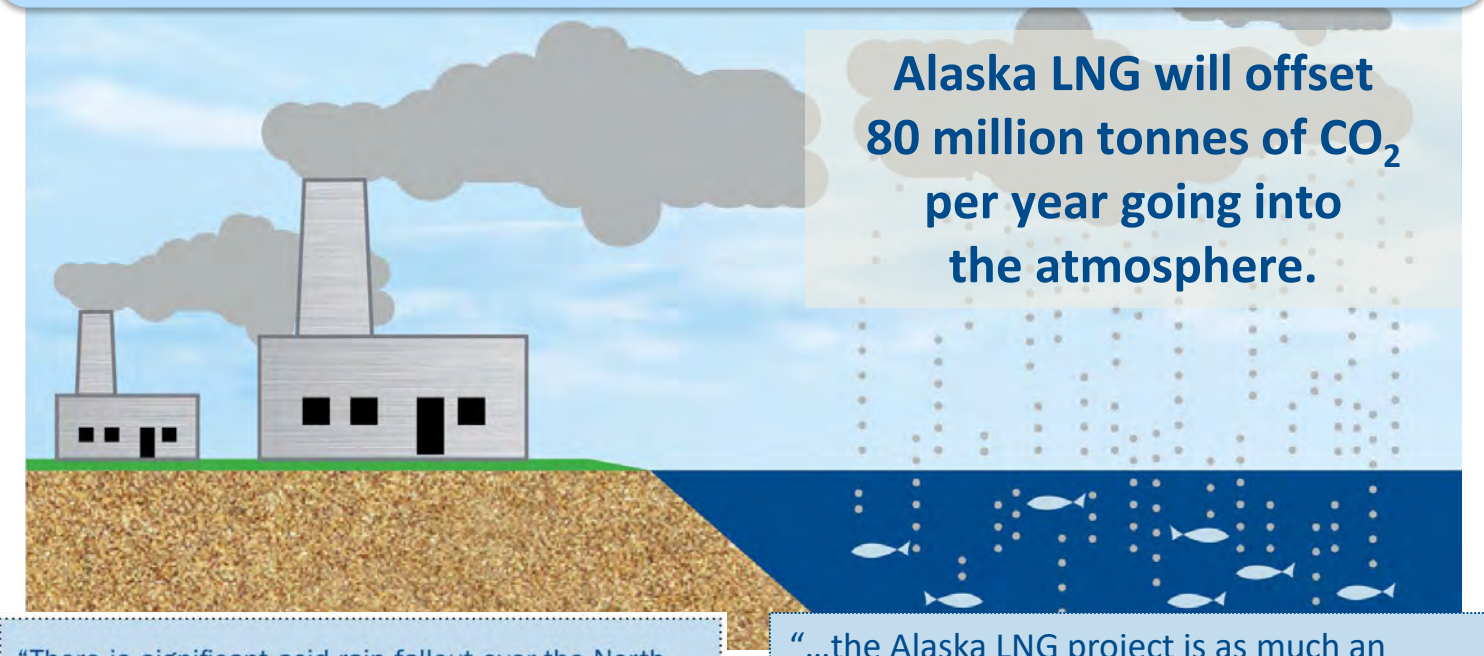
Gas Offtakes

- **Supply gas to Alaskan communities for heating and power generation**
  - Fairbanks
  - Matanuska-Susitna Valley
  - Nikiski
  - Other communities in Alaska to be named later
    - NSB has expressed interest in options for getting gas to other North Slope communities, including Anaktuvuk Pass
    - Minto, DNPP, Cantwell, Willow, and others have expressed interest in a gas offtake.

Benefits to Alaskans: Environment

ALASKA GASLINE DEVELOPMENT CORP.

Alaska LNG will bring clean air and blue skies to Alaska and the world.



"There is significant acid rain fallout over the North Pacific due to air pollution in Asia. Cleaner air in Asia will lead to cleaner oceans and healthier fish in Alaska. It is a win-win situation for all of us."

Ricky Gease,
Executive Director, Kenai River Sportfishing Association

"…the Alaska LNG project is as much an environmental project as it is an energy project" based on the positive impact it will have on the global environment.

Dr. Jiang
Energy Expert, Alaska Legislature

Alaska LNG Project Overview

ALASKA GASLINE DEVELOPMENT CORP.	Meeting Minutes Alaska LNG / AEWC July 24, 2018	AKLNG-8000-MTG-MTG-REC-00021 Date: 7/24/2018
	CONFIDENTIAL	Page 1

Meeting Details			
Functional Team	ERL	**Date of Meeting**	7/24/2018
Meeting Subject	Alaska LNG Workshop at AEWC (Fairbanks, AK)		

Attendees (* = via phone)

Name	Organization	Name	Organization
Kalb Stevenson	AGDC	John Hopson, Jr.	AEWC Chairman / Wainwright Commissioner
George Noongwook	AEWC Secretary / Savoonga Commissioner	Crawford Patkotak	AEWC Vice Chair / Barrow Commissioner
Julius Rexford	AEWC Treasurer / Point Lay Commissioner	Enoch Adams, Jr.	Kivalina Commissioner
George Kaleak, Sr.	Kaktovik Commissioner	Raymond Seetook	Wales Commissioner
Russel Lane	Point Hope Commissioner	Roald Ozenna, Jr.	Little Diomede Commissioner
Edmond Apassingok	Gambell Commissioner	Sheldon Brower	Kaktovik Alternate Commissioner
Arnold Brower, Jr.	AEWC Executive Director	Lesley Hopson	AEWC Administrative Manager
Jenny Evens	AEWC Development, Communications Director	Jessica Lefevre	AEWC Legal Counsel
Sarah D. Espelin	AEWC Finance Director	Billy Adams	AEWC Weapons Improvement Program Specialist / North Slope Borough Wildlife
Craig George	North Slope Borough Wildlife	Robert Sudyam	North Slope Borough Wildlife
Sheyna Wisdom	Fairweather Science (AGDC supporting contractor)		

Minutes Distribution

Name	Organization	Name	Organization
AGDC		AEWC	

Agenda Items

Item	Agenda Item(s)	Leader	Time
1	Alaska LNG Project Update (AKLNG-8000-MTG-PRS-REC-00001)	Kalb	
2	Q&A		

Action Items

Item	Action Items/Topics	Actions Assigned To	Due Date
1	N/A		

Meeting Notes:

(Presentation given by K. Stevenson – Project Update + Technical Details; open discussion during and after presentation)
Transcript of Q&A as provided to AGDC by AEWC:

Crawford Patkotak (Vice Chair): How is this project being impacted by visits to China by Trump and the Governor?

Kalb: There has been a change in administration at the Federal level, and that has really helped our work with potential buyers and investors in China. Visits by President Trump and work on behalf of US Secretary of Commerce, Wilbur Ross have helped to move the project along on the commercial side. That trade is very important because we can't have an LNG project without customers. On the State side, the focus on natural gas and trade for our state appears to have been

beneficial; it seems Governor Walker has a respected relationship with President Xi of China. China is our state's largest trading partner. These trips to China have been beneficial for LNG and for advancing the project in a timely manner.

Crawford: The reason why I'm asking is that China wants to buy gas and we are trying to move the project along; but this project has been a pipe dream over the years that is affected by commodity prices, things happening across the world, etc. In the past, options discussed on whether it is LNG tankers through the north vs. pipeline construction (billions of dollars) seem like cost has gotten so high that it seems nearly impossible.

Kalb: Crawford, thank you for your comment. When we took over project, it was a $65B project; but now costs are anticipated at $43B, with contingency included. Part of what makes Alaska LNG successful under AGDC is the different economic model and the size, which gets us economies of scale: 3 LNG trains and a 42" pipe will help move enough natural gas to make it financially viable. It's analogous to buying a home to rent out before paying it off; you have you're down payment and some revenue being generated during the first 20 years while the infrastructure is being paid off – the state would be earning in the $100s millions during that first 20 year phase. But just like a home, once the loan is paid off, its all revenue with projections in the range of $5-6 B per year.

John Hopson Jr. (Chair): I attended a workshop at Captain Cook Hotel, and a question at the time was is there a possibility to get a line to Kaktovik for them to get natural gas. Now that Area 1002 in ANWR is open, is it possible to get line into Kaktovok for them to have natural gas to them. Is this a possibility with this project?

Kalb: We have had conversations with Gordon Brower at NSB on the topic of getting gas to NSB communities that still need it, including Kaktovik and Anaktuvuk Pass. The answer is yes, it is possible. But our mission right now is to build the mainline; that larger infrastructure has to go in first. Once that is in, we can begin to explore the numerous possibilities of getting gas to communities - for instance, whether its possible to get gas from Point Thomson into a spur line to Kaktovik.

John: The reason why I bring this up that we want to make sure local communities in the area are considered, like Kaktovik and Anaktuvuk Pass, instead of just Fairbanks and interior communities, like on past projects. Because there are few benefits directly from the oil and gas community, other than Nuiqsut getting natural gas from Alpine or ASRC royalties.

Kalb: Thanks, John. I understand your concern. We can't build those spur lines until we get the mainline in place, but we acknowledge that there will be offtakes and spur lines for some communities. For some communities, it may make sense in terms of the economics for them to bring in gas, but getting the underlying mainline built is the first critical step.

John: That is the understanding from many years, but seemed like the State was focused on Fairbanks and interior, so make sure those north slope communities are included. It is important to put as much benefit to the communities as possible.

***Edmond* Apassingok (Gambell):** Looks like the project would not reach St. Lawrence Island.

Kalb: That is correct.

Enoch Adams Jr. (Kivalina): You used the phrase "beneficial to the state" which for me, would mean it should provide natural gas to villages that are economically strapped. There are people struggling to provide heat to their homes, and it really becomes an issue. If you can bring benefit to "us", it will make it easer to heat homes and help us allocate more money to fuel to find food because captains are broke at the end of the season. How are you going to reconcile your phrase with our issues?

Kalb: When the Alaska LNG project was being discussed by the Alaska legislature, there was a senator from Bethel named Mr. Lyman Hoffman, who made a similar comment to yours, Enoch. One of the requirements for his support of the funding bill was to develop language in statute around a rural energy fund in which up 20% of the project's revenue could be used to fund the kind of things you're discussing. Many communities in Alaska are not along route and would have the same concerns or needs. That is one possible avenue to provide some benefit from this project to those communities that wouldn't get gas from a spur off the line. Another opportunity for transporting gas to smaller communities is small shipments of compressed natural gas or LNG; for instance communities along the Yukon River that are only 50-100 miles away could potentially receive gas by barge. We have also explored having smaller deliveries up and down the coast of western Alaska by a dedicated barge, with small facilities able to convert LNG to methane. Of course, this could become easier in the future once LNG becomes a more mainstream fuel; then the cost of the infrastructure for its broader use would come down making this more feasible.

John: What is it that you need from AEWC to come present to us. What are the next steps?

Kalb: Why we are here is to begin to discuss this project early on and to listen to comments from the AEWC commissioners and staff. We are in the planning and NEPA phase of the project, so it's a good time to have these initial discussions. We want to be good neighbors, as some of the work will be on the North Slope and in the Prudhoe Bay area. The timeline is looking at first gas by 2024-2025, with a ramp up of construction late next year and into 2020. The start of

Prudhoe Bay construction would conceivably begin ramping up in 2021 and roll into 2022. So to get there, we are going through different regulatory approvals and we want to get input from you.

Jessica LeFevre (attorney): I'm new to some of this, where is the gas coming from?

Kalb: The next slide answers this question. Right now, gas would be from Prudhoe Bay gas fields (already a facility there) and Point Thompson gas field.

Ronald Ozenna Jr. (Little Diomede): Is it possible for project to purchase oil cleaners from Kennedy's PRR?

Kalb: We aren't producing oil, but other producers are and where you find oil you usually find gas. Conceivably, there could be gas transmission lines next to these new oil developments that feed into the Prudhoe Bay area. These new oil developments would likely be receptive to having oil cleaning systems on hand or in nearby communities.

John: Is this the same route as TAPS?

Kalb: The gasline parallels TAPS from Prudhoe Bay to Livengood but then the oil line goes to Valdez, whereas the gasline would go to Cook Inlet (Nikiski)

John: Wouldn't you get more support if you followed the TAPS line to Valdez instead of going into Cook Inlet with all the issues in that area, especially with beluga whales?

Kalb: Good comment, John. As part of the EIS process, alternatives are being evaluated. The joint venture (BP, CP, ExxonMobil) looked at several port sites through a site selection survey. One of the problem with Valdez is the amount of land needed to build the terminal. In Valdez, you would have to essentially blow up the side of a mountain and fill in a Bay to make enough flat land to hold the LNG facility.

John: What about Nome and ships going directly to China? Would be able to spur off for more rural communities.

Kalb: I have heard that comment in other meetings; but currently the project is not looking at that option.

John: Healy has the clean-fired coal plant with new technology that had them crush coal to dust that makes it cleaner, too bad China isn't using this.

John: We have many communities under threat of erosion; it is possible to do some pile driving and sheet piles on the way up and down to help with communities? Is this something to even entertain this to give back to communities since you can't give natural gas directly to them?

Kalb: There will be opportunities for these communities to benefit, in addition to jobs. One way for this to happen is through what is called wetlands compensatory mitigation. If approved, a compensatory mitigation fund or grant program could be approved, and this potentially could be used for community improvements to shorelines or other wetlands requiring restoration or enhancement. I encourage you to keep that discussion going, because as we move into the compensatory wetlands mitigation plan that Alaska LNG will have to develop in the next year or two, this sort of concept could be an option.

John: We hear about Kivalina having issues, Wainwright spent $9M for seawall construction where it might be better to do sheet pile driving. So the spirit of giving back would be much appreciated.

Billy Adams (AEWC WIP / NSB Wildlife): It would also be nice to dredge Elson Lagoon for the safety of the whalers. It's a place for infrastructure, and we are hoping to see that it will benefit communities.

George Noongwook (Savoonga): Recently a I heard about a Chinese LNG tanker using the northern sea route, how big is the tanker that carries all this LNG?

Kalb: I'm sorry, I don't know.

Jessica: Any local permitting requirements?

Kalb: Yes, we have been reaching out to the NSB planning department and intend to present to the Planning Commission in the future. We know that the NSB really likes the Pt Thomson master plan, so its likely that we could shoot for something similar.

John: Is there a to scale down size of LNG tankers to deliver to communities rather than relying on diesel? Would think it was cheaper than buying from Seattle?

Kalb: As LNG becomes more common and desired, the price of LNG will go down and the infrastructure cost will also go down.

Crawford: This might actually be the time that this project gets done with the current administration, so it's important for this body to be part of this, including revenue sharing for helping with rural communities. It does take investment into converting from diesel to natural gas for Nuiqsut residents.

Kalb: We are hopeful. We have seen a lot of positive feedback, working with people in Washington, D.C. As we were advancing ASAP to completion in late 2016, we were told by EPA that there could be an ARNI designation and more analysis required for the entire Yukon watershed, but after the administration changed, that designation didn't come to fruition.

Crawford: The past administration caused concerns for us based on ideas from climate change and blaming man for everything that created issues for all of us. I think this project might actually start to happen.

Kalb: Again, we're very hopeful, as well. We still need to have customers come in on the project and the commercial side to advance, but from AGDC's perspective, we are definitely looking for Alaska LNG to happen, and of course, with ASAP as a back up for Alaskans, it seems like things are moving forward.

John: Would like to thank you for coming to hear ideas on giving back to communities and listening to these concerns and ideas. Could save a lot of money to communities for this. If communities not having to pay for heating homes, more money can go to food security.

Kalb: Thank you for having us. It is important for use to keep these conversations going because there are likely to be some potential options for funding out there and there is hope for the future for gas to communities.

Arnold Brower (Executive Director): Most important thing is we are Alaskans, there has to be equity, can't just be about Anchorage or Juneau. We are Alaskan citizens and U.S. citizens and there has to be equity and there currently isn't. Infrastructure to reduce tanker size would be worth us being a part of it. One method would be to use the permanent fund – if the 65,000 people on the slope gave their PFD, it would be $90M to produce all of those tankers to go to certain parts of Alaska so that this can be funded. The state cannot remain in the poverty state mentality, it needs to have better plans than that. We need to get out of the box and work with legislature to provide equity to the rest of Alaska.

Alaska LNG Workshop & Working Lunch

AEWC Quarterly Meeting – July 24, 2018

Wedgewood Resort, Fairbanks, AK

List of Meeting Attendees

John Hopson, Jr. – AEWC Chairman / Wainwright Commissioner

Crawford Patkotak – AEWC Vice Chair / Barrow Commissioner

George Noongwook – AEWC Secretary / Savoonga Commissioner

Julius Rexford – AEWC Treasurer / Point Lay Commissioner

Enoch Adams, Jr. – Kivalina Commissioner

George Kaleak, Sr. – Kaktovik Commissioner

Raymond Seetook – Wales Commissioner

Russel Lane – Point Hope Commissioner

Roald Ozenna, Jr. – Little Diomede Commissioner

Edmond Apassingok – Gambell Commissioner

Sheldon Brower, Kaktovik Alternate Commissioner

Arnold Brower, Jr., AEWC Executive Director

Lesley Hopson, AEWC Administrative Manager

Jenny Evens, AEWC Development, Communications Director

Jessica Lefevre, AEWC Legal Counsel

Sarah D. Espelin, AEWC Finance Director

Billy Adams – AEWC Weapons Improvement Program Specialist / North Slope Borough Wildlife

Craig George – North Slope Borough Wildlife

Robert Sudyam – North Slope Borough Wildlife

Sheyna Wisdom – Fairweather Science (AGDC supporting contractor)

Kalb Stevenson – AGDC Environmental Lead (workshop presenter)

Alaska Eskimo Whaling Commission: Alaska LNG Project Update

July 30, 2019

Frank T. Richards, Senior Vice President Program Management

ALASKA GASLINE DEVELOPMENT CORP.

Topics

- Introduction to Alaska Gasline Development Corporation (AGDC)
- Alaska LNG Project
  - Overview
- Federal Energy Regulatory Commission (FERC)
  - Schedule
  - Draft Environmental Impact Statement
- Marine Mammal Monitoring & Mitigation Plan: Prudhoe Bay
- Project Action Area and Construction Schedule
- AGDC Commitments

Introduction to AGDC

ALASKA GASLINE DEVELOPMENT CORP.

- **Background**
  - Independent, public corporation owned by the State of Alaska
  - Empowered to expedite, finance, and build a gas project
  - AGDC previous presentations before the AEWC
    - Fairbanks July 2018
    - Utqiagvik July 2017
- **Vision**
  - Maximize the benefit of Alaska's vast North Slope natural gas resources through the development of infrastructure necessary to move the gas into local and international markets
- **Alaska LNG Project**
  - Alaska LNG Project provides for in-state use and large-scale export

Alaska LNG – Project Overview

ALASKA GASLINE DEVELOPMENT CORP.

Producing Fields

- Anchored by Prudhoe Bay and Point Thomson for 20 years

Gas Treatment Plant

- Located at North Slope
- Remove CO_2 / H_2S; Compress for re-injection
- Footprint: 150-250 acres

Pipeline

- Large diameter: 42" operating at >2,000 psi
- Capacity: 3.3 billion cubic feet per day
- Length: ~800 miles (similar to TAPS)
- Point Thomson Transmission Line (PTTL): 63 miles, 32" pipeline above ground on VSM
- Mainline: ~776 miles 42" pipeline, mostly buried , offshore Cook Inlet Crossing about 28 miles, buried at shore crossings
- 8 compression stations and 1 heater station for temperature control

Liquefaction Plant

- Capacity: up to 20 MTA
- 3 trains (6.67 MTA/train)
- Footprint: 640-1,000 acres

Storage / Loading

- Terminal: 2 x 240,000 m^3 LNG Storage Tanks
- 1 loading jetty with 2 berths; 15-20 tankers per month

FERC Schedule

ALASKA GASLINE DEVELOPMENT CORP.

ALASKA LNG PERMITTING TIMELINE		
2014 – 2016 Producer Led Effort	$600 million of engineering, environmental, and science completed to advance permitting of Alaska LNG under Producer Led Effort	
2017 and Beyond AGDC Led Effort	December 2016	AGDC Takes the Lead of Alaska LNG Project
	April 2017	AGDC Files FERC Application
	August 2017	FAST Act Acceptance
	August 2017	Presidential Executive Order
	November 2017	Joint Development Agreement
	March 2018	FERC Publishes EIS Schedule
	June 2019	Draft Environmental Impact Statement
	March 2020	Final Environmental Impact Statement
	June 2020	FERC Authorization to Construct

FERC Draft EIS

ALASKA GASLINE DEVELOPMENT CORP.

Milestones

- **Application and over 1,800 RFI responses – over 150,000 pages submitted**
  - FERC received 248 written comments between April 2017 and June 2019
- **Draft Environmental Impact Statement (DEIS) – Issued June 28, 2019**
  - Comment period through October 3,2019
  - 3 Volumes with 28 Appendices
- **Public Meetings**
  - Locations and dates set by FERC - TBD
  - BLM ANILCA Section 810(a) Meetings

FERC Consultation

- Tribal Government-to-Government
  - Working with BLM, FERC engaged with 9 tribes that stated an interest in consultation
- Traditional Knowledge Workshops
  - 305 participants were interviewed
  - 140 workshops between 2014 – 2016
  - FERC incorporated the information gathered into the DEIS

FERC Recommendation

- Prior to construction, AGDC shall file with the Secretary, for the review and written approval of the Director of the OEP, the Project Local Subsistence Implementation Plan and a signed Conflict Avoidance Agreement prepared in coordination with NMFS and the AEWC. (section 4.14.2.6)

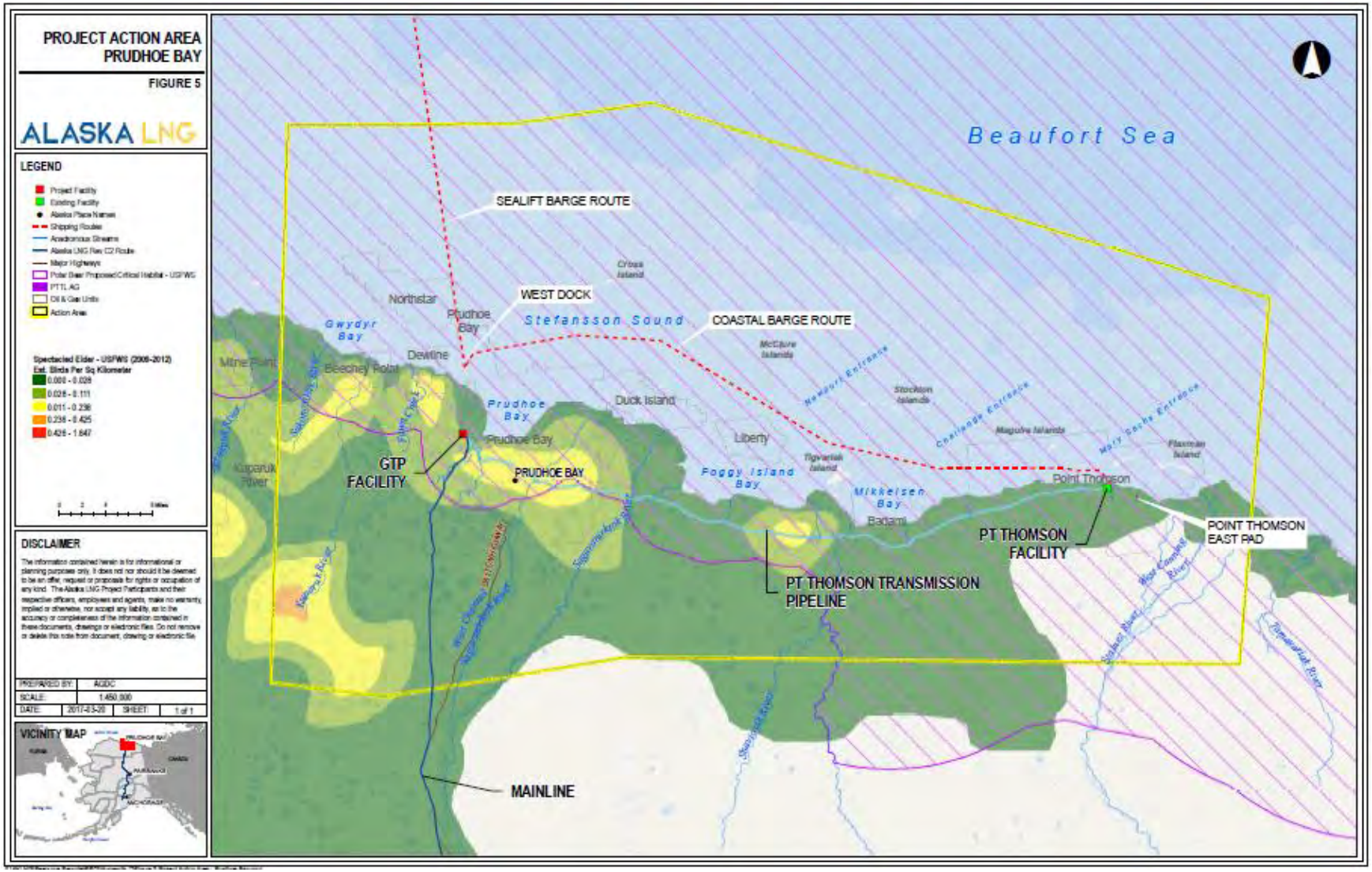
ALASKA GASLINE DEVELOPMENT CORP.

Monitoring & Mitigation Plan

- Application to NMFS for an Incidental Harassment Authorization (IHA) will be submitted
- Activities for which an IHA is required:
  - Causeway Widening
  - Dock Head 4 Construction
  - Barge Bridge and Abutments
  - Sealift
- Specific objectives:
  - Avoid and minimize impacts to marine mammals
  - Data collection of sightings including location, environmental conditions
  - Clear chain of command and communication
  - Preventative 328-foot (100-meter) Shutdown Zone for all marine mammals
- Project to employ experienced, trained Protected Species Observers during in-water activities

Project Action Area – Prudhoe Bay

ALASKA GASLINE DEVELOPMENT CORP.



Construction Activities By Year

- Years 1 to 4: Construct infrastructure development, site preparation and install field erected equipment
- Years 4 to 7: Delivery of GTP facility modules and gas treatment trains
- Year 8: Commissioning and start up of GTP

AGDC Commitments

- Establish a Local Subsistence Implementation Council
  - Meet on a regular basis
    - Provide project updates and information
    - Identify community issues and concerns
    - Work to resolve issues, if any, in a mutually satisfactory manner
- Provide mandatory subsistence related training to project workforce
- Avoid and minimize impacts on subsistence whaling and marine mammal hunting by coordination with individual whaling associations
- Employ community representatives to alert the project on planned subsistence activities and places to avoid

Thank You

ALASKA GASLINE DEVELOPMENT CORP.

AGDC.us

Barge Placement and Module Offload

ALASKA GASLINE DEVELOPMENT CORP.

- Module Offload – Docking and Transport from Causeway
  - Activity Period: Approximately 4 – 6 years
  - Season: Summer (July – September)
  - Location: Adjacent to 650 ft. breach

- Mitigation:
  - Barges placed prior to sealift but after migrating cisco passage
  - Barge bridge contains openings / gaps for passage of local fish
  - Barges would be removed at the end of each year's sealift

Gravel Fill

- Gravel Fill Placement (DH4 / Barge Bridge)
  - Activity Period: Approximately two years
  - Season: Winter, over ice
  - Location: DH4 and Barge Bridge Abutments / Mooring Dolphins

- Mitigation:
  - Placement in Winter; Sea ice to be ground down
  - Transport over ice roads from nearby source
  - Use of gravel fill at the end of causeway eliminates need for dredging / screening

Pile Driving

- Impact and Vibratory Pile Driving
  - Activity Period: Approximately two years
  - Season: Year round, except from Aug 25 – Sept 15 (no activity)
  - Location: DH4 and Barge Bridge Abutments / Mooring Dolphins

- Mitigation:
  - Activity will occur outside of the Nuiqsut subsistence window (Aug 25 – Sept 15) to protect bowhead and subsistence activity
  - Protected Species Observers (PSOs) used during pile driving to monitor for ice seals and stop work when needed
  - Work with NOAA Fisheries acoustic scientists to ensure appropriate setback zones

Vessel Activity

- Average of ~10 barges per year for six years
  - 2 years of pre-construction deliveries
  - 4 years of module transport
- Tugs and barges stage at Port Clarence awaiting ice-out at Utqiagvik, then move to Prudhoe to offload w/ assist tugs
- Some barges offload at Prudhoe, then move to Pt. Thomson
- Tugs and barges return to Dutch Harbor after offload

Gas Treatment Plant and Pipeline

ALASKA GASLINE DEVELOPMENT CORP.

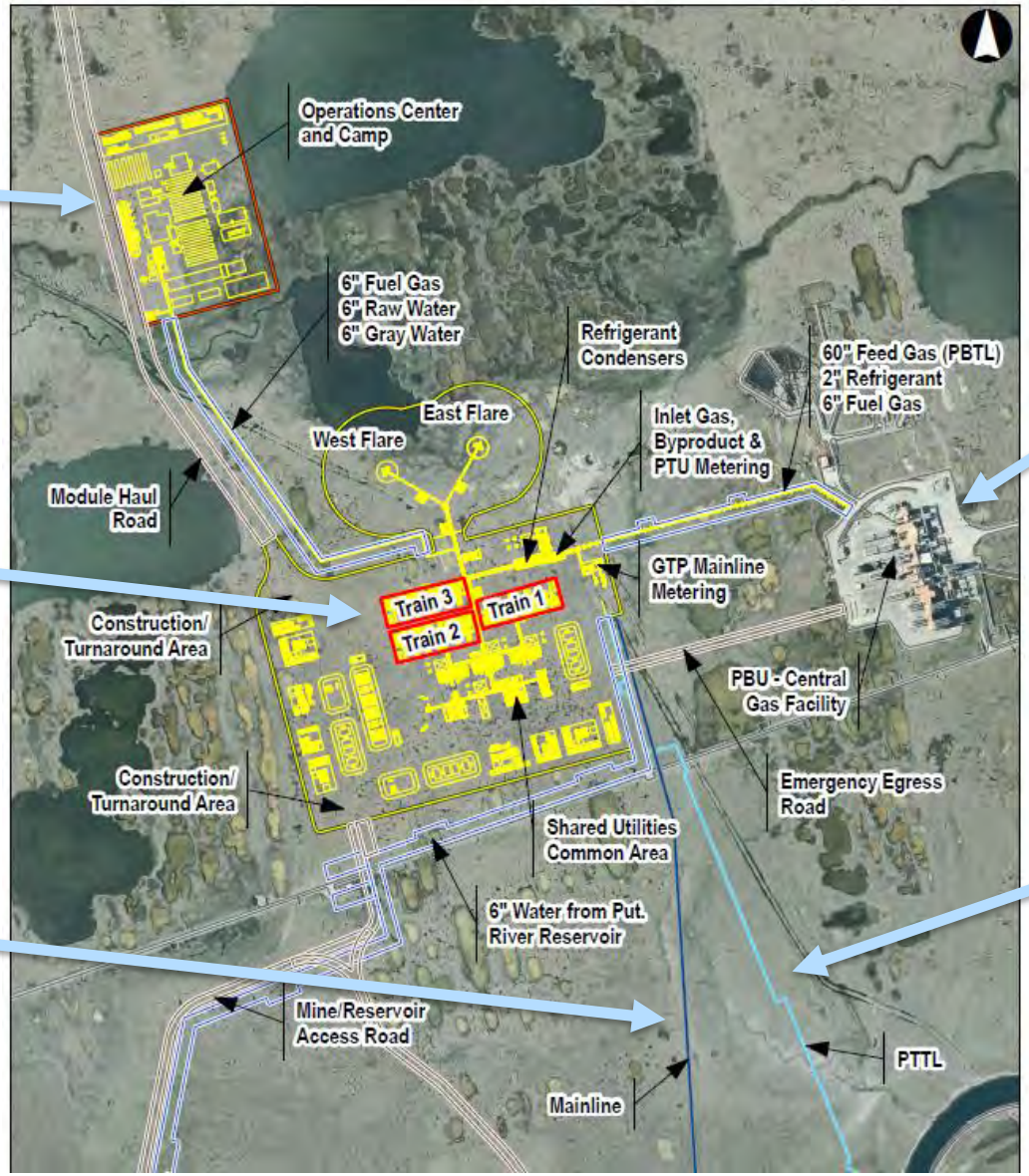
Proposed Location of GTP Camp and Operations Center

Proposed Location of GTP

Proposed Mainline

Existing Central Gas Facility

Proposed PTTL



Draft EIS Comment Period

ALASKA GASLINE DEVELOPMENT CORP.

AGDC Process

- **We will review and comment on DEIS**
- **Initial high-level review**
  - Accuracy and completeness
  - Identify key obligations and commitment
- **More detailed consideration**
  - Alaska-specific needs/issues
  - Items impacting constructability and operability
- **Proactive and timely response to input and AGDC-identified issues**
- **Consideration: Potential to file SF299 and route change request for DNPP Alternative**

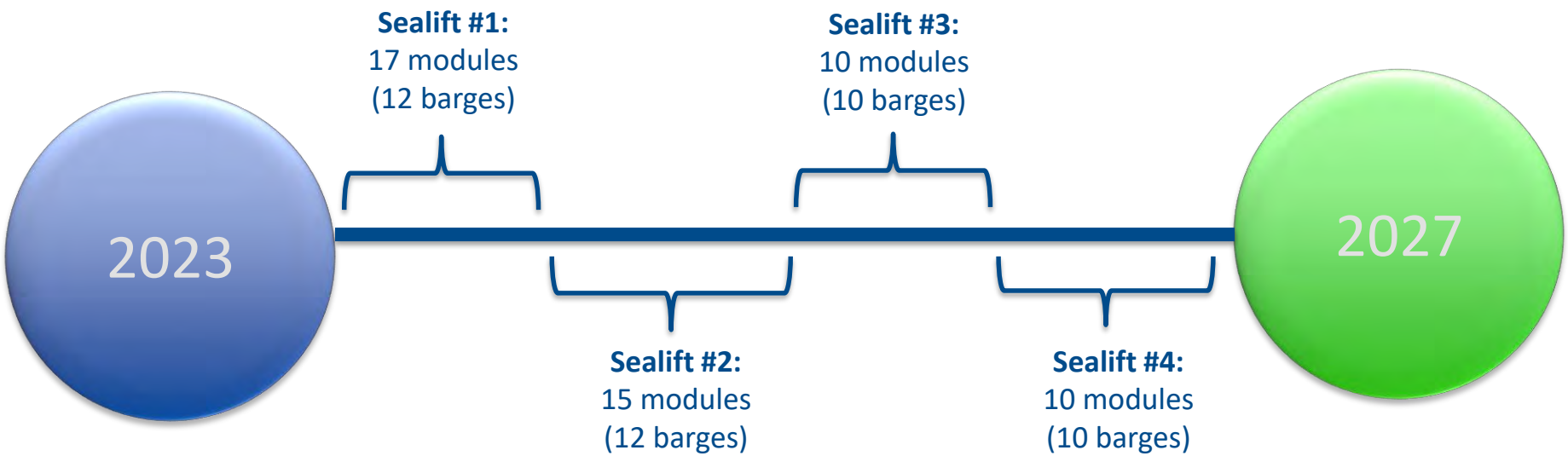
Major Permits and Approvals

ALASKA GASLINE DEVELOPMENT CORP.

In the Works or on Immediate Horizon…

- ADEC – GTP and LNG Air Permits
- SPCS – State ROW Lease
- SHPO – Section 106
- USCG – Bridge Permits
- Corps of Engineers – 404 Wetlands Permit
- PHMSA – 4 Special Permits in public notice; 1 more in progress
- BLM – ROW Grant
- NMFS and USFWS – Marine Mammal Takes
- USFWS – Eagle Permits
- NPS – Potential SF299 for DNPP Alternative

Vessel Activity

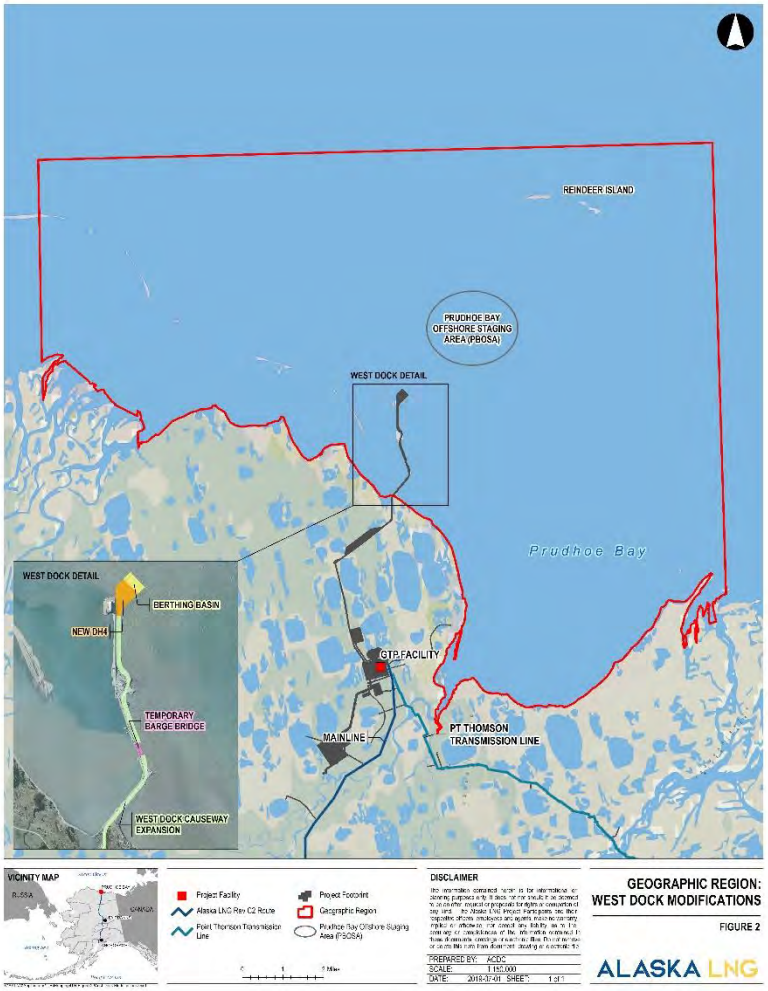


ALASKA GASLINE DEVELOPMENT CORP.

Alaska LNG – North Slope

- Gas Treatment Plant (GTP) composed of large modules weighing up to 9,400 s/tons to treat Prudhoe Bay gas
- 32” gas pipeline from Pt Thomson west to the GTP (Pt. Thomson Transmission Line, or ‘PTTL’)
- 42” mainline from GTP south to Brooks Range, Atigun Pass, and south to Cook Inlet
- West Dock causeway requires modification to receive modules
- Requires 12ft of water depth and use of furthest north portion of West Dock causeway
- Requires bypass of weight-limited causeway bridge, use of ballasted barges as temp. bridge

Geographic Region: West Dock



Alaska LNG

FERC MEETING Q & A SUMMARY

[x] Meeting	**Project Name:**	Alaska LNG
	Meeting Name:	Nuiqsut FERC Scoping Meeting Q & A Summary
	Date of Meeting:	10/29/2015
[ ] Telephone	**Number:**	

ATTENDED BY:	ORGANIZATION:	ATTENDED BY:	ORGANIZATION:
Mark Jennings	Alaska LNG		
Caryn Rea	Alaska LNG		
Bill Maxson	Alaska LNG		
Matt Horneman	Alaska LNG		
Whitney Moretti	Alaska LNG		

Note: Meeting minutes are only for the Question and Answer session. Meeting minutes from the FERC Scoping Meeting are presented in a separate document.

AGENDA ITEMS:

Item	Agenda Item(s)	Leader	Duration
1	Project Overview	Mark Jennings	20 minutes
2	Questions from Attendees	Mark Jennings	40 minutes
3	FERC Scoping Meeting (minutes in separate document)	FERC staff	

ACTION ITEMS:

Item	Action Item(s)	Action By	Date Req.
1	The Alaska LNG team learned that the Kuukpik Board Meeting was occurring at the same time and should be noted for future meetings to avoid conflict.	Alaska LNG Stakeholder Team	Complete

KEY ISSUES:

1	**Project location – routing questions North Slope:** Will the pipeline expand further west after the main route is constructed or just stay east in Deadhorse?
2	**Stakeholder engagement – general:** The community wants reassurance that concerns will be taken to the appropriate agencies, especially regarding caribou migration.
3	**Stakeholder engagement – cities and boroughs**: Concern that no one from the North Slope Borough attended the meeting to hear concerns.
4	**Regulatory – federal:** Was the Alyeska Pipeline built under FERC's guidance?
5	**Regulatory – state:** Alaska LNG should work with state regulators to change the regulations for bow and guided hunting that began as a result of the Dalton Highway construction. Currently the bow hunters can hunt in the spring when caribou are moving north from their wintering grounds to the coastal plain, but Nuiqsut would prefer that the timing be changed to the fall. Concern about roadside kills (specifically of caribou) along Dalton Highway and ice roads in the winter.
6	**Local content – general:** Concern about the cost of living in Anaktuvuk Pass (specifically heating and food). Discrimination noted during the construction of TAPS in Anaktuvuk Pass. The Alaska LNG Project needs to benefit local communities.
7	**Local content – employment general:** There are hopes that that Alaska LNG keeps its promise to provide jobs to local labor force in whatever capacity possible. The Alaska LNG Project must help the residents of Anaktuvuk Pass get jobs.
8	**Environmental effects – impacts to subsistence:** There is concern about the project impacting caribou migration similar to the Alyeska Pipeline.

FERC MEETING Q & A SUMMARY

Nuiqsut

9	**Environmental effects – air quality impacts:** Suggestion for Fairbanks to get access to gas because they are currently burning a lot of wood for heat and people are getting sick from bad air quality.
10	**Environmental effects – health:** Concern about health hazards. Concern about the increasing rate of suicide in Anaktuvuk Pass.
11	**Environmental effects – aesthetics/visual:** Increasing industrial activity in the area is a concern to Nuiqust and Anaktuvuk Pass because we can now see the bright lights from town. We used to have to travel 30 miles outside of the village to see the lights.
DISCUSSION ITEMS:	
1	Q: Was the Alyeska Pipeline built under the Federal Energy Regulatory Commission's (FERC's) guidance?
2	C: There is concern about the project impacting caribou migration similar to the Alyeska Pipeline.
3	C: Alaska LNG should work with state regulators to change the regulations for bow and guided hunting that began as a result of the Dalton Highway construction. Currently the bow hunters can hunt in the spring when caribou are moving north from their wintering grounds to the coastal plain, but Nuiqsut would prefer that the timing be changed to the fall.
4	C: Guide hunting around the Trans-Alaska Pipeline System (TAPS) affects caribou movement. There are concerns this could increase with the Alaska LNG pipeline.
5	C: Increasing industrial activity in the area is a concern to Nuiqust and Anaktuvuk Pass because you can now see the bright lights from town. We used to have to travel 30 miles outside of the village to see the lights.
6	C: Concern about the cost of living in Anaktuvuk Pass (specifically heating and food) and noted discrimination that village experienced during the construction of TAPS. The Alaska LNG Project must help the residents of Anaktuvuk Pass get jobs.
7	C: Concern about the increasing rate of suicide in Anaktuvuk Pass.
8	C: There are hopes that Alaska LNG keeps its promise to provide jobs to the local labor force in whatever capacity possible.
9	C: The Alaska LNG Project needs to benefit local communities.
10	Q: Will the pipeline expand further west after the main route is constructed or just stay east in Deadhorse?
11	C: Concern about health hazards. Suggested Fairbanks get access to gas because they are currently burning a lot of wood for heat and people are getting sick from bad air quality.
12	C: Concern that no one from the North Slope Borough attended the meeting to hear concerns.
13	C: Concern about roadside kills (specifically of caribou) along Dalton Highway and ice roads in the winter.
14	C: The community wants reassurance that concerns will be taken to the appropriate agencies, especially regarding caribou migration.

FEDERAL ENERGY REGULATORY COMMISSION

PUBLIC SCOPING MEETING FOR THE

ALASKA LNG PROJECT

PF14-21-000

Held at:
Nuiqsut Kisik Community Center
22 32nd Avenue
Nuiqsut, Alaska 99789

October 29, 2015
6:15 p.m.

PROCEEDINGS

MR. MARTIN: Good evening, folks. Thank you for coming tonight. My name is Jim Martin from the Federal Energy Regulatory Commission, and we're going to open first with a prayer.

(Prayer.)

MR. MARTIN: Thank you. Well, as I said, my name is Jim Martin; I'm the environmental project manger for the review of the AK LNG project. I'm with the Federal Energy Regulatory Commission, Office of Energy Projects. Seated to my left is -- can everyone hear me okay? Okay.

Is Jennifer Lee, she's with Natural Resources Group; she's a contractor that's supporting me. At the back table is Mike Boyle, he's also supporting us as a contractor; and Patti Trocki.

Edward here is doing the translation for tonight; so if you need that, he'll be taking care of that part.

The main reason that we're doing this meeting tonight is to get input from the public. My agency is doing an environmental impact statement to review the environmental

impacts of the Alaska LNG project.

This meeting is called a scoping meeting. And as I said, the main purpose of it is to really get feedback from people. I have a couple of things that I'm going to do first. I'm going to go through a prepared statement that goes through our process and how you can be involved in it, and I'm going to have Alaska LNG give a short overview of their project.

When we finish those two things, then we'll ask for comments from the folks that are here. So I'll just go ahead with the statement.

For the Alaska LNG, the FERC -- which is my agency -- is the lead federal agency with responsibility under the National Environmental Policy Act to consider the potential environmental impact and prepare an environmental impact statement associated with the liquefied natural gas, LNG terminal, and any associated natural gas pipelines and facilities.

The primary purpose of this meeting tonight is to give you an opportunity to comment on the project or on the environmental issues that you would like to see covered in our impact

statement.

It will help us the most if your comments are as specific as possible regarding the potential environmental impacts and reasonable alternatives for the proposed Alaska LNG project.

These issues generally focus on the potential for environmental effects; but may also address construction issues, mitigation, and the environmental process.

In addition, this meeting is designed to provide you with an opportunity to meet with the applicants, to ask them questions, and to get more detailed information about the proposed facility locations and construction plans.

So with that, I'll ask for Mark Jennings to come up and give a brief overview of the project.

(Translation provided.)

MR. JENNINGS: Thank you, Ed. Hi, everybody, my name is Mark Jennings; I'm with Alaska LNG project, and I live and work in Anchorage.

And I have some colleagues with me tonight that I'm going to introduce to you real

quickly. Karen Ray -- if you'll just raise your hand -- Karen Ray is with Alaska LNG; Bill Maxson and Matt Horneman over here, and Whitney Moretti right here. So we're -- we'll all be available after the formal proceedings tonight to talk to you about the project and answer any questions that we can.

So I'm going to speak from this handout that was just provided to everybody in the room. Rather than have an electronic PowerPoint we just thought it might be easier to just read from one tonight, so that's what we're going to do.

So if you want to flip to the first page, it's the project overview. And, Edward, when you think it's a good time to translate, let me know; and I'll just hand you the microphone.

MR. NUKAPIGAK: Yeah, just go ahead and --

MR. JENNINGS: Just go ahead and do it. Okay.

MR. NUKAPIGAK: Yeah.

MR. JENNINGS: Okay. Very good. So you're looking at a project overview map on here with some specific information about each of

the elements of the Alaska LNG project. So I'm going to just talk to you a little bit about it.

The Alaska LNG project is made up of five principal participants; and they are the State of Alaska through the Alaska Gasline Development Corporation, BP, ConocoPhillips, ExxonMobil, and TransCanada. And among those five participants we have approximately 130 people who make up our core team.

We've been working on the Alaska LNG project now for over two years, and we've got a ways to go.

So the proposed project -- and just a rough overview here -- will take natural gas from Point Thomson and Prudhoe Bay, process that gas through a new gas treatment plant to be located at Prudhoe Bay, transport the gas through a new 800-mile-long pipeline to a new liquefaction facility to be located in Nikiski -- that's our preferred location at this time -- where it will be liquefied, and then exported to markets around the world.

Along the length of the pipeline, however, there will be several off-take points for access to gas for Alaskans, and the State of

Alaska is currently working on the locations of where those off-take points might be.

There's some additional information on this map if you want to know any of the specifics about the pipeline or the gas treatment plant or the liquefaction facility, there's some statistics there that talk to the size and capacity of each of those that you can see.

(Translation provided.)

MR. JENNINGS: Okay. We're going to flip the page now to the project schedule graphic, and I'll talk to that a little bit.

So this is a -- kind of a simplified look at the schedule that we're working with, but it gives you kind of a sense of how long a project of this size and magnitude takes to make it happen.

So right now we are in the pre-FEED or the preliminary engineering phase of the project, and that's where that red arrow is on the graphic. And that's sort of the investigation phase is what we're doing right now.

We conduct a lot of fieldwork to better define what our facilities are going to look like and where they should be located; how

they should be configured and engineered and designed; and then we work on a cost estimate, how much all this is going to cost.

Currently our cost estimate for the entire project runs between 45- and $65 billion. But we're working to fine-tune that cost over the next year or so. We're working on, what they call optimization to try and make sure that we do this as efficiently as possible with the smallest footprint. And hopefully we can save some time and money in doing it that way.

After the investigation phase of the project wraps up, all the owners -- and that includes the State of Alaska -- will evaluate all the work that's been done to that point and then make a decision on whether or not to move forward with the final engineering design or detailed engineering phase.

And you can see that in the next yellow box after the green box. That's called the FEED phase, front-end engineering and design.

During that FEED phase, what we do is we're working to fine-tune our design; we're sorting through land access issues that we need to work, and we work through a comprehensive

regulatory process and better define our project design. And we begin to roll out our workforce development and contracting strategies for the project as well. It gets quite complicated at that time.

Once we've completed that -- and as you can see, that's another two to three years -- then it's another major decision point at that time.

So once that's completed, we have all the information; that's all our design and costs and we fine-tuned it to the extent that we can, and we have to make a decision on whether or not to move ahead and build the project. So that's called the final investment decision.

And if the decision is made to proceed, then construction can begin. And that would involve the efforts of tens of thousands of people and cost tens of billions of dollars.

And like I said previously, that's just a very simplified schedule. It's quite complicated, as you can imagine. But, Edward, I'm going to hand you this and --

(Translation provided.)

MR. JENNINGS: Thank you. Okay.

We're going to flip the page now and show the -- where it shows the gas treatment plant. And there's some information about the plant and its size and the capacity for gas and how that's going to be set up.

So we already know that this is really one of the most complicated projects in the world today. And, you know, the idea is to take the gas that's available here on the North Slope in reservoirs at Point Thomson and the central gas facility at Prudhoe Bay; treat it at the gas treatment plant; run it down the pipeline to Nikiski.

The reason this all starts up here though is because the gas molecules are really located here on the North Slope, and they're primarily found -- the gas that will be used for this project will be coming both from Prudhoe Bay and Point Thomson.

When the gas comes out of the ground, each molecule, it's cold and requires pressure to be moved. But before we can transmit -- or transport the gas to the LNG facility in Nikiski, they have to be treated first; and that's -- calls for a brand-new gas

treatment plant to be located near West Dock at Prudhoe Bay.

The gas treatment plant will strip out impurities like water, carbon dioxide, and other things. The gas treatment plant would be the largest gas treatment facility in the Arctic today.

And as you can see with some of those statistics up there, the facility site will be about 200 acres in size; and the construction will require about 250,000 tons of steel. It'll be a multi-year effort to move the materials necessary for -- there, and then to construct it.

Once constructed though, the gas treatment plant will treat about 3.3 billion cubic feet per day of methane or natural gas.

Gas transmission lines will be constructed to bring gas from the central gas facility approximately one mile away at Prudhoe Bay and from the Point Thomson facility, which is about 60 miles away. Those two transmission lines would be constructed to the GTP. Those are what are going to bring the gas to the plant.

And you can kind of see on the map where the plant's going to be in relation to West

Dock. That's really not to scale. But we are a couple of miles inland from West Dock in that case.

(Translation provided.)

MR. JENNINGS: Thank you. So we're going to flip the page now to the pipeline page and talk a little bit about that.

And once again, there's a map that shows you in very large scale really, the length of the pipeline; and then some interesting facts about it to the left.

But from the gas treatment facility that we just talked about, the treated gas is going to be put into a 42-inch-diameter pipeline that essentially rivals the Trans-Alaska Pipeline in length. But there are several key differences.

The primary one is TAPS currently carries crude oil. And it was designed to do that, which comes out of the ground warm, which is why it must -- most of TAPS is constructed aboveground on vertical support members.

But we can't -- and the reason for that is because you can't build a warm hot oil pipeline in the ground in permafrost regions.

But natural gas -- this is the big

difference here -- is cold, and it comes out of the ground naturally cold. So in this case, we're able to bury a gas pipeline through most of the state. There are some places where we won't be able to do it, but for most of the state we can bury it.

Project plans call for the pipeline to run basically alongside the Trans-Alaska Pipeline until about the vicinity of Livengood, which is very tiny on the map; but you might be able to see it just north of Fairbanks. And from Livengood the Alaska LNG pipeline will head south directly towards Cook Inlet.

Along the way the pipeline would require approximately eight compressor stations or one about every 100 miles to provide the pressure and maintain the temperature in order to keep the gas moving in the pipeline.

In addition to the pipeline, there are what we call on right-of-way and off right-of-way facilities to be constructed as well.

On right-of-way facilities would be things like compressor stations and heater stations, mainline block valves. Things that are really too small to be seen on this map.

But there are off right-of-way facilities to be considered as well. And those include temporary work camps for the workers during the construction period; pipeline laydown yards that'll be necessary during construction; and other facilities like access roads, railroad sites, that sort of thing. And all of those are currently being worked and designed right now.

We're doing a lot of ongoing field work and having discussions with communities along the pipeline route, as well as agencies. And we are working to refine the route, as well as where some of these on and off right-of-way facilities will be. This is a work in progress right now. We'll have many more of these details fleshed out next year.

As I stated previously, there are plans for gas off-take points along the pipeline; a minimum of five. The location of those off-take points is going to be decided by the State of Alaska. Alaska Gasline Development Corporation at this time, they're working on that now.

The idea is to make natural gas available along the route with the hope that it'll help lower energy costs throughout Alaska.

Once this pipeline reaches the shores of Cook Inlet, that's going to be in the vicinity of Tyonek and Beluga on the west side of Cook Inlet, it'll cross beneath Cook Inlet to reemerge on the western side of the Kenai Peninsula near Boulder Point; and that's just north of Nikiski. And it'll travel a short distance from Boulder Point down to where the new liquefaction facility is proposed at Nikiski.

(Translation provided.)

MR. JENNINGS: Okay. We're going to flip now to the -- essentially the last page and talk about the LNG plant and the marine terminal. And there's an artist's rendering there to give you an idea of what that might look like from the east looking west over the facility out into Cook Inlet.

So in order to load gas -- you might be wondering, why does the gas need to be liquefied? And this is going to kind of explain it.

In order to load gas onto LNG carriers that will carry it to markets around the world, the gas will be liquefied. The point of liquefying the gas is to change its state from a

gas to a liquid; and in doing that, it makes it much more efficient to transport.

When you super chill the gas to minus 260 degrees Fahrenheit -- which is what the LNG plant will do -- the gas becomes a liquid, and it becomes 600 times smaller in volume when you do that.

So this is how that -- this is why it kind of makes sense to do this. If you try to load the carriers -- the ships with natural gas, you would need 600 times as many ships to do this. So one cargo of LNG equals 600 cargos of natural gas at atmospheric pressure. So it becomes much more efficient to transport as LNG.

So these LNG carriers, the gas remain -- or the liquid -- the LNG remain super chilled. So the LNG carriers are like giant floating Thermoses. That was something that we heard yesterday that was used as an example, and we thought it was a pretty good example. It's like a floating Thermos bottle that keeps something super cold.

And those LNG carriers will carry the LNG to markets around the world. Essentially it's so we're liquefying the gas to make it safer

and easier to transport.

Project plans currently call for about 15 to 20 LNG carrier trips per month to Nikiski -- to and from Nikiski to transport the LNG from the LNG plant there.

And we talked a little bit about the challenge of having to cool it to minus 260 degrees Fahrenheit. So to do that it's a very -- it's highly specialized and requires a lot of complex processes to accomplish it, which is why this LNG plant is very complex and large and sophisticated.

But something that a lot of people don't know is that there has been a small LNG plant in Nikiski for 46 years operating by ConocoPhillips. And it's much smaller than what we're proposing, but it has operated there safely without incident now for 46 years.

20 sites were originally looked at in Alaska and studied to locate the LNG plant, but Nikiski was chosen after looking at numerous issues. And among the things that we considered were geotechnical risks, access to infrastructure, access to industrial services, a location that would have approximately 800 relatively flat

acres, fairly good weather, and the necessary water depth and bathymetry; and ice buildup was another issue.

And for all those reasons, Nikiski was selected over the other 20 or so sites that we looked at.

Now, let's see. Alaska LNG, by the way, over the past year and a half or so has been purchasing land in the Nikiski area. And we've currently acquired approximately -- well, we have purchase/sale agreements for approximately 600 acres at this proposed LNG site.

(Translation provided.)

MR. JENNINGS: And with that, that wraps up essentially our overview of the Alaska LNG project; so I'm going to hand the microphone back to Mr. Martin. Thank you.

MR. MARTIN: Thank you. Now, I want to briefly describe our environmental review process for you. To illustrate how this process works, we've prepared a flowchart, which we have posted here behind us. And also copies are at the back table if you'd like one.

Currently we are in the early phase of our environmental review process. The

applicants entered the FERC pre-filing process on September 12th, 2014, which began our review.

The purpose of the pre-filing process is to encourage involvement by all interested stakeholders in a manner that allows for the early identification and resolution of the environmental issues.

As of today, no formal application has been filed with the FERC. However, the FERC, along with the other federal, State, and local agencies have already begun a review of the project.

On March 4th, 2015, FERC issued a notice of intent -- which is short term NOI -- to prepare an environmental impact statement for this project and initiated a scoping period. This scoping, or comment period, will end on December 4th, 2015.

Once scoping is finished, our next step will be to begin analyzing the issues that have been identified during the scoping period. We will assess the project's effects on water bodies, wetlands, vegetation and wildlife, endangered species, cultural resources, soils, land use, air quality, safety, health,

subsistence; and, of course, alternatives and cumulative impacts.

During our review, we will assemble information from a variety of sources, including the applicants, the public, other federal, State, and local agencies, and our own fieldwork. We will independently analyze this information and prepare a draft environmental impact statement.

This draft environmental impact statement will be distributed to the public for comment. During the comment period on the draft we will hold more public meetings to get a feedback on our analysis and findings.

After making any necessary changes or additions, a final environmental impact statement will, again, be distributed to the public.

(Translation provided.)

MR. MARTIN: Because of the size of the mailing list that we have for the impact statement, as well as the size of the document, the mailed version of the EIS will be on CD, or compact disc.

If you prefer to have a hard copy mailed to you, you must indicate that choice on

the return mailer attached to our notice of intent. You can also identify this preference at the back table with Mike.

If you received a notice of intent, you are on our mailing list and will remain on our mailing list to receive the EIS and any other supplemental notices we may issue about the project, unless you indicate that you wish not -- that you -- unless you indicate that you wish to be removed from the mailing list.

If you did not get a copy and would like one, there are copies of the notice of intent available at the back table; and you can also add your name and address to our mailing list there.

There are many ways that you may participate in our process. Tonight's meeting is just one of them. Tonight you may sign up to speak and present verbal comments that will be transcribed and placed in the public record.

In addition, you may submit your comments by mail, electronically, or you can fill in a comment form at the back table tonight and leave it with us. Instructions for submitting comments electronically or by mail can be found in the notice of intent.

It is very important that any comments you send include our internal docket number for the project. And that docket number -- which is also printed on the notice -- is PF14-21. Including this number will ensure that staff evaluating the project will get your comments as soon as possible.

(Translation provided.)

MR. MARTIN: The EIS is being prepared to disclose to the public and to the Commission the environmental impact of constructing and operating the planned project. The EIS is not a decision document and does not constitute approval.

After the final EIS is issued, there are up to five Commissioners at FERC who are responsible for making a determination on whether to issue an authorization for the Alaska LNG project.

The Commissioners will consider the environmental information from the EIS, among other non-environmental issues in making its decision to approve or deny the project.

Again, I'd like to reiterate that following the meeting tonight, Alaska LNG

representatives will be available with project descriptions and maps that can answer your questions.

We will now begin the important part of the meeting where we hear your comments. If you prefer not to speak, you may hand us written comments tonight or mail them to us later. Whether you provide your comments verbally or by mail, they will be considered equally at FERC.

I'm sure you've noted that this meeting is being recorded by a transcription service. This is being done so that all of your comments and questions will be transcribed and put into the public record.

To help the court reporter produce an accurate record of this meeting, I ask that you please follow some ground rules.

We will call speakers up to -- well, I guess we probably won't ask you to come up; we'll just hand you the microphone -- when your name is called, please talk in the microphone and state your name and spell it for the court reporter; please identify any agency or group that you're representing, and define any acronyms that you may use.

It is important that you face us when you're giving your comments to ensure that the court reporter can capture your comments.

(Translation provided.)

MR. MARTIN: Okay. So right now we don't have anyone who signed up to speak, but I'd like to go ahead and open the floor to anyone that would like to provide comments.

Patti will take the microphone from me and carry it to you. And then you can start off by, again, stating your name and spelling your last name, if that -- if you think that that's necessary. All right. So -- yes, sir.

MR. SIELAK: Thank you. My name is George Sielak, S-i-e-l-a-k; I'm a member of this community.

I don't know much about the Federal Energy Regulatory Commission, but I think it kind of gives me an idea of your role. And I am assuming -- I assume that this Commission had been used maybe during the Alyeska Pipeline project, which they use your similar guidelines in building that pipeline.

And I think one of the things I would say too is that -- always have been issue

with the hunting and sport hunting, guide hunting.

I know -- the reason why I bring this out is, you know, we have communities such as Anaktuvuk Pass and our village; and we see a lot of changes ever since the Alyeska Pipeline has been built.

And for State of Alaska to put in hunting regulations on the transportation corridor for State of Alaska being open to public; and that, I guess, hindered a lot of hunting.

And, I mean, it's had -- affected the, you know, caribou migrations. And because of the hunting guidelines, sport hunters, that they allow to go hunt on the transportation corridor.

The main concern that I would want to see is -- it may not have been an issue at that time, but now building this LNG project, along with the -- that's going to be along the Alyeska Pipeline, they need to relook.

And I know they had some meetings and issues that we have brought up to the Borough and other entities in our local village about trying to figure out how to fix that; you know, to re-regulate. Like close or change the hunting dates where the State of Alaska allows for hunters

to hunt on the pipeline.

So I think that's something that I think would be a concern to me living in my village and hearing all our people that bring that issue.

And I don't know it makes any sense, but it seems to me this is the time to bring it up to the Commission to reevaluate that.

And like I say, it may not been worth worrying about it then when they did the Alyeska Pipeline project. But now you're putting up the LNG project, I think this is a good time that -- that is why that -- I am bringing this issue up to work with the State or whoever, you know, approves permits up on the Haul Road for the sport hunters.

And it affects the caribou migration up on the North Slope because of the guide hunting on the pipeline road. Thank you.

MR. MARTIN: Thank you.

MR. SIELAK: Maybe I could get some kind of response or somebody could answer that. I mean, if someone may --

MR. MARTIN: Yeah. Thank you, George.

MR. SIELAK: -- it makes sense.

MR. MARTIN: Those are things that we'll be looking at. We've already got that on our radar. We're going to be doing a full study on subsistence effects. And so wildlife in general, the caribou migration is one of the things that we'll definitely be looking at.

The Alyeska Line wasn't -- it wasn't authorized by our Commission, and so it wasn't built with our same oversight.

MR. SIELAK: Well, I just thought I'd bring that up.

MR. MARTIN: No, it's a great comment. Thank you. Would anyone else like to provide some comments tonight?

MR. NUKAPIGAK: Can I elaborate on some of George's comments? My name is Edward Nukapigak, N-u-k-a-p-i-g-a-k.

I just want to elaborate on George's comment in regards to caribou migration. Bow hunters are allowed to start hunting in June in the heart of caribou migration that are coming down from the foothills, and they're going towards ANWR or towards Colville.

Ever since State has expanded the

leases through the farthest west they can go, our caribous haven't -- able to come across Colville by the thousands. They are being diverted back eastward.

For some reason they are not crossing Colville anymore due to so much activities of traffics going out there, traffics. Those are the things that affects our way of life subsiding.

Caribou is one of our main dietary here. And with this project, that's -- is to happen not right away; but probably in the near future.

We like to see that these are regulated to where the subsistence users are able to harvest from those herds that are coming down from the foothills. Mainly the central herd, Teshekpuk, and porcupine. Those are the three herd that mostly comes across Colville.

So this is going to be a concern to our village. Not just to the village, but also to our neighboring village of AKP, Anaktuvuk Pass. We are the two closest to the Dalton Highway, and now they come way beyond west.

Now, you see they -- in our back to

where we don't have to look 60 miles eastward to see a -- bright lights. Today just right in the backyard, only three -- four miles, eight miles.

So these are the concerns that the hunters mostly experience with a lot of traffic going on on the east side of Colville.

So in regards to George's comment, I'd like to see that these bow hunters are being more regulated. And I hope the State LNG hears this so that it can be passed on to their superiors and make some changes too so that caribous can -- able to migrate without having to be harassed or be diverted back eastward. Thank you.

MR. MARTIN: Thank you, Ed. Would anyone else like to provide comments?

MS. MEKIANA: Good evening. My name is Irene Mekiana, originally from Anaktuvuk Pass. Lived there most of my high school time; moved up to Barrow after high school.

I saw Prudhoe Bay when it started. They told me my life would be easier. I'm almost a senior citizen now; my life hasn't been easier since the pipeline.

There's been a lot of goods and

bads. A lot of effects, a lot of hurts, a lot of discrimination. It's not easy to say. I wasn't going to talk.

I come from a community that's being impacted by suicide. And my oldest brother, when Prudhoe Bay started back in 1973, committed suicide when Prudhoe Bay opened back in 1970. The State, federal told me my life would be a lot easier.

I'm an Alaskan; and I've never traveled Outside of Alaska, not as far out of the Slope. I subsistence -- I live a subsistence way of life. When my food stamps finish, when they -- federal say that is it, that is it; we go back to subsistence way of life. Very hard.

My people are struggling in Anaktuvuk. A gallon of milk is almost $15. I see a lot of my age group with so many children struggling to keep their houses warm or to keep food on their table.

Children of Youth Services coming hard at us. They're taking away a lot of my relatives' children. Right now 27 children have been taken away from my home community of 240.

They said my life was going to be

easier 30, 40 years ago. Did it make my life easier? Yes, it did. But in the long run, I still carry that suicide that my brother did back then; and I have to live with it in our community.

Social impact -- social helpers -- if the gas pipeline is going to be built, connect us, please; connect the Village of Anaktuvuk. I'm tired of seeing my relatives struggle. Struggle to put heat and fuel on -- in their stove, food on their table or even to smile at your neighbor because of the suicide that we've been encountering.

Two times I went through that. I just came back from Anaktuvuk to lay my sister down to rest. That very day we were walking her down to the cemetery, this young man took his life.

Did we stop? No. We could not stop. We just kept going and finish our -- putting my sister to rest.

Two years before that the same thing happened. My classmate passed away; we were bringing her down to the cemetery to lay her down to rest; the same thing happened, a young man took his life.

I'm crying out for help for my people. Deeply in my heart, please help all the outlying communities. We're so impacted; we're so discriminated because we're Native. Help us find a job; help us get a job. Help -- don't just treat us like a piece of trash, it's not good.

So I'm crying out for the community of Anaktuvuk. Sympathize with us. Come and -- go cheer them up. Help them with things right now. Caribou hasn't gone through there; freezers, they're empty. Empty, and then the Children of Youth Services are down -- looking down on you. Please help us.

I know this is not a good thing, but we have to tell. They told me 54 years ago my life would be easier. It hasn't gotten easier, just got harder to live.

Like I said, my brother took his life when Prudhoe Bay started. And connect all the communities if you can up here in the North Slope. We live in such a harsh community.

We should be the one that are connected first, not someone down there in Anchorage or Seward or Kenai. Look at our villages. My gosh, help us. Thank you for this

time.

MR. MARTIN: Thank you. Would anyone else like to provide comments tonight? For you -- those of you who just came in, we're just taking comments from people who are here about the Alaska LNG project.

MR. NUKAPIGAK: Thank you for the -- my name is Robert Nukapigak, N-u-k-a-p-i-g-a-k. I'd like to thank LNG and special regulations coming to Nuiqsut for their scoping meeting on this LNG project that's coming up in the near future.

I'd like to see if the federal can regulate the LNG project that's coming up on these land issues, subsistence, and some other things that are important in our area.

And I'd like to thank you guys for coming to our village. We're the -- one of the closest village on this project that's coming up, and I hope that you'll keep your promises to help the communities out in any -- in any which way you guys can to provide services for our people.

You know, you will take a lot of money to start up this -- the natural gas pipeline that is coming up. But I want to see LNG making

promises to our people saying that you will help in any way that you guys can; because this is -- the gas that are being hooked by these -- up on the Slope, which is -- rightfully belong to our people; but you've -- been taking away by the effort.

So in return, I'd like to ask the Federal Regulations Commission to see if they can address these concerns to our people. That way our people can receive in return some sort of resources that we need in our community and in our -- the outlying villages.

And once again, I'd like to thank you guys for coming over to our community for this scoping meeting. Thank you.

MR. MARTIN: Thank you.

MR. NUKAPIGAK: Uh-huh.

MR. MARTIN: Anyone else like to provide comments tonight? Just raise your hand if you'd like to.

(Translation provided.)

MR. MARTIN: Thank you, Edward. If you'd like to give us comments but would rather not state them verbally, there are forms at the back. And you could handwrite out some comments

tonight if you want to and leave them with us or you can take one of those forms and mail it to us. You can also give us comments over the Internet if that's the way that you like to provide information.

I guess I'll ask one more time, would anyone like to provide verbal comments at this time?

(Translation provided.)

MR. NUKAPIGAK: His concern is bow hunters are the main -- Archie Ahkiviana is his name; he's one of our Elders here -- his concern was about bow hunters in the area where -- where this project is to -- to happen in the near future.

They say that the bow hunters go on the west side where the caribou -- to come across the river and not allowing the caribou to migrate westward.

So they are the problem to the migration of the caribous. And I told you at the time, the caribous don't come this far towards Colville.

I think that was his concern and wanted to know which ways the natural gas pipeline

going to be heading. Is it going to be coming westward?

Once you -- once that gas line is built, are they going to go beyond Prudhoe Bay heading west; or are they going to stay in the area of Prudhoe Bay on the LNG?

MR. JENNINGS: It's going to essentially follow -- that's a good question -- the Alaska LNG pipeline -- and Karen is pointing out -- it over there -- it's going to parallel the Trans-Alaska Pipeline from Prudhoe Bay south to Livengood.

At Livengood the Trans-Alaska Pipeline heads south to Valdez, but the Alaska LNG pipeline is going to head south to Cook Inlet.

But from Prudhoe Bay to Livengood, which is 400 miles or so, roughly, it parallels the Trans-Alaska Pipeline. So it's a neighboring Trans-Alaska Pipeline.

MR. AHKIVIANA: You mean it's going to end at the -- Valdez?

MR. MARTIN: Nikiski.

(Translation provided.)

MR. AHKIVIANA: Yeah, as long as it goes to Fairbanks. The fuel costs so much. And I

heard that they burn too much wood up there, and then it kind of -- too much smoke going to it.

And a lot of people get sick from that smoke too. I know I do. And I quit when they raise the costs of the cigarettes. As soon as they raise it a quarter, I quit.

Okay. My name is Archie Ahkiviana. Thank you.

MR. MARTIN: Thank you, Archie. Anyone else have any verbal comments they'd like to give us tonight?

MR. SIELAK: Yes, one more. I got one more. Thank you. Yeah, for the last time; but I just want to give that -- I wish the board would be here to listen to our comments.

And I don't know who's, I mean, keeping tabs of all this what we're saying. And they need to continue the dialogue of that -- the permittees that the State, BLM, or whoever permits the sport hunters, they need to work on that time frame so they can allow the caribou to, you know, go first; and -- you know, or put back their dates right after the caribous come over this way through the Haul Road.

Now, that's where that issue is.

And I just want to bring that up and hope they keep that dialogue open once they travel to all the villages, such as Barrow or North Slope Borough.

And I wish the Borough was here to listen to our concerns so they'll keep bringing that up at your meetings to make sure they come with a solution to, at least, put back the dates or wait for the caribou to pass. And then do whatever they do to let the State hunt -- or guides or sport hunters.

MR. NUKAPIGAK: I just want to say one more thing with George.

MR. MARTIN: Thanks, George. We have the comments all transcribed. The -- you know, the permits that the State issues for hunting, those aren't under our jurisdiction. So -- but we do have a gentleman from the State here tonight.

MR. SIELAK: But the reason why I say it is it's for the EIS.

MR. MARTIN: Yes.

MR. SIELAK: I mean, that's what you said.

MR. MARTIN: Yes.

MR. SIELAK: The wildlife, hunting, environment. I mean, that's why I bring that up.

MR. MARTIN: No, it's -- yeah, and we will cover it.

MR. JENNINGS: Jim, can I add one thing to that response?

MR. MARTIN: Yeah.

MR. JENNINGS: Hi. You had asked earlier about who's taking the notes and all this, and obviously the Federal Energy Regulatory Commission is taking official notes. But we're capturing many of the things that you're saying as well.

And I work with the subsistence study that's being conducted for this project. And so I've -- I've taken to heart everything that I heard about the impact to caribou, impacts on numbers of caribou, migration routes, bow hunters along the Dalton Highway; I've taken it all down.

And I'm actually meeting next week -- we're having a subsistence meeting specifically on this project; and I'll be able to carry that message directly to the Department of Fish and Game and the people that are conducting the subsistence work for us.

And I know Mark Morones is here also from the State, and Mark has his contacts at ADF&G as well. But rest assured that your comments are going to be carried directly to the people who need to hear them.

MR. NUKAPIGAK: Yeah, I just want to bring one thing that George brought up. This ain't the first time we talk about bow hunters on Dalton Highway. We've -- talk about the issue from time to time, and it's an ongoing issue that hasn't been resolved yet.

So in order for Alaska LNG to go forward, we'd like Alaska LNG to meet with the Commission of Department of Fish and Game.

MR. SIELAK: And Board and Game.

MR. NUKAPIGAK: And Board and Game so that they could set a season for the bow hunters. And we've already set the season for the bow hunters to start up in the migration when they start migrating south, not when they're in the heart of migration to the north.

So they were given seasons; and it still hasn't been solved -- been resolved yet, regardless of what our people here are saying tonight. This ain't the first time that this

issue hasn't -- been brought up. It's been brought up so many times, so it's an ongoing issue.

So I suggest that the LNG meet with their superiors and see to it that, at least, bow hunters have a season. And the season should be when they start migrating south, not in the heart of them coming down from the foothills to their calving areas or areas for the summer.

And we chose fall time for them to start bow hunting, and now would be the best time to set the season for them. Thank you.

MR. SIELAK: You need to let them know they got to come north and eat, you know; and after they eat they head back home.

MR. AHKIVIANA: That's how I quit smoking.

MR. SIELAK: That's what they need to put in their head.

MR. MARTIN: Yeah, and, George, we will have a large subsistence review within the EIS, including the incorporation of the Bureau of Land Management's subsistence review under ANILCA. So that will be coordinated with BLM and the State to try to put together an accurate assessment of

how this project will affect -- or, yeah, how it might affect some of the migrations and some of the other subsistence uses.

Good comments. Anyone else have something they'd like to say tonight?

MR. NUKAPIGAK: I got one more.

MR. MARTIN: Okay.

MR. NUKAPIGAK: Thank you. Again, for the record, Robert Nukapigak. Besides bow hunters and the sports hunters, you know, people that travel the Haul Road from here to witness a lot of roadside killing on caribou and moose.

And I'd like to see if the Federal Regulation Committee can enforce that, a lot of this -- like U.S. Fish & Wildlife to start conducting these roadside kills that always happen on the Dalton Highway.

Besides sports hunters and game guides, you know, people that travel the Haul Road from here during the wintertime and during the summertime, we have witnessed a lot of those incidents, especially with the trucking company.

And they always keep a lot of caribous on the roadside, and I think the Federal Regulations should have meetings with the

Commission of U.S. Fish & Wildlife Services and start investigating on these incidents that happen on the Dalton Highway. Thank you.

MR. MARTIN: Thank you. Anyone else like to provide more comments? These are good comments.

(Translation provided.)

MR. MARTIN: Well -- all right. So what we'll do is we'll go ahead and close down the meeting, but I'll stay up here for as long as you'd like if any of you would like to come up and just talk one on one. There's plenty of food over there if anyone wants to grab some of that, please go ahead and do that.

So thank you for welcoming us to your community, and thank you for coming here tonight. And we look forward to hearing from you.

(Translation provided.)

MR. MARTIN: All right. The meeting is adjourned at 7:36. Thank you all for coming.

(Meeting adjourned at 7:36 p.m.)

North Slope Borough

OFFICE OF THE MAYOR

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Charlotte E. Brower, Mayor

December 4, 2015

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

Via eFiling at www.ferc.gov

RE: Scoping Comments Alaska LNG

Dear Ms. Bose,

The North Slope Borough (Borough) appreciates this opportunity to participate in the Federal Energy Regulatory Commission (FERC or Commission)'s preparation of an environmental impact statement (EIS) to discuss the environmental impacts of the Alaska LNG Project (Project).

The National Environmental Policy Act (NEPA) scoping process is "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action."[1] The agency must use the scoping process to "[d]etennine the scope ... and the significant issues to be analyzed in depth in the environmental impact statement."[2] "Scope consists of the range of actions, alternatives, and impacts to be considered in an environmental impact statement. To determine scope, the agency must consider actions including connected actions, cumulative actions, and similar actions; alternatives including no action, other reasonable courses of action, and mitigation measures; and impacts including direct, indirect. and cumulative impacts."[3] With this in mind, the Borough submits these comments on the upcoming EIS Process.

About the North Slope Borough

The North Slope Borough (Borough or NSB) is the regional municipal government for eight communities across the North Slope of Alaska within the 89,000 square miles of the Alaskan Arctic, north of the Brooks Mountain Range to the Arctic Ocean. Our Borough is the largest

[1] 40 C.F.R. 1501.7.
[2] 40 C.F.R. 1501. 7(a)(2).
[3] 40 C.F.R. 1508.25.

municipality in the United States in terms of landmass. The 2011 populations of our villages ranged from under 300 in Pt. Lay to just over 4,800 in Barrow, the seat of our Borough government and the northernmost community in the country. In total we have approximately 7,840 residents, of which nearly 70 percent are Iñupiat. Five of our communities are located directly on the arctic coast, while the residents of a sixth, Nuiqsut, access the waters of the Beaufort Sea via the Colville River. Our villages are small and remote – accessible only by air, seasonal ice roads or barge. Severe weather often prevents travel in or out of the villages.

Overall, the NSB is supportive of oil and gas exploration, provided the activities are conducted in manner that is safe for the environment and does not impact subsistence activities or resources. Those subsistence activities and resources form the foundation for meeting the nutritional and cultural needs of our North Slope residents. Traditional foods are far more nutritious than many types of imported "store-bought" food, and their continued consumption has repeatedly been shown to be critical to the health of our people.[4] The social fabric of our communities revolves around subsistence traditions. All of our communities, whether through direct harvest or extensive sharing networks, utilize the full range of traditional marine subsistence resources that abound in arctic waters. Any threat to subsistence resources is a threat to the continued viability of our communities and the Iñupiat culture.[5]

Recommendations for Scoping

In general, the EIS must contain a comprehensive analysis of the potential impacts associated with the proposed project, and of a reasonable range of project alternatives. This analysis must consider:

- The full range of potential impacts to subsistence, including those associated with construction and operation of project facilities, vessel, vehicle, and aircraft traffic, impediments to or deflection of caribou movement, whale or pinniped movement, fish movement, and waterfowl nesting and other habitat uses, displacement from harvest areas, and loss of potential harvest opportunities associated with project-related employment;
- Potential impacts to the health of the people in Nuiqsut and Anaktuvuk Pass and other affected communities, including any associated with increased contact with outside

[4] The subsistence diet protects against obesity and diabetes, and associated problems such as hypertension and cardiovascular disease. Restricted access to subsistence foods therefore places the community at increased risk for these problems. If subsistence use in the region is reduced, very significant increases in obesity and diabetes in the impacted communities would predictably ensue. *See* Ebbesson SO, Kennish J et al, Diabetes is Related to Fatty Acid Imbalance in Eskimos, *International Journal of Circumpolar Health,* 58: 108-119. 1999); Shephard R and Rode A, The Health Consequences of Modernization: Evidence from Circumpolar Peoples, Cambridge University Press (1996).

[5] "Environmental changes, both real and perceived, also influence health. Resource development activities and structures can change animal migration patterns due to disturbance of hunting lands also affecting consumption of traditional foods and by possibly causing hunters to travel farther out on the land, thereby increasing the risk of personal injury. Oil and gas spills could affect areas of traditional harvesting, and real or perceived contamination could impact people's desire to consume food off the land and increase the consumption of store bought foods." Habitat Health Impact Consulting/North Slope Borough, *Health Indicators in the North Slope Borough: Monitoring the Effects of Resource Development Projects*, Page 5 (June 2014) *available at* http://www.north-slope.org/assets/images/uploads/NSB_Indicators_Report_August_4_printable_FINAL.pdf.

project workers, degradation of air and water quality, tainting or perceived tainting of fish or other resources resulting in decreased consumption, or decreased food security;

- Potential impacts to wildlife, including those associated with any likely increased human/bear (polar and grizzly) interactions, attraction and concentration of fox, raven, gull, and other predators, bird collisions with facilities, alteration of area hydrology affecting fish use of ephemeral streams, and alteration of wildlife movement patterns, including any associated with direct habitat loss, deflection or attraction due to aircraft, roads, pipelines, lighting, noise, smells, or waste handling;
- Potential cumulative effects on all area resources and current uses, including those associated with other reasonably foreseeable exploration and development projects occurring during the construction and life of the project;
- Present alternatives that achieve goals, while ensuring the health and safety of our people;
- Issues associated with facility abandonment, dismantlement and removal of infrastructure, and subsequent site restoration, rehabilitation (DR&R) and reclamation;
- Potential impacts to the project associated with climate change, including the potential for increased rates of permafrost thawing, riverbank erosion, lake subsidence, and snowfall during the life of the project, with resulting effects to facility integrity, and challenges for facility maintenance and inspection; and
- Alternate options for gravel source.

The Borough also has some specific recommendations for consideration with the EIS.

Ensuring Adequate Public Process in All Phases of the Project

It is important for the agency to ensure meaningful public participation in the process. We appreciate the FERC's willingness and ability to host meetings about Scoping in the affected communities of the North Slope, including Kaktovik, Nuiqsut and Barrow. We hope FERC continues to incorporate this level of public participation into all activities that impact the North Slope communities. Only by going to the Villages can the agency truly understand the community needs and concerns.

Economic Opportunity Plan and Economic Analysis

Under the terms of the Alaska Native Claims Settlement Act of 1971 ("ANCSA"), Congress settled Alaska Natives' aboriginal land claims in exchange for the establishment of regional and village for-profit corporations owned by and for the benefit of Alaska Natives.[6] Congress's intent was to allow Alaska Native corporations to utilize resources to provide benefits to its thousands of Iñupiat shareholders and their descendants, promoting their health, education and welfare.[7]

NSB recommends that the EIS include analysis of both the potential positive and negative impacts to its residents from this project and the associated potential tax revenues and jobs created. In addition, the Borough generally requires an Economic Opportunity Plan be developed

[6] 43 U.S.C. § 1606.
[7] *Id.* § 1606(r).

prior to construction activities that includes a local hire manpower plan, local business contracting plan, training program, mentoring program, monitoring program, and socio-cultural value system component. Development of this plan should include consultation with the NSB, Native Corporations, and tribal governments.

Human Health

The health and welfare of NSB residents should be a primary factor in FERC's decision making. Lack of appropriate health data and health impact assessment has historically complicated efforts to understand how observed illness trends in the NSB are influenced by ongoing development activities. NEPA was enacted in recognition of the fact that the environmental consequences of major federal actions come with interrelated social, economic, and health effects, and the consideration of these effects was central to the purpose of NEPA. NEPA's requirement to analyze and consider mitigation for health effects reflects not only an administrative requirement but an ethical imperative. NEPA regulations and Council on Environmental Quality (CEQ) Guidance instruct agencies to evaluate the direct, indirect and cumulative health effects of proposed federal actions.[8]

The EIS should include a thorough health impact assessment (HIA). HIA is an accepted tool used internationally in evaluating public health impacts from various policies, programs, projects, and proposals. The actions of the federal agencies with regard to oil & gas development have a profound effect on our communities. To date, most NEPA analysis in the region has focused on identifying "upstream" factors such as pollution and economic change. These factors can exert a profound impact on public health (both positive and adverse), but they are not the only impacts to be considered. To protect our communities, FERC must work with us toward the goal of recognizing and addressing any appropriate mitigation measures available to reduce potential health effects, and analyze cumulative impacts of oil & gas development.[9]

The NSB DHSS recently developed a guide on Health Impact Assessment, titled "*Health Impact Assessment in the North Slope Borough: A Guide for Stakeholders, Decision Makers and Project Proponents*." Within the guide is a list of health impacts that are specifically linked to resource development projects in the arctic. We expect the HIA to examine health impacts resulting from social, economic and cultural changes that may result from the proposed development, including: infectious disease, chronic disease, injuries, mental health and wellbeing, maternal and child health, exposure to hazardous substances, food security and nutrition, housing, employment and income, education, cultural wellbeing, and health care services. To examine health impacts in such a holistc way would meet the NEPA's intended meaning.

Lastly, it is important to understand that a holistic assessment of health includes meaningful engagement with the affected communities. This means, not only going to communities to provide information on the project, but also asking for input on the potential project effects, and

[8] 40 C.F.R. § 1508.8; *see e.g.*, CEQ, Considering Cumulative Effects Under the National Environmental Policy Act 1997, *available at* http://energy.gov/nepa/downloads/considering-cumulative-effects-under-national-environmental-policy-act.

[9] A baseline analysis of the health status of North Slope communities was conducted and completed in 2012. *North Slope Borough Baseline Community Health Analysis Report.*

working with key stakeholders (e.g. NSB, NSB DHSS, tribal governments and Native Corporations) to develop mitigation and enhancement strategies.

Impacts Offshore and Conflict Avoidance

Communities of the North Slope and beyond depend upon the subsistence harvest of the Bowhead whale and the sharing of its harvested products for their cultural, nutritional, and spiritual well-being. The Borough supports the work of the Alaska Eskimo Whaling Commission (AEWC) to ensure the ability to hunt is not harmed by industrial and other activities. As such, there are concerns that the changes at West Dock may have impacts to whaling temporarily during the barging activities of materials for project, as well as increasing barge traffic in and out of West Dock.

FERC should analyze not only the potential impacts of vessel traffic noise and disturbance from this Project on the bowhead whale subsistence hunt, but also discuss the cumulative impacts to bowhead whales, other species, and subsistence activities from increasing vessel traffic through the Bering, Chukchi, and Beaufort Seas. In the EIS, FERC should examine ways to reduce vessel traffic, including an alternative utilizing ground transportation to move equipment via the Dalton Highway.

Further, the EIS should consider as a mitigation measure, timing of construction activities to minimize impacts to subsistence activities, based on consultations with local communities, as well as subsistence users. Because the project potentially involves vessel traffic that overlaps with the bowhead whale subsistence hunt, the EIS should also explicitly require consultation with National Marine Fisheries Service (NMFS) and the AEWC, and should require vessels operators to enter into annual Conflict Avoidance Agreement (CAA) negotiations with the AEWC as a proven mechanism for reducing subsistence conflicts.

In addition to requiring an annual negotiation process between the whalers and industry operators (the CAA process), the EIS should include certain successful measures that the whalers and operators have developed over years of experience with the CAA process. In particular, the use of communication centers and vessel transit guidelines are relatively non-controversial and have relevance to activities throughout the bowhead whale migratory and subsistence hunting areas. In fact, the use of Communications Centers, or "Com Centers," have been the cornerstone for decades of the integrated management structure developed through the CAA. In National Oceanic and Atmospheric Administration's (NOAA) Supplemental Draft Environmental Impact Statement for Effects of Oil and Gas Activities in the Arctic, the agency considers the inclusion of the communications centers as a standard mitigation measure. Their use is also required by NOAA in many Incidental Harassment Authorizations under the Marine Mammal Protection Act. Thus, the Borough strongly encourages FERC to also include this measure in the EIS.[10]

There may be dredging associated with the project. The Borough has some concerns about potential discharges related to the disposal of dredged materials. FERC should identify all potential environmental risks associated with such discharges, and impose appropriate measures

[10] NOAA, Effects of Oil and Gas Activities in the Arctic Ocean Supplemental Environmental Impact Statement (March 2013) (hereinafter NOAA SDEIS) at ES-16.

to mitigate those risks, including the inclusion and analysis of EIS alternatives that reduce discharges to the maximum extent feasible.

Ecosystem Change and Caution

It is clear from increasing studies across a wide range of disciplines that the arctic marine ecosystem is undergoing rapid change. The short and long term implications of this change for the wildlife resources and arctic residents who had for centuries or longer depended upon a relatively stable ecosystem cannot be reliably predicted. This unsettling reality demands that extreme caution be exercised in considering proposals for new large-scale development into this ecosystem, like commercial fishing, marine transport, tourism, and oil and gas development. We Iñupiat have always been adaptable people, but recognize that the current pace of ecological change is more rapid than has been experienced before. We also recognize that decisions made now by officials who have never lived in the Arctic can have far-reaching consequences, and that it is our people that will be most directly impacted. We will remain here, and will adapt to whatever changes occur, but demand that we be assured of a meaningful role in the management of our homeland. That management must be adaptive and driven by the results of consistent and comprehensive scientific studies.

The fact that the EIS will study Permafrost, Soils, and Reclamation, as stated in the Notice is important in understanding the impacts of this Project.

Subsistence and Cultural Uses

The continued availability of and access to subsistence resources is of critical importance to the residents of the North Slope. North Slope residents continue to depend heavily on subsistence foods and practices for maintaining both their physical and cultural health. Traditional foods are far more nutritious than many types of imported foods, and their continued consumption has repeatedly been shown to be critical to the health of our residents. Subsistence activities also provide spiritual and cultural affirmation, and are crucial for passing skills, knowledge and values from one generation to the next.

The Borough understands that the proposal will follow the Trans-Alaska Pipeline. In developing the proposal and analyzing the alternatives, the EIS should evaluate and describe cumulative effects of those activities on subsistence and other uses of caribou. Placement of this pipeline, any access roads and the drill pad should be carefully thought out and placed to avoid disrupting these species or the subsistence harvest. Additionally, FERC must adopt measures to insure that infrastructure – roads, gravel pads, buildings – do not restrict access to subsistence resources.

Other Mitigation Measures

In considering Mitigation Measures , the Borough would request that FERC analyze and include the measures the Borough typically applies to all North Slope Projects:

- Activities associated with the Project should not adversely impact subsistence activities or restrict the boating routes, mooring spots, or safe harbor of any subsistence hunters or vessels.

- Aircraft/helicopter use in support of the Project should maintain an altitude sufficient to avoid harassing concentrations of 25 or more caribou to avoid interfering with or disturbing them. Except in the case of emergency, refueling of helicopters and aircraft on waterbodies is prohibited.
- All nonessential air and vessel traffic associated with the Project shall occur prior to or after the period of whale migration through the area. Essential traffic (traffic that could not reasonably occur prior to or after the period of whale migration through the area) shall avoid disrupting the whale migration, subsistence activities, in accordance with the CAA.
- Vessels and aircraft that are likely to cause significant disturbance must avoid areas where species that are sensitive to noise or movement are concentrated at times when such species are concentrated. Concentrations may be seasonal or year round and may be due to behavior (e.g., flocks or herds) or limited habitat (e.g., polar bear denning, seal haulouts).

Furthermore, to address impacts associated with public health, we ask that the project proponents work with the NSB DHSS and other key agencies in the NSB to develop strategies that adequately mitigate negative health impacts stemming from the Alaska LNG Project and enhance positive health benefits. Measures that are relevant for a project of this size and scope should include strategies on prevention of infectious disease transmission, minimizing alcohol and drug misuse, increasing local employment, siting of work camps, public health monitoring, environmental contamination and effects on subsistence, and spill clean up and compensation.

Conclusion

Thank you for the opportunity to comment on this initial phase of the EIS.

Sincerely,

Charlotte E. Brower

Charlotte E. Brower
Mayor

Cc: Jacob Adams, Sr., CAO
John Boyle, Special Counsel
Dawn Winalski, Assistant Borough Attorney
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Taqulik Hepa, Director, Wildlife Management