Alaska LNG

DOCKET NO. PF14-21-000

DRAFT RESOURCE REPORT NO. 2

WATER USE AND QUALITY

PUBLIC VERSION

Document Number: USAKE-PT-SRREG-00-0002

RESOURCE REPORT NO. 2 SUMMARY OF FILING INFORMATION[1]	
Filing Requirement	**Found in Section Location**
Identify all perennial surface waterbodies crossed by the proposed project and their water quality classification. (§ 380.12(d)(1)) • Identify by milepost • Indicate if potable water intakes are within 3 miles downstream of the crossing.	2.3.8, Appendix C
Identify all waterbody crossings that may have contaminated waters or sediments. (§ 380.12(d)(1)) • Identify by milepost • Include offshore sediments.	2.3.2, 2.3.6, Appendix C
Identify watershed areas, designated surface water protection areas, and sensitive waterbodies crossed by the proposed project. (§ 380.12(d)(1)) • Identify by milepost	2.2.3.3, 2.3.3, 2.3.5
Provide a table (based on National Wetlands Inventory (NWI) maps if delineations have not been done) identifying all wetlands, by milepost and length, crossed by the proposed project (including abandoned pipeline), and the total acreage and acreage of each wetland type that may be affected by construction. (§ 380.12(d)(1&4))	2.4.3, Appendix E, Appendix F, Appendix G
Discuss construction and restoration methods proposed for crossing wetlands, and compare them to staff's Wetland and Waterbody Construction and Mitigation Procedures. (§ 380.12(d)(2))	2.4.8
Describe the proposed waterbody construction, impact mitigation, and restoration methods to be used to cross surface waters and compare to the staff's Wetland and Waterbody Construction and Mitigation Procedures. (§ 380.12(d)(2)) • Although the Procedures do not apply offshore, the first part of this requirement does apply. Be sure to include effects of sedimentation, etc. This information is needed on a mile-by-mile basis and will require completion of geophysical and other surveys before filing. (See also Resource Report 3.)	2.3.10, Appendix H
Provide original NWI maps or the appropriate state wetland maps, if NWI maps are not available, that show all proposed facilities and include milepost locations for proposed pipeline routes. (§ 380.12(d)(4))	Appendix F
Identify all U.S. Environmental Protection Agency (EPA) - or state-designated aquifers crossed. (§ 380.12(d)(9)) • Identify the location of known public and private groundwater supply wells or springs within 150 feet of construction.	2.2.1, Appendix B
Additional Information Often Missing and Resulting in Data Requests	
Identify proposed mitigation for impacts on groundwater resources.	2.2.5, 2.2.6

[1] Guidance Manual for Environmental Report Preparation (FERC, August 2002). Available online at http://www.ferc.gov/industries/gas/enviro/erpman.pdf.

RESOURCE REPORT NO. 2
SUMMARY OF FILING INFORMATION [1]

Filing Requirement	Found in Section Location
Discuss the potential for blasting to affect water wells, springs, and wetlands, and associated mitigation.	2.2.5, 2.4.8, Appendix A
Identify all sources of hydrostatic test water, the quantity of water required, methods for withdrawal, and treatment of discharge, and any waste products generated.	2.2.5, 2.2.6, 2.3.10, 2.3.11
If underground storage of natural gas is proposed, identify how water produced from the storage field will be disposed.	N/A
If salt caverns are proposed for storage of natural gas, identify the source locations, the quantity required, the method and rate of water withdrawal, and disposal methods.	N/A
For each waterbody greater than 100 feet wide, provide site-specific construction mitigation and restoration plans.	2.3.8, Appendix H
Indicate mitigation measures to be undertaken to ensure that public or private water supplies are returned to their former capacity in the event of damage resulting from construction.	2.2.5, 2.3.10, Appendix B
Describe typical staging area requirements at waterbody and wetland crossings.	2.3.10, 2.4.8, RR1, Appendix E
If wetlands would be filled or permanently lost, describe proposed measures to compensate for permanent wetland losses.	2.4.8, Appendix G
If forested wetlands would be affected, describe proposed measures to restore forested wetlands following construction.	2.4.7, 2.4.8
Describe techniques to be used to minimize turbidity and sedimentation impacts associated with offshore trenching, if any.	2.3.10

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ACRONYMS AND ABBREVIATIONS

ABBREVIATION	DEFINITION
Abbreviations for Units of Measurement	
°C	degrees Celsius
°F	degrees Fahrenheit
BSCF/D	billion standard cubic feet per day
cfs	cubic feet per second
cm	centimeters
dB	decibels
dBA	A-weighted decibels
ft	feet
g	grams
gpm	gallons per minute
ha	hectare
hp	horsepower
Hz	hertz
in	inches
kg	kilogram
kHz	kilohertz
kW	kilowatts
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
m^3	cubic meters
Ma	mega-annum (millions of years)
mg	milligrams
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MGD	million gallons per day
mm	millimeters
MMBtu/hr	million British thermal units per hour
MMSCF/D	million standard cubic feet per day
MPH	miles per hour
MMTA	million metric tons per annum
ng	nanograms
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
ppmv	parts per million by volume
Psig	pounds per square inch gauge
rms	root mean square
SPL	sound pressure level

ABBREVIATION	DEFINITION
tpy	tons per year
µg	microgram
µg/kg	micrograms per kilogram
µPa	micropascals
Other Abbreviations	
§	section or paragraph
AAAQS	Alaska Ambient Air Quality Standards
AAC	Alaska Administrative Code
ACC	Alaska Conservation Corps
ACEC	Areas of Critical Environmental Concern
ACP	Arctic Coastal Plain
ACRC	Alaska Climate Research Center
ACS	U.S. Census, American Community Survey
AD	aggregate dock
ADCCED	Alaska Department of Commerce, Community, and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADGGS	Alaska Division of Geological and Geophysical Surveys
ADM	average daily membership
ADNR	Alaska Department of Natural Resources
ADOLWD	Alaska Department of Labor and Workforce Development
ADOT&PF	Alaska Department of Transportation and Public Facilities
AEIC	Alaska Earthquake Information Center
AES	Arctic Slope Regional Corporation Energy Service
AGDC	Alaska Gasline Development Corporation
AGPPT	Alaska Gas Producers Pipeline Team
AHPA	Alaska Historic Preservation Act
AHRS	Alaska Heritage Resources Survey
AIDEA	Alaska Industrial Development and Export Authority
AKNHP	Alaska Natural Heritage Program
AMP	approximate mile post
ANCSA	Alaska Native Claims Settlement Act
ANGPA	Alaska Natural Gas Pipeline Act
ANGTS	Alaska Natural Gas Transportation System
ANILCA	Alaska National Interest Lands Conservation Act
ANIMIDA	Arctic Nearshore Impact Monitoring in the Development Area
ANS Task Force	Aquatic Nuisance Species Task Force
ANVSA	Alaska Native Village Statistical Area
AOGCC	Alaska Oil and Gas Conservation Commission
AOI	Area of Interest
APCI	Air Products and Chemicals Inc.
APDES	Alaska Pollutant Discharge Elimination System
APE	Area of Potential Effect

ABBREVIATION	DEFINITION
API	American Petroleum Institute
APP	Alaska Pipeline Project
Applicants	ExxonMobil Alaska LNG LLC, ConocoPhillips Alaska LNG Company, BP Alaska LNG LLC, TransCanada Alaska Midstream LP, and Alaska Gasline Development Corporation
APSC	Alyeska Pipeline Service Company
AQRV	Air Quality Related Value
Arctic NWR	Arctic National Wildlife Refuge
ARD	acid rock drainage
ARDF	Alaska Resource Data File
ARPA	Archaeological Resources Protection Act of 1979
ARRC	Alaska Railroad Corporation
AS	Alaska Statute
ASAP	Alaska Stand Alone Pipeline
ASME	American Society of Mechanical Engineers
ASOS	Automated Surface Observation System
ASRC	Arctic Slope Regional Corporation
ATC	Allakaket Tribal Council
ATWS	additional temporary workspace
AWOS	Automated Weather Observing System
B.C.	British Columbia
BACT	Best Available Control Technology
BGEPA	Bald and Golden Eagle Protection Act
BIA	U.S. Department of the Interior, Bureau of Indian Affairs
BLM	U.S. Department of the Interior, Bureau of Land Management
BMP	best management practices
BOD_5	biochemical oxygen demand
BOEM	U.S. Department of the Interior, Bureau of Ocean Energy Management
BOG	boil-off gas
BP	Before Present
C.F.R.	Code of Federal Regulations
CAA	Clean Air Act
CAMA	Central Arctic Management Area
CCP	Comprehensive Conservation Plans
CDP	Census Designated Place
CEA	Chugach Electric Association
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGF	Central Gas Facility
CGP	Construction General Permit
CH_4	methane
CHA	Critical Habitat Area
CIRCAC	Cook Inlet Regional Citizens Advisory Council

ABBREVIATION	DEFINITION
CIRI	Cook Inlet Region Inc.
CLG	Certified Local Government
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	total greenhouse gas emissions, in CO_2-equivalent global warming potential
COC	Certificate of Compliance
CONUS	Continental U.S.
COOP	National Weather Service, Cooperative Observer Program
CPCN	Certificate of Public Convenience and Necessity
CRA	Certificate of Reasonable Assurance
CSD	Contaminated Sites Database
CSP	Contaminated Sites Program
CSU	conservation system units
CV	coefficient of variation
CWA	Clean Water Act
DB	Denali Borough
DEM	Digital Elevation Model
DGGS	ADNR Division of Geological and Geophysical Surveys
DH	dock head
DHSS	Alaska Department of Health and Social Services
DMLW	Alaska Department of Natural Resources, Division of Mining, Land, and Water
DPS	Distinct Population Segment
DWPP	Drinking Water Protection Program
EDA	U.S. Department of Commerce, Economic Development Administration
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPRP	Emergency Preparedness and Response Plan
ERL	Environmental, Regulatory and Lands
ERMA	Extended Recreation Management Areas
ESA	Endangered Species Act
ESD	Emergency Shut Down
ESU	Evolutionary Significant Unit
FAA	U.S. Department of Transportation, Federal Aviation Administration
FCC	Federal Communications Commission
FE	U.S. Department of Energy, Office of Fossil Energy
FEED	front-end engineering design
FEIS	Final Environmental Impact Statement
FEMA	U.S. Department of Homeland Security, Federal Emergency Management Agency
FERC	U.S. Department of Energy, Federal Energy Regulatory Commission

ABBREVIATION	DEFINITION
FERC Plan	FERC Erosion Control, Revegetation, and Maintenance Plan
FERC Procedures	FERC Wetland and Waterbody Construction and Mitigation Procedures
FLPMA	Federal Land Policy and Management Act (of 1976) BLM
FMP	Fisheries Management Plan
FNSB	Fairbanks North Star Borough
FR	Federal Regulation
GDP	Gross Domestic Product
GHG	greenhouse gases
GIS	geographic information system
GMU	Game Management Units
GP	General Permit
GRI	Gas Research Institute
GTP	gas treatment plant
GWP	Global Warming Potential
H_2S	hydrogen sulfide
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HAP	Hazardous Air Pollutant
HAPC	Habitat Areas of Particular Concern
HCA	High Consequence Area
HDD	horizontal directional drill
HDMS	Hazard Detection and Mitigation System
HGM	hydrogeomorphic
HLV	heavy lift vessel
HMR	Hazardous Materials Regulations
HRS	Hazard Ranking System
IBA	Important Bird Areas
ICS	Incident Command System
IHA	Incidental Harassment Authorization
IHLC	Inupiat History, Language, and Culture
ILI	In-line Inspection
IMP	Integrity Management Plan
IP	Individual Permit
ISO	International Organization for Standardization
JPO	State and Federal Joint Pipeline Office
kbpd	thousand barrels per day
KCC	Kuparuk Construction Camp
KOP	key observation points
KPB	Kenai Peninsula Borough
KTC	Kuparuk Transportation Company
LiDAR	light detection and ranging
Liquefaction Facility	natural gas liquefaction

ABBREVIATION	DEFINITION
LLC	Limited Liability Company
LNG	liquefied natural gas
LNGC	liquefied natural gas carrier
LOA	Letter of Authorization
LOD	Limits of Distribution
LP	Limited Partnership
LPG	liquefied petroleum gas
LUP	Land Use Permit
LUST	Leaking Underground Storage Tanks
MACT	maximum achievable control technology
Mainline	An approximately 800-mile-long, large-diameter gas pipeline
MAOP	maximum allowable operating pressure
MARPOL	Marine Pollution Protocol
MBTA	Migratory Bird Treaty Act
MCD	marine construction dock
MHHW	mean higher high water
MHW	mean high water
ML&P	Anchorage Municipal Light and Power
MLA	Mineral Leasing Act
MLBV	Mainline block valve
MLLW	mean lower low water
MLW	mean low water
MMPA	Marine Mammal Protection Act
MMS	Mainline Meter Station
MOE	margin of error
MOF	material offloading facility
MP	Mainline milepost
MPRSA	Marine Protection Research and Sanctuaries Act of 1972
MSB	Matanuska-Susitna Borough
MSCFD	Thousand standard cubic feet per day
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAS	nonindigenous aquatic species
NCC	national certification corporation
NCDC	National Climatic Data Center
NDE	non-destructive examination
NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFIP	National Flood Insurance Program
NGA	Natural Gas Act
NHPA	National Historic Preservation Act of 1996, as amended

ABBREVIATION	DEFINITION
NID	Negligible Impact Determination
NLURA	Northern Land Use Research Alaska, LLC
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
North Slope	Alaska North Slope
NPDES	National Pollutant Discharge Elimination Systems
NPL	National Priority List
NPP	National Park and Preserve
NPR-A	National Petroleum Reserve – Alaska
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise-Sensitive Areas
NSB	North Slope Borough
NSPS	New Source Performance Standards
NTC	national training center
NTP	Notice to Proceed
NVIC	Navigation and Vessel Inspection Circular
NWA	Northwest Alaska Pipeline
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O_3	Ozone
OC	open-cut
OCS	Outer Continental Shelf
OD	outside diameter
OEP	FERC, Office of Energy Projects
OHA	ADNR Division of Parks and Outdoor Recreation, Office of History and Archaeology
ONA	Outstanding Natural Area
OPMP	ADNR, Office of Project Management and Permitting
OU	Operating unit
PAC	potentially affected community
Pb	the element lead
PBTL	Prudhoe Bay Gas Transmission Line
PBU	Prudhoe Bay Unit
PCB	polychlorinated biphenyl
PHMSA	Pipeline and Hazardous Materials Safety Administration
$PM_{2.5}$	particulate matter having an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter having an aerodynamic diameter of 10 microns or less
PMP	Point Thomson Gas Transmission Line milepost

ABBREVIATION	DEFINITION
POC	Plan of Cooperation
POD	Plan of Development
Project	Alaska LNG Project
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
PTTL	Point Thomson Gas Transmission Line
PTU	Point Thomson Unit
PWS	public water supply
Q&A	question and answer
RCA	Regulatory Commission of Alaska
RCRA	Resource Conservation and Recovery Act
RNA	Research Natural Area
ROD	Record of Decision
ROE	right-of-entry
ROW	right-of-way
RR	Resource Report
SCC	Deadhorse Airport
SDWA	Safe Drinking Water Act
SEIS	Supplemental Environmental Impact Statement
SGR	State Game Refuge
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SMA	Special Management Areas
SRMA	Special Recreation Management Areas
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure Plan
SPCO	State Pipeline Coordinator's Office
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SPMT	self-propelled module transporters
SRA	State Recreation Area
SRR	State Recreation River
STATSGO	State Soil Geographic
STATSGO2	State Soil Geographic2 – General Soils Map of Alaska & Soils Data (2011)
SWAPA	Southwest Alaska Pilots Association
SWPPP	Stormwater Pollution Prevention Plan
TAHC	total aliphatic hydrocarbons
TAPS	Trans-Alaska Pipeline System
TBD	To be determined
TCC	Tanana Chiefs Conference
The Applicants' Plan	Applicants' Upland Erosion Control, Revegetation, and Maintenance Plan
The Applicants' Procedures	Applicants' Wetland and Waterbody Construction, and Mitigation Procedures
TPAH	total polycyclic aromatic hydrocarbons

ABBREVIATION	DEFINITION
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act
TSD	tug support dock
TSS	total suspended solids
UCIDA	United Cook Inlet Drift Association
UIC	Underground Injection Control
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health and Human Services
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USDW	underground sources of drinking water
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VPSO	Village Public Safety Officer
VRM	Visual Resource Management Methodology
VSM	Vertical Support Members
WELTS	Well Log Tracking System
WRCC	Western Regional Climate Center
WSA	Waterway Suitability Assessment
WSR	Wild and Scenic Rivers

Information in this draft Resource Report, including maps, is preliminary and may change during Project pre-filing. Updated information will be provided in the subsequent draft and final versions of the Resource Reports.

2.0 RESOURCE REPORT NO. 2 – WATER USE AND QUALITY

2.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LP (Applicants) plan to construct one integrated LNG Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular 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 opportunity for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and FERC regulations, 18 C.F.R. § 153.2(d) (2014), define "LNG terminal" to include "all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States." With respect to this Project, the "LNG terminal" includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 800-mile, large diameter gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; a gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and a gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.

These components are shown in Resource Report No. 1, Figure 1.1-1, and their current basis for design is described below.

The new Liquefaction Facility will be constructed on the eastern shore of Cook Inlet in the Nikiski area of the Kenai Peninsula. The Liquefaction Facility will include the structures, equipment, underlying access rights and all other associated systems for pre-processing (other than that performed by the GTP) and liquefaction of natural gas, as well as storage and loading of LNG, including terminal facilities (dock) and auxiliary marine vessels used to support marine terminal operations (excluding LNG carriers). The Liquefaction Facility will include three liquefaction trains combining to process up to approximately 20 million metric tons per annum (MMTPA) of LNG. Three 160,000 cubic meter (m^3) tanks will be constructed to store the LNG. The Liquefaction Facility will be capable of accommodating two LNG carriers. The size range of LNG carriers that the Liquefaction Facility will accommodate will be determined through further engineering study and consultation with the United States Coast Guard (USCG) as part of the Waterway Suitability Assessment (WSA) process.

In addition to the Liquefaction Facility, the LNG Terminal will include the following interdependent facilities:

- Mainline: A new large-diameter natural gas pipeline approximately 800 miles in length will extend from the Liquefaction Facility to the GTP on the North Slope, including the structures, equipment, and all other associated systems. The diameter of the pipeline has not been finalized

but for the purpose of these Resource Reports a 42-inch diameter pipeline is assumed. The Mainline will include compressor stations, heater stations, meter stations, and various mainline block valves; pig launcher and receiver facilities; and associated ancillary and auxiliary facilities. Ancillary and auxiliary facilities will include additional temporary work spaces, access roads, helipads, construction camps, pipe storage areas, contractor yards, material extraction sites, and material disposal sites. Along the Mainline route, there will be at least five off-take interconnection points to allow for the opportunity for future in-state deliveries of natural gas. The size and location of such interconnection points are unknown at this time. None of the potential third-party facilities used to condition, if required, or move natural gas away from these off-take points will be part of the Project.

- GTP: A new GTP and associated facilities in the Prudhoe Bay area will receive natural gas from the PBU Gas Transmission Line and the PTU Gas Transmission Line. The GTP will treat/process the natural gas for delivery into the Mainline. The Project also includes a new pipeline that will deliver natural gas processing byproducts from the GTP to the PBU.

- PBU Gas Transmission Line: A new natural gas transmission line will extend approximately one mile from the inlet flange of the GTP to the outlet flange of the PBU gas production facility.

- PTU Gas Transmission Line: A new natural gas transmission line will extend approximately 60 miles from the inlet flange of the GTP to the outlet flange of the PTU gas production facility.

- Ancillary Facilities: Existing State of Alaska transportation infrastructure will be used during the construction of these new facilities including ports, airports, roads, and airstrips (potentially including previously abandoned airstrips). The potential need for new infrastructure and modifications or additions to these existing in-state facilities is under evaluation. The Liquefaction Facility, Mainline, and GTP will require the construction of material offloading facilities.

Draft Resource Report No. 1, Appendices A and B contain general maps of the Project footprint. Detailed plot plans will be developed during the pre-front-end engineering and design (Pre-FEED) process and will be provided to the Commission in a subsequent draft of Resource Report No. 1. An update to the current list of affected landowners is being filed under separate cover as privileged and confidential information.

Outside the scope of the Project, but in support of, or related to, the Project, additional facilities or expansion/modification of existing facilities will be needed or may be constructed. These other projects may include:

- Modifications/new facilities at the PTU;

- Modifications/new facilities at the PBU;

- Relocation of the Kenai Spur Highway; and

- Third-party pipelines and associated infrastructure to transport natural gas from the off-take interconnection points to markets in Alaska.

2.1.1 Purpose of Resource Report

As required by 18 C.F.R. § 380.12, the Applicants have prepared this draft Resource Report in support of a future application under Section 3 of the NGA to construct and operate the Project facilities. The purpose of this Resource Report is to:

- Describe the existing water resources and water quality that may be affected either directly or indirectly by the Project;
- Assess the potential effects to these resources resulting from the construction and operation of the proposed facilities; and
- Identify potential mitigation measures to avoid or minimize potential effects to groundwater, surface waterbodies, wetland resources, and floodplains.

The data for this draft Resource Report were compiled based on a review of:

- Recent aerial photography;
- Preliminary Pre-FEED Engineering design and proposed construction plans;
- Scientific literature;
- Geographic Information System (GIS) data from federal and state agencies; and
- Field survey data.

2.1.2 Agency and Organization Consultations

This section describes consultations that have been conducted to date with agencies and other interested parties related to the Project. As Project details are refined in the Pre-FEED process currently underway, additional consultations will be conducted.

2.1.2.1 Federal Agencies

Due to the amount of wetlands, navigable waters, and open water present within the Project area, this Project will require coordination, and in certain instances regulatory permit filings, with multiple federal agencies (i.e., U.S. Army Corps of Engineers [USACE]; U.S. Environmental Protection Agency [EPA]; U.S. Coast Guard [USCG]). A list of the required federal permits for the Project is provided in draft Resource Report No. 1, Appendix C. A summary of public, agency, and stakeholder engagement conducted by Alaska LNG Project Participants is also provided in Resource Report No. 1, Appendix C and will be updated in subsequent report versions as additional input is solicited.

2.1.2.2 State Agencies

Due to the water use, stream crossings, and open water present within the Project area, this Project will require close coordination, and in certain instances regulatory permit filings, with multiple state agencies (i.e., Alaska Department of Environmental Conservation [ADEC]; Alaska Department of Natural Resources [ADNR] Division of Mining, Land and Water; Alaska Department of Fish and Game [ADF&G] Division of Habitat). A list of the required State of Alaska permits for the Project is provided in draft Resource Report No. 1, Appendix C. A summary of public, agency, and stakeholder engagement conducted by Alaska LNG Project Participants is also provided in Resource Report No. 1, Appendix C and will be updated in subsequent report versions as additional input is solicited.

2.2 GROUNDWATER RESOURCES

2.2.1 Existing Groundwater Resources

The USGS indicates that groundwater provides about 23 percent of the total water used in Alaska (USGS, 1984). This equals about 63 million gallons per day (MGD) of fresh groundwater. The ADEC estimates that about 50 percent of Alaska's overall population, and about 90 percent of rural Alaskans, rely on groundwater for drinking water (ADEC, 2008). Most of Alaska's groundwater meets water quality standards for domestic, agricultural, aquaculture, commercial, and industrial uses with minimal treatment required (ADEC, 2014). Around 14 MGD of groundwater are used for commercial and industrial purposes, and less than 1 percent of the total groundwater use is for agriculture (ADEC, 2008).

Groundwater is available in almost all parts of the state, with the exception of northern Alaska where permafrost is continuous. Permafrost forms a nearly impenetrable layer that restricts recharge, discharge, and movement of groundwater, and decreases the volume in which water may be stored in unconsolidated deposits and bedrock (USGS, 1984). At the same time, a seasonal thaw layer above permafrost can serve as a water source in some areas. This is detailed below.

Aquifers in Alaska

An aquifer is any geologic layer that stores and/or transmits water. Generally, the more porous a layer is, the greater its capacity to store and transmit water. Fractured and faulted bedrock, porous bedrock, and unconsolidated sediments may all serve as aquifers. The groundwater present in aquifers is fed by infiltration of precipitation, snowmelt, and surface water from streams. In contrast, an aquitard is any geologic layer that restricts the flow of groundwater.

The extent of aquifers in Alaska is not well-defined due primarily to the remote nature of much of the landscape and the lack of water wells over much of Alaska. In more densely populated areas of Alaska, such as in Fairbanks and Anchorage, some local aquifers have been identified.

Aquifers in Alaska are found either within coarse-grained alluvium and glacial outwash or within permeable bedrock. These two types of aquifers are outlined below.

Alluvial and Glacial Outwash Aquifers

The majority of the known aquifers in use in Alaska are within coarse-grained Quaternary alluvium and glacial outwash. Deposits of coarse sand and gravel provide high porosity for storage and mobility of water within these layers. Lower fine-grained layers with a higher percentage of silt and clay may act as aquitards, defining the base of these aquifers. Alluvial and glacial outwash aquifers are generally found in lowland areas, particularly along the floodplains of major drainages. In some areas, where freshwater mixes with seawater, deposits of glacial till are known as glacioestuarine. The thickness of the layers can vary from thin, surficial deposits, to nearly 1,000 feet thick. Accordingly, depth to water within the aquifers varies from just a few feet to several hundred feet (USGS, 1999).

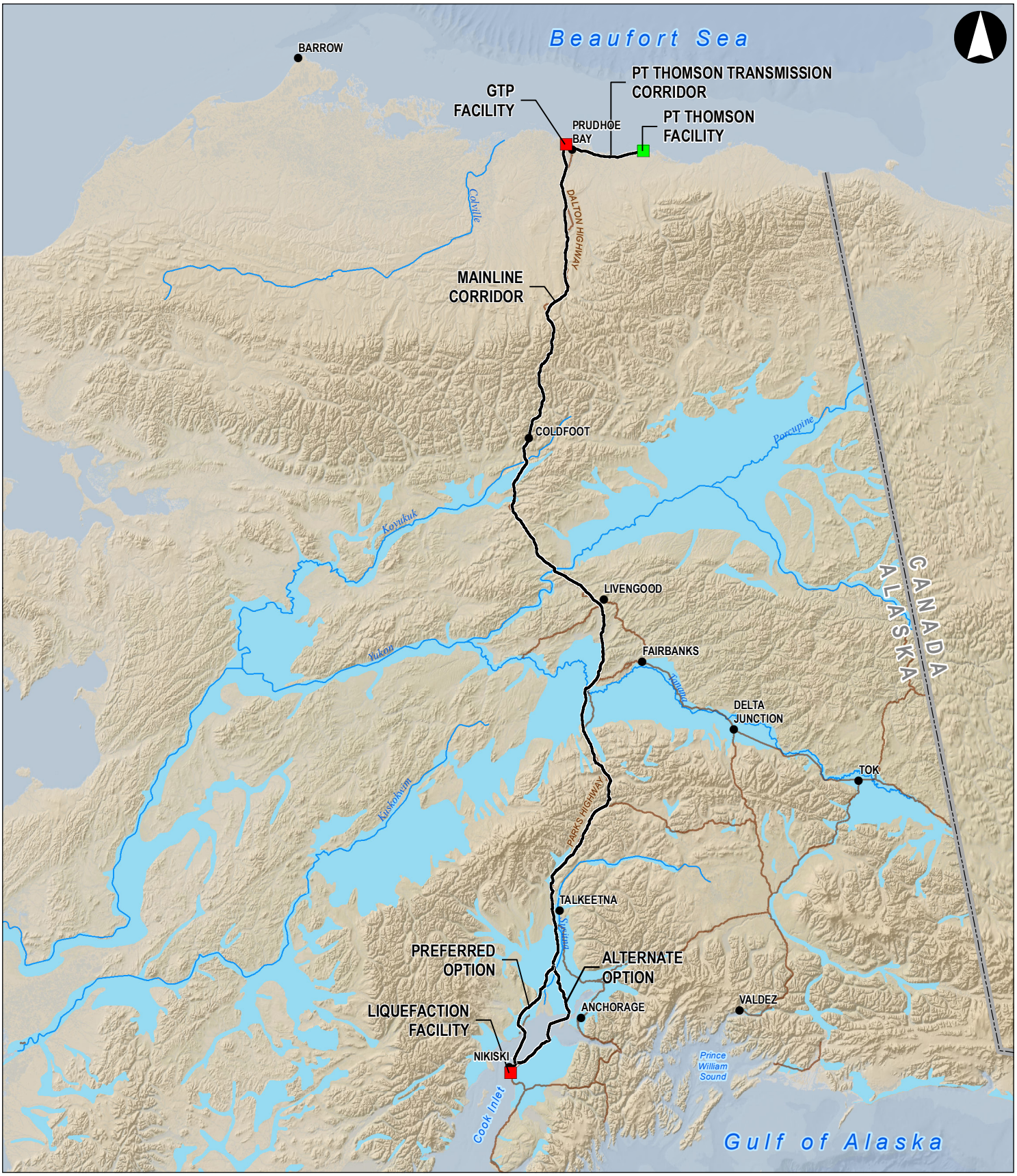
No state-wide maps of aquifers exist for Alaska. The closest approximation to an aquifer map is Figure 2.2.1-1, which shows the extent of large deposits of Quaternary alluvium and glacial outwash. These deposits, which occur along the floodplains of several large drainages throughout the state, are the most productive known aquifers in Alaska (USGS, 1999).

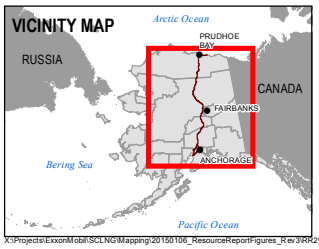
Bedrock Aquifers

In addition to the alluvial and glacial outwash aquifers, there are a small number of known aquifers in bedrock across the state. Bedrock aquifers are composed of consolidated material such as limestone, dolomite, sandstone, siltstone, shale or fractured crystalline rock. In order for bedrock to serve as an effective aquifer, it must have a high degree of porosity and/or permeability, generally as a result of fractures, faults, or abundant cavities, such as those from dissolution of limestone. These aquifers have not been well studied, and their subsurface extents and capacities are unknown (USGS, 1999).

2.2.1.1 Liquefaction Facility

The Liquefaction Facility will be in an area of glacial outwash, glacioestuarine, and alluvial deposits that make up part of the Cook Inlet Aquifer System. The aquifer deposits can be up to 200 feet thick in the Nikiski area. Approximately 3.5 MGD of groundwater is pumped for industrial uses and about 1.0 MGD for public water supply in the Nikiski area (Glass, 2001).





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LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- Course-Grained Quaternary Deposit Aquifer

0 35 70 140 Miles

DISCLAIMER

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QUATERNARY ALLUVIUM AND GLACIAL OUTWASH DEPOSITS WHICH COMMONLY SERVE AS AQUIFERS IN ALASKA

FIGURE 2.2.1-1

Alaska LNG

Cook Inlet Aquifer System

The Cook Inlet Aquifer System as a whole encompasses floodplains along the Susitna River, the Matanuska River, other smaller drainages, as well as coastal lowlands along northern Cook Inlet. The aquifer is generally composed of alluvium and glacial outwash. These are relatively thick deposits made up of clay, silt, sand, gravel, and boulders. Where these deposits are locally coarse-grained (sand and gravel), they yield shallow groundwater. Depth to water is likely to be less than 100 feet throughout the system. Lenses of finer-grained silts and clays may serve as aquitards deep within the aquifer, but these layers are not well-defined (Glass, 2001).

2.2.1.2 Interdependent Facilities

The Mainline corridor north of the Brooks Range is in an area of continuous permafrost and aquifers do not generally exist except as a seasonal thaw layer. Along the Brooks Range, the Mainline corridor may cross groundwater aquifers trapped in limestone bedrock. Further south, the Mainline corridor crosses the Yukon-Tanana Aquifer in the Kobuk Ridges, Yukon Tanana Uplands, Ray Mountains, and a portion of the Tanana Kuskokwim Lowlands ecoregions. Ecoregions are further discussed in Resource Reports No. 1 and 6. Where the Mainline corridor crosses the Alaska Range, groundwater may be found in unnamed Quaternary and glacial aquifers. The mainline also crosses the Cook Inlet Aquifer System in the Anchorage area, up to where the aquifer ends past the Matanuska-Susitna Borough in the Alaska Range Ecoregion (USGS, 1999). The Cook Inlet Aquifer System is described above, other aquifer systems are further described below.

North Slope

In areas of continuous permafrost, the top of the permafrost layer is referred to as the permafrost table. An active layer may lie above the permafrost table, and freeze and thaw seasonally. Where the active layer is permeable and saturated, it forms a suprapermafrost aquifer. Where water quantity and quality in these aquifers is sufficient, they serve as water sources for some villages near the Arctic Ocean. The suprapermafrost aquifers are bound on the bottom by the permafrost table. Suprapermafrost groundwater plays an important role in creating distinctive geomorphic features such as wetlands, pingos (e.g., ice-core hills in permafrost formed when hydrostatic pressure of freezing groundwater causes upheaval), shallow lakes, and patterned mosaics formed by freeze-thaw cycles (Nelson, 1990).

Brooks Range Aquifers

From the Brooks Range through the southern Alaska Range, permafrost is discontinuous. Where there is discontinuous permafrost, the depth to the base of the permafrost ranges from 155 to 265 feet (Ferrians, 1965). Large groundwater yields are available both above and below the permafrost (USGS, 1955a). Depth to the top of the permafrost table varies widely depending on elevation and proximity to a seasonally-open waterbody.

Where the Project corridor passes through the Brooks Range, extensive areas of carbonate bedrock are present, with locally high porosity. This porous limestone serves as a high capacity aquifer in some areas. Springs present in the eastern Brooks Range have demonstrated discharge rates of up to 16,000 gallons per minute (GPM) (USGS, 1999). However, the porosity and potential groundwater storage of the bedrock in the Project area is unknown.

Yukon-Tanana Region Aquifers

Quaternary alluvium serves as shallow aquifers along the floodplains of the Tanana and Yukon Rivers in Interior Alaska (USGS, 1999). The maximum known thickness of alluvium in the Tanana River Valley is 2,000 feet (USGS, 1984); however, lenses of finer-grained glacial sediments may serve as aquitards at depth. Where the Mainline corridor crosses these rivers, there is large groundwater recharge potential.

Groundwater in the area also occurs in taliks and thaw bulbs. Taliks are unfrozen zones that occur beneath lakes, rivers, and other areas that are either underlain by permafrost or are completely open to subpermafrost groundwater. Thaw bulbs are localized regions of thawed permafrost produced by a local heat source (USGS, 1999).

Unconsolidated Aquifers in the Alaska Range

The Alaska Range contains many glaciers and permafrost which affects the quantity of groundwater (USACE, 2012). Aquifers and potential aquifers are not well-defined within the Alaska Range. Unconsolidated alluvium and glacial deposits may yield water in some areas along the Susitna drainage.

Anchorage

Groundwater in the Anchorage area is part of the Cook Inlet Aquifer System. Most of the groundwater is sourced from shallow, unconsolidated aquifers of glacial outwash and alluvium. Depth to the water table varies from up to approximately 300 feet in the upper elevations of Anchorage to less than 50 feet near the shores of Cook Inlet. A deeper confined zone (typically greater than 300 feet) is present in some areas, and produces an artesian flow. Interspersed lenses of finer-grained sediments likely serve as aquitards within the system. Recharge to these aquifers is largely on the east side of Anchorage, from streams at the base of the Chugach Mountains. Groundwater flows westward and northwestward from the mountains to the shores of the inlet, with some discharge into streams at lower elevations (Glass, 2001). Some lower elevation wells experience daily depth to water variations of up to 4 feet due to pressure changes from incoming and outgoing tides. Salt water from Cook Inlet does not appear to significantly intrude the aquifers, as the hydraulic head is high (USGS 1999; Glass, 2001).

In addition to the unconsolidated deposits that make up the Cook Inlet Aquifer System, there is a known bedrock aquifer in the upland areas around Anchorage. Fractured slate and metagreywacke have sufficient porosity to provide groundwater flow for several domestic wells in the area (Glass, 2001).

2.2.2 Groundwater Quality

Alaska's groundwater is generally of good quality and is suitable for most uses, although hard water and naturally high iron concentrations are common. On a localized basis, some water quality problems exist due to various natural and man-made causes. These include natural geologic conditions, such as aquifers in marine sedimentary rocks, that produce brackish water; natural biologic processes and contamination from domestic discharges that can cause high nitrate concentrations; and intensive pumping in aquifers near the coasts that can mix sea water with freshwater, making it unfit for most uses (USGS, 1999).

2.2.2.1 Liquefaction Facility

In the late 1980's or early 1990's, there was a combined industry/agency/public effort to better understand the groundwater within the Kenai Peninsula Borough in general and the Nikiski area in particular. A subsequent draft of this Resource Report will contain additional information regarding the effort undertaken and information collected.

Groundwater quality in the Liquefaction Facility area was also studied by Glass (2001). Results from this analysis showed groundwater quality in this area to be generally high, with the only anomalous results being elevated iron and manganese levels.

The pH of water sampled in the 2001 study was 6.7 and the temperature was 6.5°C (Glass, 2001). All major ions for which the sample was tested (e.g., calcium, magnesium, sodium, potassium, sulfate, chloride, fluoride, bromide, and silica) showed low concentrations well within EPA drinking water standards. Nutrients and dissolved organic carbon levels were low, as would be expected in an area with no significant agricultural activity. Likewise, there were no significant levels of pesticides or volatile organic compounds (VOCs) detected in the sample. Environmental isotopes of hydrogen and oxygen were within expected ranges for local precipitation-derived waters. Elevated Radon-222 levels are common within the Cook Inlet basin, but in Nikiski the radon was measured at 260 picocuries per liter, well below the national median concentration of 450 (Glass, 2001).

Water sampled in 1999 at a well in Nikiski showed elevated iron levels of 7,300 micrograms per liter (μ/L). The preferred level for public water supply is less than 300 μ/L, and the average iron levels in the Cook Inlet region groundwater are less than 10 (μ/L). Iron is naturally present in groundwater from dissolution of common minerals in rocks and soils and does not pose human health risks. High levels of iron, however, can impart a reddish-brown color and a slightly bitter taste to drinking water. Increased iron levels can also cause the precipitation of sediment that can leave stains on laundry and plumbing fixtures, and in serious cases can promote growth of iron bacteria in pipes (Glass, 2001). Water sampled in Nikiski also showed elevated levels of manganese, measured at 290 and 295 (μ/L) by two different testing methods. The preferred level for public water supply is less than 50 (μ/L). Elevated manganese, like iron, can impart a bitter taste to drinking water and can produce black staining (Glass, 2001).

Due to the age of the most 'recent' reports, on-going investigations are occurring, including field research by the Project and others who are preparing a study to model the hydrogeology and water quality of the aquifer. This new information will be included as it becomes available after the field seasons. Additional information will be provided in a subsequent draft of this Resource Report.

2.2.2.2 Interdependent Facilities

In the summer, suprapermafrost aquifers on the North Slope generally contain water of usable quality; however, in certain areas or in less active layers, water may be highly mineralized (USGS 1999; Ferrians 1969). For instance, in areas of continuous permafrost, the restricted circulation imposed by permafrost boundaries may increase the concentration of dissolved solids in groundwater (USGS, 1970). They may be higher than 250 mg/L in many parts of this zone. In areas of continuous permafrost, water gathered from lakes and stored in heated tanks is more common than using suprapermafrost groundwater resources.

Within the Brooks Range, water that stems from carbonate rock springs or limestone aquifers will likely be basic given the dissolution of calcite in the groundwater. The pH however, must not be greater than 8.5 for most uses in Alaska.

Groundwater in Yukon-Tanana Region Aquifers may contain calcium bicarbonate or calcium magnesium bicarbonate but is generally suitable for most uses. Locally, concentrations of iron and manganese may also be high (USGS, 1999).

In the Alaska Range, dissolved solids concentrations in unconsolidated deposit aquifers range from 110 to 340 milligrams per liter (mg/L) (USGS, 1999). For reference, Alaska's Water Quality Standard for drinking water is that total dissolved solids from all sources may not exceed 500 mg/L. Neither chlorides nor sulfates may exceed 250 mg/L (18 AAC 70.020(b) (4)).

Groundwater quality in the Cook Inlet Aquifer System is generally quite high. Most major ion concentrations are low, with only occasional elevated levels of chloride up to 500 mg/L. Total dissolved solids are also generally low, mostly in the 100-200 mg/L range, with the highest value reported in recent studies being 986 mg/L in southeastern Cook Inlet. Nutrients, dissolved organic carbon, pesticides, and volatile organic compounds levels are all low, well within EPA drinking water standards (Glass, 2001). High levels of arsenic, iron, and manganese are common throughout the region. The Glass 1999 study showed arsenic levels up to 29 µg/L in Cook Inlet groundwater (Glass, 2001). Elevated Radon-222 levels are common within the Cook Inlet basin, averaging 100-200 picocuries per liter. Radon-222 levels have been measured as high as 610 picocuries per liter, well above the national median concentration of 450 (Glass, 2001). Water from wells in coal-bearing strata in the Cook Inlet Aquifer System commonly contains objectionable concentrations of hydrogen sulfide and iron as well (USGS, 1999).

Groundwater in the Municipality of Anchorage is known to be of very high quality. Common urban pollutants such as excessive nutrients, dissolved organic carbon, pesticides, and volatile organic compounds are all very low in Anchorage (Glass, 2001). Major ion concentrations and total dissolved solids are generally low as well. Elevated arsenic, up to 10 µg/L, iron, and manganese however, can be present. Iron and manganese levels average <10 µg/L in the Cook Inlet Aquifer System, but levels in Anchorage have been reported as high as 330 µg/L and 591 µg/L for iron and manganese respectively. Most Radon-222 levels in Anchorage are well below the national median concentration of 450 picocuries per liter, but levels have been measured as high as 610 picocuries per liter (Glass, 2001).

2.2.3 Groundwater and Wellhead Protection

Wellhead protection measures are implemented to protect groundwater zones of influence from pollutants that may reduce the uses of a well. Identified groundwater and wellhead protection areas are depicted in Appendix C of Resource Report No. 8. Additionally, there may be local ordinances established to protect watershed areas and larger groundwater basins (ADEC, 2014). The following sections describe various programs that have been put in place to protect groundwater sources.

2.2.3.1 State Programs

ADEC has specified minimum separation distances between wellheads and potential sources of contamination (18 AAC 80.020(a)). These setbacks range from 75 to 200 feet depending on the potential source of contamination (this can also be modified if necessary to protect public health). The separation

distance from a petroleum line (such as a natural gas pipeline) is 75 to 100 feet depending on how the water system at the wellhead is defined.[2] Additionally, the separation distance from a wastewater disposal system such as a leach field, which might be needed for the Project's ancillary and auxiliary facilities, is 150 to 200 feet.[3]

Wells within proximity to the Project area will be identified using ADNR's Well Log Tracking System (WELTS). Although the database may not be complete, field surveys also will be conducted along the selected footprint to confirm the presence of public and private drinking water wells proximate to the construction area prior to the start of construction. Public and private water wells that have been identified within 150 of the Project corridor are listed in Appendix B.

The EPA requires ADEC to perform source water assessments under the Safe Drinking Water Act (SDWA) (110 Stat. 1613). Source water assessments determine the susceptibility of a drinking water system, including groundwater wells, to contamination. For some systems where contamination risk is high, the EPA also requires a Hydrogeologic Sensitivity Assessment; however, since no aquifers are currently at risk of contamination, there are no such assessments required by USEPA in Alaska at this time (Miller, 2009).

Source water assessments also determine where drinking water originates. To determine the origination area, groundwater movement within two timeframes is evaluated (although additional timeframes are possible). The first timeframe is "several months, "Zone A." The second timeframe is two years, "Zone B." For groundwater, this creates two areas around a wellhead showing the distance groundwater can move within the timeframe. These areas are usually generalized as a representative polygon. To the extent Project facilities cross drinking water zones, such areas are summarized in Table 2.2.3-1 and depicted in Appendix C of Resource Report No. 8 (labeled concurrent with the ADNR as subsurface and surface water rights). Their zones are further identified on the map's legend.

TABLE 2.2.3-1

Drinking Water Zones Crossed by the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Timeframe (Zone Type)	Approximate Distance (feet) and Direction Crossed
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	N/A	TBD	TBD
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				

[2] For community water systems, non-transient non-community water systems, and transient non-community water systems the separation distance minimum is 100 feet, but for a Class C, non-public, non-federally regulated system the separation distance minimum is 75 feet.

[3] Wastewater disposal systems follow the same categorizations for water systems as previous footnote.

TABLE 2.2.3-1

Drinking Water Zones Crossed by the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Timeframe (Zone Type)	Approximate Distance (feet) and Direction Crossed
Compressor Stations	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE				
Access Roads	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Offshore West Dock	North Slope Borough	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD

Sources:

ADEC reviews ADNR's water rights issuances to determine if there are contaminated sites within the groundwater travel polygon and thus potentially affecting the source water. For instance, the Project will need several temporary water use authorizations (TWUAs) from ADNR for water use during construction and operations; ADEC could review these. ADEC also reviews permits for other permitted sites (like material extraction sites) with the potential to affect groundwater. Additionally, certain ADEC permits such as the excavation dewatering or the construction general permit (AKG002000 and AKR100000 respectively) require additional monitoring when dewatering or discharging near a contaminated site. Specifically, dewatering within 1,500 feet of a contaminated site requires an additional permit application

and the submittal of a best management practices (BMP) plan. Potential contamination sources are addressed in Resource Report No. 8; they may include contamination sources identified by ADEC's Contaminated Sites Program, Leaking Underground Storage Tanks Program, Spill Prevention and Emergency Response, and/or Solid Waste Program. Sites within 1,500 feet of the Project corridor are listed in Resource Report No. 8.

ADEC has also implemented a community based effort to protect groundwater sources for public drinking water under the voluntary Drinking Water Protection Program (DWPP). The DWPP includes a source water assessment, as described above, and voluntary efforts may assist in the development or enforcement of local protection ordinances. Some local entities may also have Clean Water Action grants from ADEC to perform certain actions like developing a DWPP; however, for state fiscal year 2015 there are no ACWA grants within or adjacent to the Project area. There is one Clean Water Action grant in the Susitna Valley that addresses clean boating and outreach to the Deshka River boating community (ADEC, 2014).

2.2.3.2 Federal Programs

Sole-source aquifers are defined by the EPA pursuant to Section 1424(e) of the SDWA. Sole-source aquifers are aquifers that contribute greater than 50 percent of the drinking water to a specific area and for which there are no reasonably available, alternative sources of water should the aquifer become contaminated). There are no EPA designated sole-source aquifers in Alaska (EPA, 2014).

A potential option for disposing of surplus water during Project construction is through underground injection, a process regulated through EPA's Underground Injection Control Program pursuant to Section 40 CFR Part 144. As the Pre-FEED process develops, the Project may seek approval from the USEPA to develop a Class I Underground Injection Control well at the Liquefaction Facility.

A number of other important EPA programs, such as their Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also protect groundwater quality in Alaska. Sites covered by these programs are depicted in Appendix C of Resource Report No. 8. Formerly used defense sites crossed by the Project (which may have their own requirements under compliance orders issued by EPA) are also depicted.

2.2.3.3 Public Watershed Areas

Protected drinking water areas are defined by the community. This section will be further developed in a subsequent draft of this Resource Report after consultation with those communities has occurred. Table 2.2.3-2 shows how this information will be presented in the subsequent draft of this Resource Report.

TABLE 2.2.3-2

Public Drinking Water Protection Areas within Project Corridor

Facility Name	Surface Water Protection Area	Milepost of Drainage Crossed	Distance Crossed / Direction (mi)
LIQUEFACTION FACILITY			
LNG Plant	TBD	TBD	TBD
Marine Terminal	TBD	N/A	TBD
PIPELINES			
Mainline	TBD	TBD	TBD
PBTL	TBD	TBD	TBD
PTTL	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES			
Compressor Stations	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD
LNG Terminal Meter Station	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD
PBU Meter Station	TBD	TBD	TBD
PTU Meter Station	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE			
Access Roads	TBD	TBD	TBD
ATWS	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD
GTP			
GTP	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE			
Offshore West Dock	TBD	TBD	TBD
Module Staging Area	TBD	TBD	TBD
Access Roads	TBD	TBD	TBD
Construction Camp	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	TBD	TBD	TBD
Sources:			

Section 2.2.5 further describes the potential impacts of the Project on nearby wells and mitigation measures that will be taken in the event that construction activities damage a potable water source well. Section 2.2.6 describes potential operational impacts and mitigations on groundwater resources.

2.2.4 Seeps and Springs

Seeps and springs that are drinking water sources which have been identified in proximity to the Project are listed in Table 2.2.4-1 and depicted in Appendix C of Resource Report No. 8. Seeps and springs within 150 feet of the Project (or within 200 feet of a Project wastewater disposal system) will be further identified through field study, if required by FERC. Field studies may also be able to determine if seeps and springs flow seasonally, or are affected by permafrost conditions or thaws. This data will be provided in a subsequent draft of this Resource Report.

TABLE 2.2.4-1

Springs and Seeps Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Name or ID Number (If Applicable)	Approximate Distance (feet) and Direction	Public or Private
LIQUEFACTION FACILITY					
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	N/A	TBD	TBD	TBD
PIPELINES					
Mainline	TBD	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES					
Compressor Stations	TBD	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE					
Access Roads	TBD	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD	TBD
GTP					

TABLE 2.2.4-1

Springs and Seeps Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Name or ID Number (If Applicable)	Approximate Distance (feet) and Direction	Public or Private
GTP	North Slope Borough	TBD	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE					
Offshore West Dock	North Slope Borough	TBD	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD	TBD

Sources:

2.2.5 Potential Construction Impacts and Mitigation Measures for Groundwater

Groundwater use during the construction of each Project component will be summarized in Table 2.2.5-1 in a subsequent draft of this Resource Report. This will also include groundwater which is used as a source for hydrostatic test water.

TABLE 2.2.5-1

Anticipated Groundwater Use for Construction of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Groundwater Use	Source	Details
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD	TBD
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				
Compressor Stations	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD
LNG Terminal Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD

TABLE 2.2.5-1

Anticipated Groundwater Use for Construction of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Groundwater Use	Source	Details
Mainline Meter Station	North Slope Borough	TBD	TBD	TBD
Prudhoe Bay Meter Station	North Slope Borough	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE				
Access Roads	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Offshore West Dock	North Slope Borough	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD

Sources:

Construction activities that could potentially impact groundwater include the following:

- Activities that draw on aquifers;
- Activities that disturb the recharge area for an aquifer, impact infiltration rates, volume, or groundwater movement rates;
- Activities that dewater and discharge shallow groundwater, or that contact shallow groundwater directly and allow surface material to enter the groundwater system; and
- Activities that result in the release of materials which are carried into the soil and percolate to the water table, or activities that draw and discharge contaminated groundwater.

A general summary of potential impacts to groundwater from construction of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. A subsequent draft of this Resource Report will identify site-specific potential impacts to groundwater resources crossed, or in the vicinity of, the (1) Liquefaction Facility and (2) the Interdependent Facilities. Examples of some of the Project-specific plans and/or BMPs needed may include the following:

- Applicants' Erosion Control, Revegetation, and Maintenance Plan (Plan) with requested project-specific variances;
- Applicants' Wetland and Waterbody Construction and Mitigation Procedures (Procedures) with requested project-specific variances;
- A Spill Prevention, Control, and Countermeasure (SPCC) Plan;
- A Stormwater Pollution Prevention Plan (SWPPP); and/or
- State of Alaska permitted mitigation measures or BMPs.

2.2.6 Potential Operational Impacts and Mitigation Measures for Groundwater

Groundwater use during operation of each Project component will be summarized in Table 2.2.6-1 in a subsequent draft of this Resource Report.

TABLE 2.2.6-1

Anticipated Groundwater Use for Operations for the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Groundwater Use	Source	Details
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD	TBD

TABLE 2.2.6-1

Anticipated Groundwater Use for Operations for the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Groundwater Use	Source	Details
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				
Compressor Stations	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD

Sources:

Operation of the Project could potentially impact the supply and quality of groundwater resources. A general summary of potential impacts to groundwater from operation of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific potential impacts to groundwater resources crossed or in the vicinity of the (1) Liquefaction Facility and (2) the Interdependent Facilities from operational activities. Operations plans will protect groundwater from potential impacts and may include the following:

- An Alaska Pollutant Discharge Elimination System (APDES) permit required plan;
- An SPCC Plan; and
- Underground injection control well plans as specified by EPA Region 10.

2.3 SURFACE WATER RESOURCES

The surface water resources in the Project area range from salt water conditions at the northern and southern end of the Project to freshwater lakes, rivers, and streams along the Mainline corridor. The sections below describe the various surface water resources in the Project area.

2.3.1 Marine Environment

Barges\heavy lift vessels (HLVs) will deliver modules and other supplies to the existing West Dock on the North Slope and the marine construction dock, aggregate dock, and material offloading facility (MOF) at the Liquefaction Facility in Nikiski. Additional information on the dredging required and associated impacts will be provided in a subsequent draft of this Resource Report.

About 20 carriers per month will dock and load at the Liquefaction Facility. The process involves discharge of ballast water from the ship's hold. However, there are several ballast water BMPs to minimize such risks. A subsequent draft of this Resource Report will contain additional information about the marine environment. Information about LNG carriers, pilotage, and other marine vessel traffic in Cook Inlet can be found in the WSA.

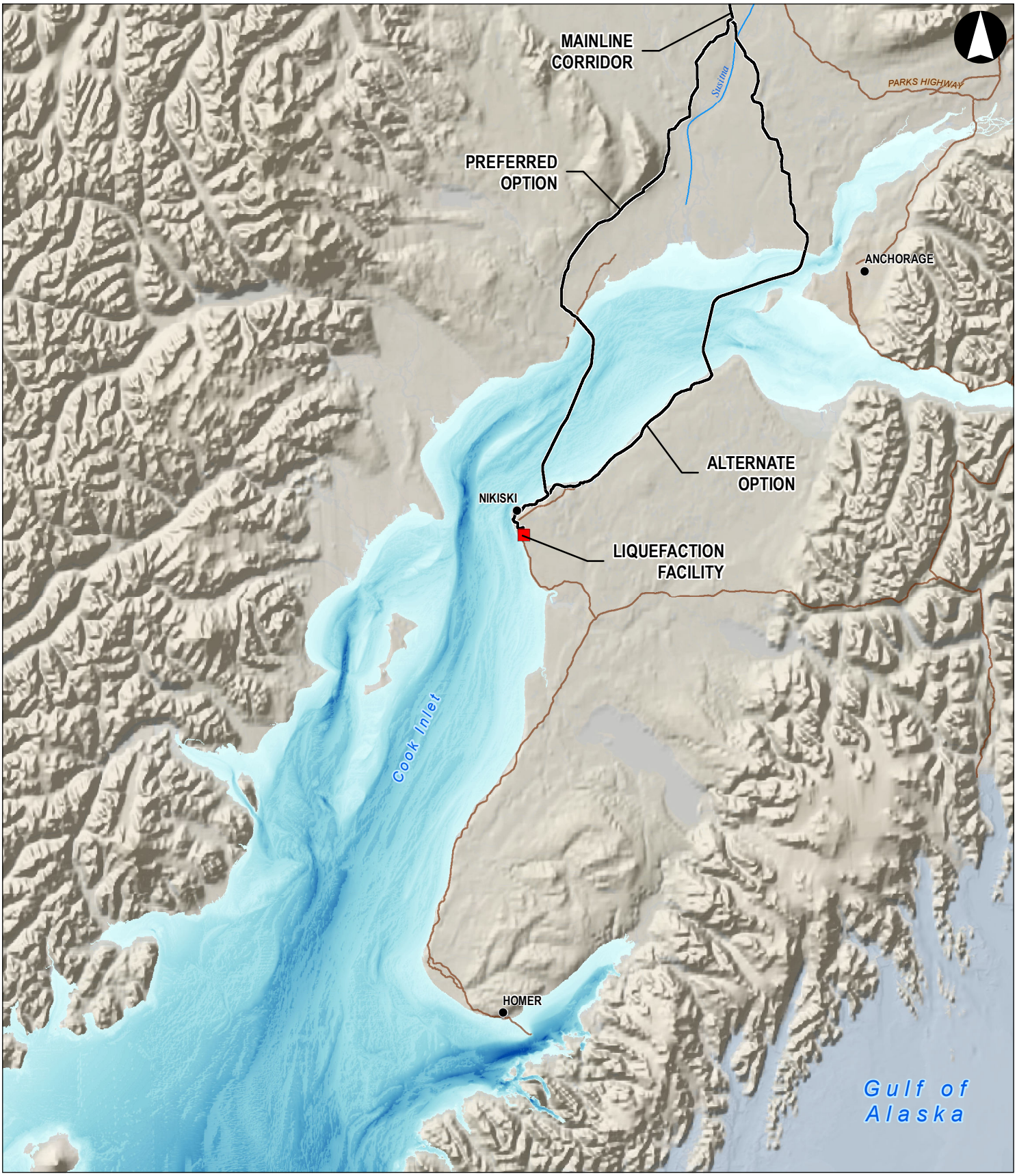
2.3.1.1 Liquefaction Facility

Cook Inlet

The Liquefaction Facility will be located on the eastern shore of Cook Inlet near Nikiski. Cook Inlet is a tidal estuary extending from the Anchorage area to the Gulf of Alaska (Figure 2.3.1-1). At the northern end of Cook Inlet are two extensions, the Turnagain Arm (an easterly extension) and the Knik Arm (a northerly extension). Cook Inlet is approximately 220 miles in length, ranging from 60 miles wide at the mouth, to 15-20 miles wide in Upper Cook Inlet. It separates the Kenai Peninsula from mainland Alaska (NOAA Nautical Chart #16660).

Water depths in the center of the channel can range from 60 to over 500 feet, with the deepest portions at the straight between the Forelands, separating Upper and Lower Cook Inlets (NOAA nautical chart #16660). Outside of the center channel, shallow-water depths in upper Cook Inlet can be as deep as 100 feet mean lower low water (MLLW). From the shoreline at the Liquefaction Facility the depth extends to 100 feet by the berthing piers.

The tides at Anchorage near the head of Cook Inlet range from 2.2 feet mean low water (MLW) to 28.4 feet mean high water (MHW), with a mean higher high water (MHHW) level at 29.2 feet (NOAA Nautical Chart #16660). At Nikiski (NOAA Station ID 9455760), the average tide ranges from 8.7 MLW to 26.5 feet MHW, with a highest predicted astronomical tide of 32.2 feet (NOAA, 2015). Storm surges (storm-induced wave run-up) in Cook Inlet are small compared to tidal fluctuations. Wave heights are generally less than 10 feet in central Cook Inlet, although they can reach up to 15 feet in upper Cook Inlet near the Beluga Point area (EPA, 2002). The tidal currents near the Project area average 0.9 knots off the coast of Anchorage, 4.6 knots in Knik Arm north of Anchorage, and 5.3 knots at the Forelands (NOAA, 2014).



X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR2\Figure 2_3_1-1 Cook Inlet Bathymetry.mxd

LEGEND

- Project Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers

200 ft or Deeper
100 - 150 ft
50- 100 ft
10 - 50 ft
Sea Level - 10 ft

0 5 10 20 Miles

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COOK INLET BATHYMETRY

FIGURE 2.3.1-1

Alaska LNG

Weather Conditions Affecting Offshore Construction and Navigation in Cook Inlet

In upper Cook Inlet, sea ice is present for up to five months per year, but year-to-year variation can be large (EPA, 2002). Icing typically forms first in the upper inlet and continues to grow in extent and thickness through February, with peak ice conditions typical in mid-February or early March. The west side of the inlet tends to accumulate more sea ice than the eastern side. During colder winters the ice may extend into the lower inlet as far south as Anchor Point on the east side and Cape Douglas on the west side (Cape International, 2012).

2.3.1.2 Interdependent Facilities

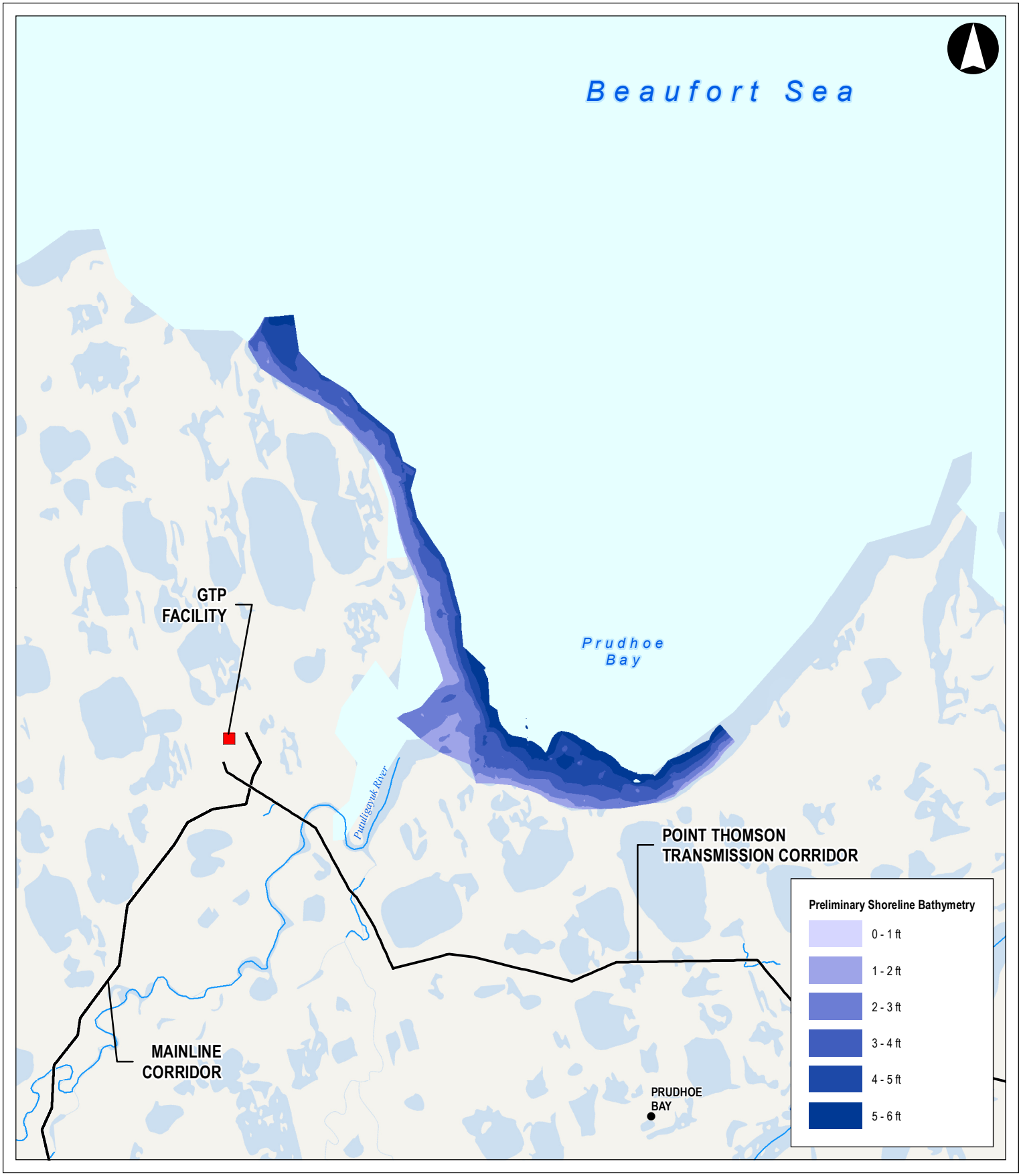
Prudhoe Bay/Eastern North Slope

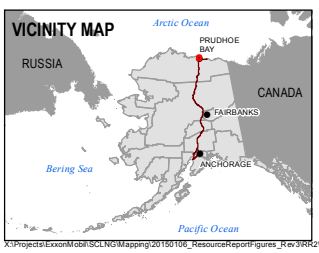
A relatively shallow marine lagoon, situated south of a barrier island complex with water depths typically ranging between 5 and 25 feet, makes up the principal marine environment in the Prudhoe Bay and Eastern North Slope area to Point Thomson (Figure 2.3.1-2). The barrier island complex parallels the coast and partially protects and stabilizes much of the shoreline from exposure to waves, storm surges, and ice generated in the Beaufort Sea. During the open-water season, sea level variation from tidal action is usually less than 1 foot, however during extreme storms, variations can reach up to 8 feet. Positive storm surges are associated with westerly winds and negative storm surges are associated with easterly winds (ADNR, 2006).

Weather Conditions Affecting Offshore Construction and Transportation

Sea ice, a dominant feature of the Arctic marine environment, generally covers the Beaufort Sea shelf for about nine months of the year (October to June). Ice encroachment occurs when sea ice is forced onshore by strong wind or currents, resulting in ice rubble and sediment being shoved as much as several hundred feet inland (ADNR, 2009; USDOI, 2003a). While the Prudhoe Bay area is somewhat protected by barrier islands from ice override hazards, ice pileup has been known to occur on the West Dock causeway, where ice rubble up to 20 feet high was reported in the late 1970s (Kovacs, 1983). Typically grounded ice only extends to depths of 6 or 7 feet. In the spring, floating landfasted ice can extend up to about 40 miles from the shore (USDOI, 2003a). In the summer, the ice pack retreats up to 50 miles from shore, but winds can bring floes back at any time (LGL Alaska Research Associates, Inc. et al., 1998). Seaward of the landfast ice is the stamukhi, or shear zone, where the mobile pack ice covering the Arctic Ocean grinds from east to west past the landfast ice. Generally lying within 60 and 100 feet of water depth, intense ice gouging of the seafloor can occur from ice ridges and keels moved by the mobile pack (ADNR, 2009).

Marine transportation is vitally important to the North Slope for the transport of equipment and materials to Prudhoe Bay and Point Thomson during the open water seasons when ice roads are not available or when heavy loads are not able to be transported via aircraft. Depending on near shore ice conditions, the open water season is generally from late July or early August through the end of September, although this season is not entirely available for barging due to subsistence whaling activity.





LEGEND

- Project Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers

0 0.5 1 2 Miles

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR2\Figure 2_3_1-2 Prudhoe Bay Bathymetry.mxd

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PRUDHOE BAY BATHYMETRY

FIGURE 2.3.1-2

Alaska LNG

The majority of projects and operations in the area coordinate with stakeholders such as the Alaska Eskimo Whaling Commission to minimize potential conflicts with subsistence activities.

Alaska's major ports are in Anchorage, Seward, Valdez, and Whittier, and much of the cargo shipped to the North Slope passes through these ports. Some cargo is transferred from barge to railroad at the ports; other cargo continues by barge to the North Slope. There is no deepwater port on the North Slope; facilities are limited to shallow-draft docks with causeway-road connections to facilities at Prudhoe Bay and beach landing areas at some local communities.

Cook Inlet

A description of the Cook Inlet is provided above in Section 2.3.1.1. The Mainline, which is an interdependent facility, will potentially cross the Cook Inlet between Anchorage and Nikiski.

2.3.2 Marine Surface Water, Indicated Quality

Surface water quality standards are promulgated at the state and federal level to protect marine waterbodies from degradation because of discharges of pollutants or other materials. The standards protect such beneficial uses of the waterbody as water supply, recreation, and fisheries. Standards are sometimes based on a variance from the natural (or background) condition of a waterbody. Information contained in this Resource Report draft is based on existing data and also includes sediment quality and contaminant information from previous studies. Further information regarding marine surface water quality will be provided in a subsequent draft of this Resource Report.

2.3.2.1 Liquefaction Facility

Cook Inlet

High suspended sediment concentrations characterize the entire upper Cook Inlet, with sediment loads increasing between the Forelands, at approximately 100-200 parts per million (ppm), to the Anchorage area at the head of the inlet, at levels greater than 2,000 ppm. High local tidal currents tend to keep this sediment suspended. Soils within Cook Inlet consist of silts, sands, gravels, cobbles, and boulders – all can be moved by the tidal fluctuations (EPA, 2002). Silicate concentrations range from 9 to 90 parts per billion (ppb) and are likely related to the overall sediment load. Sediment is carried into the upper inlet from several glacial rivers, including the Matanuska, Knik, and Susitna Rivers, among others.

Some water quality sampling has been done as a result of the oil and gas activity in Cook Inlet. This sampling has indicated that suspended and bottom sediments are relatively free of anthropogenic hydrocarbon contaminants. Total polycyclic aromatic hydrocarbon (TPAH) levels ranged from 6 to 469 ppb during sediment sampling in Cook Inlet and the Shelikof Straits from 1993-97 (EPA, 2002). TPAH Levels tested did not appear to follow any predictable patterns, but were lowest in areas with oil production activities. Total aliphatic hydrocarbons (TAHC) levels varied from approximately 50 to 2,816 ppb and also did not follow any predictable patterns.

2.3.2.2 Interdependent Facilities

Prudhoe Bay

The U.S. Bureau of Ocean Energy Management (BOEM) has conducted surface sediment sampling on the Beaufort Sea inner shelf for a number of years as part of the Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA) Project. Average grain size for the ANIMIDA monitoring area, which extends for about 100 miles on either side of Prudhoe Bay, consists of mostly sand and fine-grained material with a minor amount of gravel (Neff, 2010).

The seawater in Prudhoe Bay contains naturally occurring constituents derived from atmospheric, terrestrial, and freshwater environments, as well as those derived from human activities. Most contaminants in the Beaufort Sea and on the North Slope occur in low levels (EPA, 2009). Sampling results for water, sediment, and fauna collected as part of the ANIMIDA Project corroborate that conclusion (Brown et al., 2005; Neff, 2010). Dissolved metals concentrations in sea water throughout the coastal Beaufort Sea are similar to, or less than, world average values in coastal and marine areas (EPA, 2009).

Regional sediment samples collected for the ANIMIDA project in 1999 were analyzed for metals, polycyclic aromatic hydrocarbons (PAHs), and other organic compounds. Using older data for comparison, the concentrations of metals in the sediment samples were found to fall within the normal concentration range for Arctic marine sediments and are considered representative of natural background conditions.

Concentrations of total PAH in the sediment samples ranged from 12 to 1,800 micrograms per kilogram (µg/kg) in assemblages indicating the primary source to be peat eroded by rivers (Neff, 2010). The EPA indicates that concentrations of aliphatic and aromatic hydrocarbons in sediments from the coastal Beaufort Sea are high relative to other undeveloped outer continental shelf sediments. However, EPA similarly notes the source to be mainly derived from natural outcrops of coal and shale on land that has drained into rivers and into the coastal Beaufort Sea (EPA, 2009).

PAH analysis of ANIMIDA biota tissue samples yielded annual averages of 61–100 nanograms (ng) per gram in amphipods and 32–230 ng per gram in mussels. These levels are consistent with those measured elsewhere in the Beaufort Sea and fall well below levels that pose a health risk to humans, fish or wildlife. Similarly, concentrations of 18 metals in tissue samples collected in the Beaufort Sea from amphipods, isopods, clams, and mussels indicate that metals analyzed were in the range of those reported for the same or similar species from other locations throughout the world (Neff, 2010).

Cook Inlet

A description of the Cook Inlet is provided above in Section 2.3.2.1. The Mainline, which is an interdependent facility, will potentially cross the Cook Inlet at the northern end between Anchorage and Nikiski.

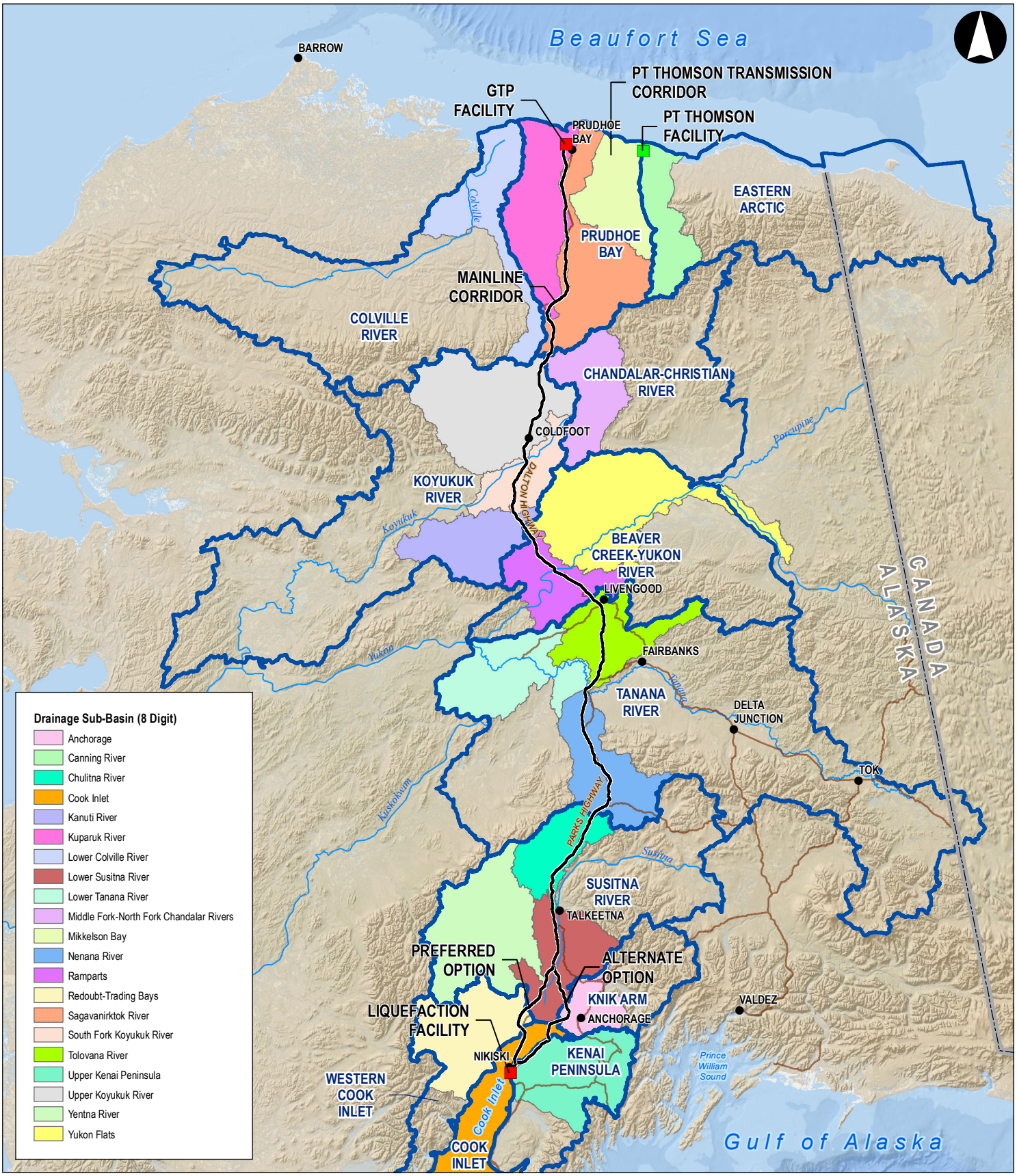
2.3.3 Freshwater Environment

As noted above, freshwater lakes, rivers, and streams occur along the Mainline corridor. The various flowing rivers and streams drain the mountains and lowlands. Some are rainfall and snowmelt driven while others are glacier-fed. Many of these streams are frozen in the winter and all achieve peak flow during

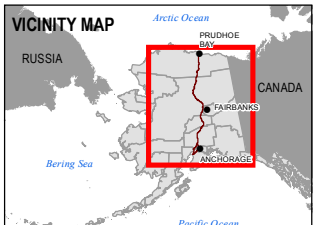
snowmelt in the late spring and early summer (May-July). Maps showing the hydrology units, drainage basins, and NHD water lines within the Project area are included in Appendix D. The following sections discuss the freshwater environment.

The Project crosses 12 major hydrologic basins in Alaska (Figure 2.3.3-1). These basins are identified based on the primary river or waterbody within the basin, as described below:

- The East Arctic – The East Artic Basin includes the Sagavanirktok River that carries runoff from the North Slope to the Beaufort Sea;
- Prudhoe Bay – The Prudhoe Bay Basin is at the northern end of the Project and is part of the Beaufort Sea. Local runoff flows to the bay;
- Colville River – The Coleville River Basin is north of the Brooks Range and drains to the Beaufort Sea;
- Koyukuk River – The Koyukuk River is a tributary of the Yukon River that drains the basin north of Fairbanks;
- Chandalar-Christian Rivers – The Chandalar and Christian River Basins contribute to the Yukon River northeast of Fairbanks;
- Beaver Creek-Yukon River – The Yukon River Basin drains an area north of Fairbanks and terminates in the Bering Sea far to the west of the Project;
- Tanana River – The Tanana River Basin contributes to the Yukon River near Fairbanks;
- Susitna River – The Susitna River Basin drains to northern Cook Inlet and contains the Susitna River. Several other large rivers such as the Chulitna and Deshka are tributary to the Susitna River;
- Knik Arm – The Knik Arm is west of the Anchorage area at the northern end of Cook Inlet. It contains the Knik River and the Matanuska River;
- West Cook Inlet – The West Cook Inlet basin includes the portion of mainland Alaska that is west of the Cook Inlet. This region includes the Beluga River;
- Kenai Peninsula Basin – The Kenai Basin includes the upland areas of the Kenai Peninsula that drain directly to the Cook Inlet; and
- Cook Inlet – The Cook Inlet Basin includes Cook Inlet and the adjacent beaches and nearshore areas.



VICINITY MAP



LEGEND

- Project Facility
- Existing Facility
- Alaska Place Names
- Project Corridor
- Major Highways
- Major Rivers
- Drainage Basin Boundary (6 Digit)

0 35 70 140 Miles

X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR2\Figure 2_3_3-1 Major Drainage Basins Along the Project Alignment.mxd

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MAJOR DRAINAGE BASINS ALONG THE PROJECT ALIGNMENT

FIGURE 2.3.3-1

Alaska LNG

These 12 basins are comprised of numerous sub-basins. Sub-basins located within the East Arctic, Prudhoe Bay, and Colville River basins drain into the Beaufort Sea; sub-basins located within the Chandalar-Christian Rivers, Koyukuk River, Beaver Creek-Yukon River, and Tanana River basins drain into the Bering Sea; and the Susitna River, Knik Arm, Western Cook Inlet, and Kenai Peninsula drain to Cook Inlet. A description of the major drainage basins crossed by the Project and the surface water quality characteristics of the waterbodies within the basins are discussed below based on USGS information. The regional basins and sub-basins that will be crossed by the Project, with the approximate mile post, are listed in Table 2.3.3-1.

TABLE 2.3.3-1

Basins and Sub-basins Crossed by the Project

Facility Name	Segment/Borough or Census Area	Basin or Sub-Basin Name	Milepost
LIQUEFACTION FACILITY			
LNG Plant	Kenai Peninsula Borough	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD
PIPELINES			
Mainline	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD
PTTL	North Slope Borough	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES			
Compressor Stations	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE			
Access Roads	TBD	TBD	TBD
ATWS	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD
GTP			
GTP	North Slope Borough	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE			
Offshore West Dock	North Slope Borough	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD

TABLE 2.3.3-1

Basins and Sub-basins Crossed by the Project

Facility Name	Segment/Borough or Census Area	Basin or Sub-Basin Name	Milepost
Material Sites	North Slope Borough	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD
Sources:			

2.3.3.1 Liquefaction Facility

Kenai Peninsula Basin

The Liquefaction Facility (excluding the Marine Terminal) will be located on the upland area of the upper Kenai sub-basin near Nikiski, within the Kenai Peninsula Basin. Glacial rivers and non-glacial streams, along with numerous ponds, lakes, and wetlands, contribute to the hydrology of the Kenai Peninsula Basin. The Kenai Peninsula Basin receives approximately 15–30 inches of precipitation annually (KPB, 2008).

There are no major freshwater watercourses near the Liquefaction Facility; however, numerous lakes are within a mile of the Liquefaction Facility site.

Cook Inlet Basin

The Marine Terminal will be positioned within the Cook Inlet Basin. The Cook Inlet Basin is comprised of the Cook Inlet Sub-basin and is a confluence of freshwater from surrounding basins and seawater. This sub-basin includes the tidal zone and the low-lying uplands adjacent to the beaches. Rocky intertidal areas are intermixed with mudflats, beaches, and benthic environments. The Marine Terminal is located approximately 10 miles north of the Kenai River, the only major river in the area, but the most popular sport fishing destination in Alaska (ADF&G, 2015).

2.3.3.2 Interdependent Facilities

The Mainline, GTP, and PTTL interdependent facilities will cross the following basins from north to south.

The East Arctic, Prudhoe Bay, and Colville River Basins

The East Arctic, Prudhoe Bay, and Colville River Basins drain the area north of the Brooks Range, and include the Arctic Foothills and Arctic Coastal Plain. The Arctic Coastal Plain, comprised of tundra, is nearly level, poorly drained, and rises to the south with an average gradient of about 10 feet per mile. South of the coastal plain, the Arctic Foothills Region is a treeless area with broad uplands and east-west trending ridges. Within the central North Slope, in or near the Mainline corridor, most streams flow in a northerly direction. Stream valleys are narrow with few tributaries because of low precipitation and little runoff. Tributaries discharge into the Sagavanirktok and Kuparuk Rivers, the principal river watersheds within this area. The Sagavanirktok River encompasses a watershed of approximately 5,512 square miles, has a main

river length of 166 miles, and an estimated average annual flow of 2,770 cubic feet per second (cfs) (APP, 2011). The major tributary to the Sagavanirktok River along the Mainline corridor is the Atigun River, which has its headwaters in the Brooks Range. One other river along the corridor, the Putuligayuk River, is a short stream system less than 30 miles in length, discharging directly into the Beaufort Sea west of the Sagavanirktok.

The Kuparuk River has a main river length of 183 miles and a drainage basin covering 4,672 square miles. The rivers estimated annual flow is 1,830 cfs on average. The Kuparuk River and its principal tributary along the Mainline corridor, the Toolik River, originate in the rolling northern foothills of the Brooks Range. The Toolik River drains 1,181 square miles, has a main-stem length of 101 miles, and an estimated average annual flow of 590 cfs (APP, 2011).

Below-freezing temperatures throughout most of the year and continuous permafrost characterize the extreme Arctic climate. There is no snowmelt or rain during the long Arctic winter. Such weather and permafrost conditions lead to wide fluctuations in stream flow.

A unique characteristic of spring snowmelt, or breakup, in this region is the accumulation of extensive areas of standing water and rapid runoff that can occur over a period of a few days due to the limited infiltration of water into the frozen tundra soils. At this time of the year, stream and river main channels are commonly filled with snow and ice, which can reduce the ability of the channel to contain peak flows. Mean annual runoff in this region is lowest near the Beaufort Sea coast, and increases somewhat in the foothills and Brooks Range. The annual runoff peak generally occurs as a result of snowmelt runoff between late May and early June; however, late summer and fall rains in August can also produce substantial runoff events.

Koyukuk and Chandalar-Christian Rivers Basin

The Koyukuk River and Chandalar-Christian River Basins will be crossed by the Mainline corridor. They include the watersheds of the Dietrich River, Middle Fork Koyukuk River, South Fork Koyukuk River, Jim River, Prospect Creek, and Kanuti River. The Koyukuk River encompasses a drainage area of 32,600 square miles and a main river length of 554 miles before discharging into the Yukon River. The annual precipitation in this region ranges from 10 to 17 inches in the lowlands to more than 20 inches in the uplands. Permafrost occurs throughout the area except under the thawed zones of major rivers and streams. Peak runoff is the result of spring snowmelt and precipitation during the summer. The rivers in this region are virtually inactive from October to April. Although some degree of seasonality is typical of most large rivers, this phenomenon is especially pronounced in Arctic and sub-Arctic rivers.

Upper Yukon River Basin

The Beaver Creek-Yukon River Basin will be crossed by the Mainline corridor in two areas:

- The West Fork of the North Fork Chandalar River on the immediate south side of Atigun Pass; and

- The area between Olsen Lake Creek and Erickson Creek including the drainages of the West Branch of the Dall River, the main-stem of the Yukon River, and the Hess Creek watershed.

The West Fork of the North Fork of the Chandalar River watershed will be crossed near its headwaters in the mountains of the Brooks Range as the stream flows east to the main-stem of the Chandalar River. This portion of the Upper Yukon Basin is situated between the East Arctic Basin and the Koyukuk Basin in more gently rolling topography on the north and south sides of the main-stem of the Yukon River. The Upper Yukon Basin is rimmed by mountainous terrain from the confluence with the Tanana River upstream all the way to the U.S.–Canada Border. The predominant physiographic feature of this region is the marshy, lake-dotted Yukon Flats. Tributaries originating in the surrounding uplands tend to have meandering reaches as they approach their Yukon River confluences.

Mean annual runoff throughout much of this basin is very low, less than 0.5 cubic feet per second per square mile in the lowland areas. Along the northern periphery of the Upper Yukon Basin, the runoff increases to nearly 2 cfs per square mile. Three basic patterns of runoff are exhibited in the Yukon River Basin: snowmelt runoff, rainfall runoff, and glacier meltwater runoff. From October through late April, runoff is minimal and streamflow gradually decreases as the temperatures drop substantially below freezing. In most years, the greatest volume of runoff occurs between May and September. Generally, snowmelt occurs earlier in this timeframe and river levels rise. River levels generally decrease after snowmelt and then rise again in response to glacier melt (where it is present) and seasonal rainfall. In locations where glaciers are present in the basin, the rise will generally be prolonged. Where the rise is the result of rainfall, it may be prolonged or short, depending upon storm patterns.

Tanana River Basin

The Tanana River basin is comprised of: the Tolovana River, Lower Tanana River, and Chena River, Salcha, Kantishna, and Nenana Rivers; the Tanana Flats, Delta River, Healy Lake, Tok, and Nebesna-Chisana Rivers sub-basins. Approximately 200 miles of the Mainline corridor intersects the Tanana River basin via the Tolovana River sub-basin and the Nenana River sub-basin. Glacially and non-glacially influenced rivers occur throughout this basin. The Tanana River, which runs from the southeast to the northwest of this basin, is fed by glacially influenced streams that originate within the Alaska Range.

Mean annual precipitation in the Tanana River basin is about 12–13 inches a year. Permafrost is discontinuous, with thaw areas occurring near streams and rivers and the adjacent lowlands. Annual peak flows typically occur in summer in response to rainfall, but will occasionally occur in the spring as a result of snowmelt. Frequent channel icing and ice-jam flooding in May contribute to a high susceptibility to floods along the tributaries and main-stem of the Tanana River (APP, 2011).

Most streams in small tributary watersheds freeze completely during most winters, leaving water under large, ice covered rivers as the only substantial source of streamflow. Water storage is seasonal and limited. The snowpack retains most precipitation during the winter, and glaciers provide some year-to-year storage that helps sustain streamflow during dry years.

Susitna River Basin

The Susitna River basin is comprised of the Upper Susitna River, Yentna River, Lower Susitna River, Chulitna River, and Talkeetna River sub-basins. Approximately 170 miles of the Mainline corridor will run through the Susitna River basin via the Chulitna River, Yentna River, and Lower Susitna sub-basins. This basin originates in the Alaska Range, flowing south before entering upper Cook Inlet. The Susitna

Basin contains parts of both the Alaska Range and the Talkeetna Mountains, as well as large portions of the lowlands that are in the Matanuska-Susitna Borough. The Susitna River basin is the 15th largest basin in the nation in terms of discharge, with the largest tributaries to the basin being the Chulitna, Yentna, and Talkeetna rivers (Cleary, 2013). Average precipitation is approximately 35 inches, but higher elevations commonly exceed 100 inches (Curran, 2012). Stream flow is driven by glacier melt, snowmelt, and rainfall. Flows generally decline in winter.

West Cook Inlet Basin

The West Cook Inlet Basin is comprised of the Redoubt-Trading Bays and Tuxedni-Kamishak Bays sub-basins. A small portion of the Mainline corridor will run through the Western Cook Inlet Basin via the Redoubt-Trading Bay Sub-basin. It addition to glaciers, a large amount of lakes and ponds within this basin feed rivers, like the Chuitna River, Beluga River, Chakachatna River, and the McArthur River that eventually discharge into Cook Inlet. Stream flows are often much lower during the winter months. Average yearly precipitation is approximately 48 inches (EPA, 1990).

Cook Inlet Basin

In addition to the Liquefaction Facilities Marine Terminal, a small portion of the Mainline corridor will also run through this basin via the Cook Inlet Sub-basin. The hydraulic characteristics of the basin and sub-basin are described above.

2.3.4 Freshwater Surface Water Quality

Alaska water quality standards may differ slightly for freshwater, but the standards protect similar uses to those for marine water. Again these uses may be water supply, recreational activities, and the propagation of anadromous and local fish.

2.3.4.1 Liquefaction Facility

Kenai Peninsula Basin

Waters within this basin consist of glacial and non-glacial streams and numerous ponds and lakes. Snow melt and rainfall often cause the isolated lakes and ponds to combine through surface water flow. Wetlands, composed primarily of peatlands, are prevalent in depressions and moraines. Surface waters are considered to have good water quality; however they are generally neutral to slightly acidic and can contain high concentrations of naturally occurring iron (DOI, 2003).

Cook Inlet Basin

The Cook Inlet basin receives water from adjacent basins, which include the Susitna River, Knik Arm, Kenai Peninsula, and West Cook Inlet basins. Urban runoff, discharges from municipal wastewater treatment systems, and discharges from various industrial activities flow into the Cook Inlet from those basins (USDOI 2003b). Again, large amounts of suspended sediments are found within this basin within the Susitna and Knik rivers. Water temperatures in this basin range from 32ºF in most streams to over 70ºF in low land streams (NOAA, 2014).

2.3.4.2 Interdependent Facilities

The East Arctic, Prudhoe Bay, and Colville River Basins

Arctic Coastal Plain streams with headwaters in the Brooks Range (e.g. the Atigun and Sagavanirktok rivers) contain coarser streambed sediments consisting of large gravel, cobbles, and boulders. On the flatter terrain of the North Slope much of the stream sediment originates from streambed, bank, and gully erosion of unconsolidated deposits. Tundra vegetation and permafrost in these areas inhibit erosion except near streambanks where water thaws the banks and removes material from beneath the vegetative cover. Smaller tributary streams in the foothills and tundra generally contain sediments comprised of finer gravel, sand, and organic materials. In this region essentially all sediment transport in streams and rivers occurs between May and October. Peak sediment concentrations and discharges generally occur during spring break up, when the majority of the annual sediment discharge normally occurs.

The concentration of total suspended solids in streams and rivers typically increases from headwaters to mouth. There is minimal glacial input to the tributaries of the major river watersheds in this basin, and consequently the stream water has high clarity in the Sagavanirktok and Kuparuk Rivers. Representative surface water temperatures for the Sagavanirktok and Kuparuk Rivers between early June and early September range from a low of 36 to 38ºF to a high of 60 to 62ºF (NOAA, 2014).

Koyukuk and Chandalar-Christian Rivers Basin

Streams within the Koyukuk Basin commonly carry minimal settleable (non-colloidal) solids. Glacial input to stream flows is minimal; therefore, water clarity during periods of non-peak flows is high. Non-glacier-fed tributaries have beds composed of sand, gravel, and cobbles; the coarser material is found in the upper reaches of streams within the basin, and the finer material in the lower reaches of the larger rivers and streams. Bed material is gradually sorted and rounded progressively downstream, and consists of gravel and cobbles in the main channel and gravel and sand on the bars.

Surface water quality is excellent, and the sediment load transported by streams and rivers is low. Concentrations of dissolved solids in surface waters range from less than 50 mg/L to nearly 200 mg/L, with major rivers such as the Koyukuk having the highest dissolved solids content. More than 95 percent of the suspended sediment load is discharged during the months of May through September (USGS, 2001).

Upper Yukon River Basin

The dissolved solids content of streams in the region south of the Brooks Range averages less than 200 mg/L. Smaller streams, with meandering courses, lower gradients, and tributaries that drain wetland areas and organic soils, contribute tea-colored water to some of the watersheds. The Yukon River's main-stem is a very large, turbid river whose water quality varies temporally between summer and winter with highest flows and highest turbidity from suspended sediment occurring during the summer. The observed range of water temperature in this region ranges from 32ºF to 52ºF (NOAA, 2014).

At its mouth, the Yukon River transports about 60 million tons of suspended sediment annually into the Bering Sea. Suspended sediment concentrations for the main-stem of the Yukon River in the vicinity of the Project area will be identified in a subsequent draft of this Resource Report. Virtually all sediment particles carried in suspension in the Yukon River are finer than 0.5 mm (0.02 inch). Streams that are tributaries to

the Yukon River in this portion of the basin commonly carry less than 100 mg/L of suspended sediment. Upper Yukon River watershed streams near the more mountainous borders of the basin may carry sediment loads of up to 500 mg/L (USGS, 2001).

Tanana River Basin

Within the Tanana River basin, the Tolvana River sub-basin, and the Nenana River sub-basin in the Project area, the rivers have a high-suspended sediment load. However, the non-glacial tributaries from the north carry lower amounts of sediment.

Within the basin, surface waters generally contain between 60 and 500 mg/L of dissolved solids, with most surface waters having less than 200 mg/L. Dissolved solids concentrations appear to be highest from streams draining the Alaska Range (USGS, 2001).

Susitna River Basin

Streams that occur within the Susitna River basin are classified as either glacial or non-glacial streams. Glacial streams have high turbidity from fine sediment during the melt-water season from May through September, but are typically lower in turbidity during winter months. Water temperatures in this basin range from 32ºF in most streams to over 70ºF in low land streams (NOAA, 2014).

West Cook Inlet Basin

The West Cook Inlet Basin is sparsely populated, but the presence of coal and timber reserves has increased activity within the area. The continued development of mineral resources and the increase in suspended sediments caused by glacial melt and storm events contributes to the basin's water quality degradation (USGS, 1999).

Cook Inlet Basin

Freshwater water quality for Cook Inlet Basin is discussed above.

2.3.5 Potentially Sensitive or Specially Designated Waterbodies

Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created to preserve certain rivers with outstanding natural, cultural and recreational values. There are no Federal or Alaska Wild and Scenic Rivers that are crossed by the Project. The North Fork of the Koyukuk River is the closest Wild and Scenic River to the Project. It is 10.5 miles to the west at its nearest point from the Project corridor.

Nationwide Rivers Inventory

Rivers listed on the Nationwide Rivers Inventory (NRI) are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be more than local or regional significance (16 U.S.C. § 1271). The following NRI-listed Rivers will be crossed by the Project:

- Lower Susitna River (part of Talkeetna River) – valued due to high angler effort for King and coho salmon. Also popular for kayaking and rafting, floating and power boating.

- Alexander Creek – popular fishing river for King and coho salmon. The upper reaches have scenic views of the Alaska Range. Class I waters encourage beginning floaters. Lower reaches contain archaeological sites of native sites, historic roadhouses and the Iditarod Trail;

- Little Susitna River – Important spawing areas for King, coho, and chum salmon. Receives the highest angling effort of the six State Recreation Rivers because of its accessibility. Popular for boating, snow-machining, dog mushing, and cross-country skiing; and

- Yentna River (also known as Johnson River) – 50 percent of the Susitna sockeye salmon are believed to spawn in this drainage. There are many popular fishing lodges, and roadhouses. The river is also popular for boating, snow-machining, dog mushing, and cross-country skiing;

No other NRI-listed rivers occur within the Project area (NPS, 2009). Crossings of these rivers will be identified by milepost in a subsequent draft of this Resource Report.

American Heritage Rivers

American Heritage Rivers are designated by the EPA to receive special attention for natural resource and environmental protection, economic revitalization and historic and cultural preservation. There are no American Heritage Rivers in Alaska.

2.3.6 Impaired Waterbodies

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waterbodies which do not meet water quality standards that these entities have set for them. There are no waterbodies within the Project area that are designated as Clean Water Act Section 303(d), impaired for water quality (ADEC, 2010).

2.3.7 Surface Water Use

Water use by others along the Project area includes uses for municipal water supply and drinking water; commercial uses, fisheries, and protecting the natural propagation and growth of fish and shellfish. Personal uses include drinking water, navigation, recreation, and subsistence hunting and fishing. Subsistence is further discussed in Resource Report No. 5. Table 2.3.7-1 details surface water uses along or near Project facilities. This list also includes downstream uses that could be impacted by a Project crossing of that waterbody.

This section will be expanded as additional Project details become available in a subsequent draft of this Resource Report.

TABLE 2.3.7-1

Surface Water Use in the Alaska LNG Project Area

Facility Name	Segment/Borough or Census Area	Surface Water Use	Waterbody Name	Details
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD	TBD
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				
Compressor Stations	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE				
Access Roads	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Offshore West Dock	North Slope Borough	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD

Sources:

2.3.8 Waterbody Crossings (excluding Wetlands)

Waterbodies that are crossed by the corridor are shown in Appendix C. The total number of waterbodies that may be affected by the Project will be determined after Pre-FEED and will be provided to the Commission in a subsequent draft of this Resource Report. The pipeline waterbody crossings will be installed using a variety of techniques depending on season, weather, and size of the crossing, typical flow and flood conditions, sediment loading, and stream hydraulics. Resource Report No. 1 provides a summary of the construction methods for crossing waterbodies. The seasonal conditions for the Project vary from the northernmost point of the Project to the southernmost reaches so this will be taken into account in developing the construction methods. However, in general, the Project can expect to see freezing in the waterbodies six to eight months per year. Freezing begins in the smaller waterbodies and ponds and marshes, and then progresses to the large bodies of water. In the southern Project areas, the largest rivers do not necessarily freeze over.

A list of waterbody crossings that are greater than 100 feet is shown in Table 2.3.8-1. These are considered major waterbody crossings. These tables will be completed following identification of the final Project route in a subsequent draft of this Resource Report.

TABLE 2.3.8-1

Major Waterbodies (≥100 feet at time of construction[a]) Crossed by the Alaska LNG Project Corridor

Facility Name	Basin/Subbasin	Segment/ Waterbody Name	Approx. Milepost	Crossing Width (feet)	Anticipated Crossing Method	Site-Specific Plan No	Construction Window
PTTL	Prudhoe Bay/Mikkelson Bay	Kadleroshilik River	TBD	TBD	TBD	TBD	TBD
PTTL	Prudhoe Bay/ Sagavanirktok River	Sagavanirktok River West Channel	TBD	TBD	TBD	TBD	TBD
PTTL	Prudhoe Bay/ Sagavanirktok River	Sagavanirktok River Main Channel	TBD	TBD	TBD	TBD	TBD
Mainline	Prudhoe Bay/ Sagavanirktok River	Pond	TBD	TBD	TBD	TBD	TBD
Mainline	Koyukuk River/Upper Koyukuk River	Middle Fork Koyukuk River	TBD	TBD	TBD	TBD	TBD
Mainline	Beaver Creek-Yukon River/Ramparts	Yukon River	TBD	TBD	TBD	TBD	TBD
Mainline	Tanana River/Lower Tanana River	Tanana River	TBD	TBD	TBD	TBD	TBD
Mainline	Tanana River/Nenana River	Nenana River (1)	TBD	TBD	TBD	TBD	TBD
Mainline	Tanana River/Nenana River	Nenana River (2)	TBD	TBD	TBD	TBD	TBD
Mainline	Tanana River/Nenana River	Pinch Point Pond	TBD	TBD	TBD	TBD	TBD
Mainline	Tanana River/Nenana River	Nenana River (3)	TBD	TBD	TBD	TBD	TBD
Mainline	Susitna River/Chulitna River	Chulitna River	TBD	TBD	TBD	TBD	TBD

TABLE 2.3.8-1

Major Waterbodies (≥100 feet at time of construction[a]) Crossed by the Alaska LNG Project Corridor

Facility Name	Basin/Subbasin	Segment/ Waterbody Name	Approx. Milepost	Crossing Width (feet)	Anticipated Crossing Method	Site-Specific Plan No	Construction Window
Mainline	Susitna River/Lower Susitna River	Deshka River	TBD	TBD	TBD	TBD	TBD
Mainline	Susitna River/Lower Susitna River	Yentna River	TBD	TBD	TBD	TBD	TBD
Mainline	Western Cook Inlet/ Redoubt-Trading Bays	Beluga River	TBD	TBD	TBD	TBD	TBD
Mainline	Cook Inlet/Cook Inlet	Cook Inlet	TBD	TBD	TBD	TBD	TBD

[a]Estimated.

2.3.8.1 Liquefaction Facility

The Marine Terminal will be in the Cook Inlet Basin (see Section 2.3.1.2) and design and construction of the facility will take into consideration the tidal and weather conditions described above for that basin. At this time, no freshwater waterbodies are expected to be crossed in building the Liquefaction Facility.

2.3.8.2 Interdependent Facilities

The total number of waterbodies that may be affected by the Project will be refined during Pre-FEED and will be provided to the Commission in a subsequent draft of this Resource Report. In addition, the presence or absence of potable surface water intakes within three miles of all Project waterbody crossings will also be included in a subsequent draft of this Resource Report.

2.3.9 Rivers and Harbors Act, Section 10 Waterbodies

Waterbodies that are of sufficient size and use may be designated as navigable under the authority Section 10 Rivers and Harbors Act, and will require a permit for work in or affecting the waterway. The Project facilities cross several of these waters as shown in Table 2.3.9-1.

TABLE 2.3.9-1

Section 10 Navigable Waterbodies Crossed by the Alaska LNG Project

Facility	Waterbody	Approx. Milepost	Basin/Sub-basin	State/Federal Designation/Sensitivity
PBTL	Beaufort Sea	TBD	Prudhoe Bay Basin Kuparuk River Sub-Basin	River and Harbors Act, Section 10
PTTL	Beaufort Sea	TBD	Prudhoe Bay Basin Kuparuk River Sub-Basin	River and Harbors Act, Section 10
PTTL	Sagavanirktok River	TBD	Prudhoe Bay Basin Sagavanirktok River Sub-Basin	River and Harbors Act, Section 10
GTP	Beaufort Sea	TBD	Prudhoe Bay Basin Kuparuk River Sub-Basin	River and Harbors Act, Section 10

TABLE 2.3.9-1

Section 10 Navigable Waterbodies Crossed by the Alaska LNG Project

Facility	Waterbody	Approx. Milepost	Basin/Sub-basin	State/Federal Designation/Sensitivity
Mainline	Sagavanirktok River	TBD	Prudhoe Bay Basin Sagavanirktok River Sub-Basin	River and Harbors Act, Section 10
Mainline	Koyukuk River	TBD	Koyukuk River Basin/Upper Koyukuk River Sub-Basin	River and Harbors Act, Section 10
Mainline	Yukon River	TBD	Bear Creek-Yukon River Basin Ramparts Sub-Basin	River and Harbors Act, Section 10
Mainline	Tolovana River	TBD	Tanana River Basin Tolovana River Sub-basin	River and Harbors Act, Section 10
Mainline	Chatanika River	TBD	Tanana River Basin Tolovana River Sub-basin	River and Harbors Act, Section 10
Mainline	Tanana River	TBD	Tanana River Basin Lower Tanana River Sub-basin	River and Harbors Act, Section 10
Mainline	Nenana River	TBD	Tanana River Basin Nenana River Sub-basin	River and Harbors Act, Section 10
Mainline	Little Susitna River	TBD	Susitna River Basin Lower Susitna River Sub-basin	River and Harbors Act, Section 10
Mainline	Susitna River	TBD	Susitna River Basin Lower Susitna River Sub-basin	River and Harbors Act, Section 10
Mainline	Cook Inlet	TBD	Cook Inlet Basin Cook Inlet Sub-basin	River and Harbors Act, Section 10
Liquefaction Facility	Cook Inlet	TBD	Cook Inlet Basin Cook Inlet Sub-basin	River and Harbors Act, Section 10

2.3.10 Potential Construction Impacts and Mitigation Measures for Surface Water

Surface water use during the construction of each Project component will be summarized in Table 2.3.10-1 in a subsequent draft of this Resource Report. This will also include surface water which is used as a source for hydrostatic test water.

TABLE 2.3.10-1

Anticipated Surface Water Use During Construction of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Surface Water Use	Source	Details
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD	TBD
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				
Compressor Stations	TBD	TBD	TBD	TBD

TABLE 2.3.10-1

Anticipated Surface Water Use During Construction of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Surface Water Use	Source	Details
Heater Stations	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE				
Access Roads	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD
Contractor Yards	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Offshore West Dock	North Slope Borough	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD
Sources:				

Temporary impacts to waterbodies from Project construction could include:

- Surface water use, including water withdrawals (e.g., hydrostatic testing);
- Releases of sediment and turbidity (e.g., dredging, construction);
- Scouring;
- Temperature change;
- Discharge of biocide; and
- Spills of fuels, lubricants, or solvents.

A general summary of potential impacts to surface water from construction of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific potential impacts to surface water resources crossed or in the vicinity of the (1) Liquefaction Facility and (2) the Interdependent Facilities. Surface water protection will also be further described in Project-specific plans and/or BMPs including:

- Applicants' Plan;
- Applicants' Procedures;
- An SPCC Plan;
- An SWPPP; and
- State of Alaska permit required mitigation measures or BMPs.

2.3.11 Potential Operational Impacts and Mitigation Measures for Surface Water

Surface water use during operation of each Project component will be summarized in Table 2.3.11-1 in a subsequent draft of this Resource Report.

TABLE 2.3.11-1

Anticipated Surface Water Use During Operation of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Surface Water Use	Source	Details
LIQUEFACTION FACILITY				
LNG Plant	Kenai Peninsula Borough	TBD	TBD	TBD
Marine Terminal	Kenai Peninsula Borough	TBD	TBD	TBD
PIPELINES				
Mainline	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES				
Compressor Stations	TBD	TBD	TBD	TBD
Heater Stations	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD
Mainline Meter Station	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD
MLBVs (not on Compressor Sites)	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE				
Access Roads	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD

TABLE 2.3.11-1

Anticipated Surface Water Use During Operation of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Anticipated Surface Water Use	Source	Details
Contractor Yards	TBD	TBD	TBD	TBD
Pipe Yards	TBD	TBD	TBD	TBD
Construction Camps	TBD	TBD	TBD	TBD
Disposal Sites	TBD	TBD	TBD	TBD
Material Sites	TBD	TBD	TBD	TBD
GTP				
GTP	North Slope Borough	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE				
Offshore West Dock	North Slope Borough	TBD	TBD	TBD
Module Staging Area	North Slope Borough	TBD	TBD	TBD
Access Roads	North Slope Borough	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD

Sources:

Temporary impacts to waterbodies from Project operations could include:

- Surface water use, including for hydrostatic test water;
- Temperature change;
- Discharge of biocide; and
- Spills of fuels, lubricants, or solvents.

A general summary of potential impacts to surface water from operation of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to surface water resources crossed or in the vicinity of the (1) Liquefaction Facility and (2) the Interdependent Facilities from operations activities. Operations plans will protect groundwater from potential impacts and may include the following:

- An APDES permit required plan; and
- An SPCC Plan.

2.4 WETLAND RESOURCES

Appendixes E, F, and G provide much more detail on wetlands resources than the overview provided here. Additional information from these appendixes, as well as previous wetlands mapping efforts (e.g., those north of Livengood, AK) will be included in a subsequent draft of this Resource Report.

Wetlands are areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support (and under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory, 1987). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, flood control, and naturally improving water quality. More than 43 percent of Alaska's surface area is comprised of wetlands (Hall et al., 1994). This amounts to more than 174 million acres of land. Nearly all of the wetlands found in Alaska are classified as palustrine.

More than half of Alaska's wetlands are located in the Northern and Western regions of the state (USACE, 2007). The Northern region of the state includes the Colville River, Prudhoe Bay, and Eastern Arctic drainage basins. Again, permafrost impedes drainage in soils, creating saturated soils in much of this area. Lakes and rivers are abundant and vegetation consists mainly of tundra.

Wetlands are less abundant in the Southcentral region which includes Western Cook Inlet, the Susitna River, Knik Arm and Kenai Peninsula drainage basins. Permafrost may occur in isolated areas throughout these drainage basins. Spruce and hardwood forests are considered the dominant vegetation, but black spruce and ericaceous shrubs (indicating wetlands) occur within lowlands and bogs. Wetlands in the Southcentral region also include scrub-shrub bogs and marshes dominated by grasses. Upper Cook Inlet contains a large amount of tidally influenced mud flats that may contain wetlands vegetation.

Two classification systems are discussed for the characterization of wetlands within the Project area:

- U.S. Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) classification system – The NWI is hierarchical, describing wetlands and deepwater habitats within five major systems (marine, estuarine, lacustrine, riverine, and palustrine) and further distinguishing by hydrologic conditions and modifiers that describe site hydrology and special conditions; and

- Hydrogeomorphic (HGM) classification system - The HGM classification system describes the wetland's position in the landscape and its function using geomorphic and hydrologic characteristics.

Using both systems provides a comprehensive assessment of wetlands within the Project area. A description of the wetland codes used by both systems is provided in Sections 2.4.1 and 2.4.2.

2.4.1 National Wetland Inventory (NWI) Codes

Cowardin classifications are used as the standard codes in the NWI which classify wetlands and aquatic habitats by system, subsystem, class, subclass, and water regime and is based on hydrologic setting (e.g., marine, riverine, lacustrine, estuarine, palustrine), vegetation structure (e.g., forested, scrub-shrub, emergent, aquatic bed), and water regime (e.g., saturated, seasonally flooded, semi-permanently flooded,

etc.) (Cowardin et al., 1979). The summary of these wetland codes and the detailed hierarchy of the USFWS code system is briefly outlined below, detailed information is found in Cowardin et al 1979.

Estuarine

The estuarine system includes deepwater tidal habitats and adjacent tidal wetlands that have partial access to the ocean. The estuarine system includes offshore areas of continuously diluted sea water. They tend to have low-energy waves, but the system is affected by oceanic tides, evaporation, wind, and freshwater runoff from land.

E1: Subtidal Wetlands – Substrate is continuously submerged.

E2: Intertidal Wetlands – Substrate is exposed and flooded by tides; includes the associated splash zone.

Lacustrine

The lacustrine system includes wetlands and deepwater habitats with the following characteristics: deepwater situated in a topographic depression or a dammed river channel; lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent aerial coverage; and total area exceeds 8 hectares (20 acres). Basins less than 20 acres in size are included if they have either a wave-formed or bedrock feature forming all or part of the shoreline, or at low water the depth is greater than 2 meters (6.6 feet) in the deepest part of the basin.

L1: Limnetic – This subsystem of lacustrine extends outward from littoral boundary and includes all deepwater habitats within the lacustrine system.

L2: Littoral – This subsystem of lacustrine extends from shoreward boundary to 2 meters (6.6 feet) below annual low water or to the maximum extent of non-persistent emergents, if these grow at depths greater than 2 meters.

Riverine

The riverine system includes channelized wetlands and deepwater habitats with periodically or continuously flowing water, or that link two standing bodies of water. Upland or palustrine wetland islands may be within the channel, but are not included in the riverine system.

R1: Tidal – This subsystem of riverine extends from the upper boundary of the estuarine system to the extreme upper limit of tidal fluctuations. The tidal reach terminates downstream where of annual average low flow. The gradient is low and water velocity fluctuates under tidal influence.

R2: Lower Perennial – This subsystem is characterized by a low gradient and slow water velocity. There is no tidal influence, and some water flows throughout the year. The substrate consists mainly of sand and mud. The floodplain is well developed. Oxygen deficits may sometimes occur.

R3: Upper Perennial – This subsystem is characterized by a high gradient and fast water velocity. There is no tidal influence, and some water flows throughout the year. This substrate consists of rock, cobbles, or gravel with occasional patches of sand. There is very little floodplain development.

R4: Intermittent – This subsystem includes channels that contain flowing water only part of the year, but may contain isolated pools when the flow stops.

Palustrine

The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, emergents, mosses, or lichens. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: are less than 8 hectares (20 acres) (ponds), do not have an active wave-formed or bedrock shoreline feature, and at low water the depth is less than 2 meters (6.6 feet) at the deepest part.

PEM: Emergent Wetland – This subsystem of palustrine is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

PSS: Scrub-Shrub Wetland – This subsystem of palustrine includes areas dominated by woody vegetation less than 20 feet tall (6 meters). The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.

PFO: Forested Wetland – This subsystem of palustrine is characterized by woody tree species that are 6 meters tall (20 feet) or taller.

PUB: Unconsolidated Bottom – This subsystem of palustrine includes all wetlands with at least 25 percent cover of particles smaller than stones, and a vegetative cover less than 30 percent. Ponds fall under the PUB classification.

PAB: Aquatic Bed – This subsystem of palustrine includes areas dominated by plants growing principally on or below the surface of the water for most of the growing season in most years, for example duckweed or pond lily.

PUS: Unconsolidated Shore – This subsystem of palustrine includes areas characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Beaches, bars, and flats are included in this class.

NWI Water Regime Modifiers

A: Temporarily Flooded – Surface water is present for brief periods during growing season, but the water table usually lies well below the soil surface. Plants that grow both in uplands and wetlands may be characteristic of this water regime.

B: Saturated – The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

C: Seasonally Flooded – Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.

E: Seasonally Flooded/Saturated – The wetland has surface water present at some time during the growing season exhibiting flooded conditions (especially early in the growing season). When surface water is absent the substrate remains saturated near the surface for much of the growing season.

F: Semi-Permanently Flooded – Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

H: Permanently Flooded – Water covers the land surface throughout the year in all years.

2.4.2 HGM Wetland Classes

Mineral Soil Flats – These wetlands do not receive groundwater discharge, rather they receive water from precipitation and overland flow. Flat wetlands lose water by evapotranspiration and saturation by overland flow. Flat wetlands are very common in permafrost soils, but can also form from an accumulation of organic material and primarily function to store surface water and provide wildlife habitat; notably, for waterfowl.

Depressional – These wetlands occur in topographic depressions. Their water source is precipitation, ground water discharge, and both interflow and overland flow from adjacent wetlands. These wetlands store surface water and provide groundwater recharge and wildlife habitat.

Slope – These wetlands occur where there is groundwater discharge to the surface. They are normally found along elevation gradients. They do not store surface water, or recharge groundwater. Instead, they mediate surface flow to other wetlands and Waterbodies.

Riverine – These wetlands occur in floodplains and riparian corridors. Their water source is primarily overbank flow, supplemented by overland flow and precipitation. Riverine wetlands can moderate stream flow, store floodwaters, and facilitate nutrient export.

Lacustrine Fringe – These wetlands occur adjacent to ponds and lakes and are largely maintained by an elevated water table. They function to store floodwater and detritus (organic material) and provide habitat for wading birds and juvenile fish.

Extensive Peatlands – These wetlands are created by the vertical accretion of organic matter. The water source for extensive peatlands is typically precipitation with water loss due to saturation and seepage to groundwater. Bogs or muskegs are common examples.

Estuarine Fringe – These wetlands occur along coasts and estuaries that are influenced by sea level. They intergrade with riverine wetlands where tidal current declines and river flow is the dominant source. These wetlands frequently flood from tidal exchange. Organic matter accumulates in higher elevated marsh areas. Salt marshes are an example of an Estuarine Fringe wetland.

2.4.3 Existing Wetland Conditions

Mapping of wetlands within the Project area is provided in Appendix F, Wetland Maps.

Additional wetland mapping, as well as field surveys, will be conducted in the Project area. The determination of wetlands and waterbodies that could be affected by construction or operation of the Project

will be made according to currently accepted methods in Alaska, as described in the "*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region*" (Regional Supplement) (USACE, 2007), and the "*USACE Wetlands Delineation Manual*" (USACE Manual) (USACE, 1987). The areas that have been evaluated to date are listed in Table 2.4.3-1 and a summary report has been provided in Appendix E that summarizes the verification work completed in 2014. In addition to the Cowardin classification system of mapping wetlands, field crews are also assessing wetland quality in accordance with the HGM classes.

Facility locations will be determined based on the outcome of further engineering. However, an approximate location for the LNG Facility and GTP has been identified. Based on desktop analysis, supplemented with field surveys, the presence of wetlands has been evaluated in over 70 percent of the Project area (see Table 2.4.3-1).

TABLE 2.4.3-1

Wetland Evaluation of the Alaska LNG Project Area

Asset	Unsurveyed (Acres)	Surveyed (Acres)	Total Target (Acres)	Percent Complete[a]
PTTL	21.14	14,220.68	14,241.81	99.8%
GTP	0.00	1,270.68	1,270.68	100%
Mainline	61,058.62	133,533.58	194,592.20	68.6%
Liquefaction Facility	0.01	1,501.01	1,501.02	100%

[a] Percent Complete is based upon desktop analysis

2.4.3.1 Liquefaction Facility

Wetlands at the Liquefaction Facility site were identified through the same means as described above. . Mapping of those wetlands and a brief report are provided in Appendices E and F.

2.4.3.2 Interdependent Facilities

The Project, including the Mainline corridor, will cross numerous wetlands. These wetland areas will be identified through wetland delineations, as described above. Following the synthesis of data from previous field seasons, continuing wetland delineations, and determination of the footprint of the interdependent facilities, this section will be updated in a subsequent draft of this Resource Report. Details will be provided similar to the basin by basin analysis presented in the Surface Water Section. A review of the wetland maps provided in Appendix F provides an overview of the corridor and the information for sections 2.4.6 through 2.4.9.

2.4.4 Wetland Crossings

This information will be provided in a subsequent draft of this Resource Report.

2.4.5 Wetland Functional Analysis

This information will be provided in a subsequent draft of this Resource Report.

2.4.6 Special Use Wetlands

This information will be provided in a subsequent draft of this Resource Report.

2.4.7 Forested Wetlands

This information will be provided in a subsequent draft of this Resource Report.

2.4.8 Potential Construction Impacts and Mitigation Measures for Wetlands

Wetland resources may be impacted by excavation and the placement of fill in the wetland, structure placement, or alteration of wetland hydrology. Examples of activities that could impact wetlands include the following:

- Clearing and grading;
- Material extraction;
- Construction of helipad/airstrips;
- Construction of ice roads/access roads;
- Waterbody crossings;
- Pipelaying and trenching through wetlands; and
- Surface water withdrawals (e.g., hydrostatic test water).

A general summary of potential impacts to wetlands from construction of projects similar to this Project is provided in Appendix G. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific impacts to wetland resources crossed or in the vicinity of the (1) Liquefaction Facility and (2) the Interdependent Facilities. The quantity, type (e.g., herbaceous, forested), and duration (i.e., temporary versus permanent) of wetland impact will determine what type of plans and BMPs that will be required. Examples of plans and/or BMPs references will include (see Appendices H through K):

- The Applicants' Procedures;
- Site-specific crossing plans;
- SWPPP (Appendix I); and

- SPCC Plan (Appendix K).

2.4.9 Potential Operational Impacts and Mitigation Measures for Wetlands

Examples of operations activities that could impact wetlands include the following:

- Continued material extraction (e.g., for facility maintenance); and
- Spills

A general summary of potential impacts to wetlands from operation of projects similar to this Project is provided in Appendix G. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific potential impacts to wetland resources crossed or in the vicinity of the (1) Liquefaction Facility and (2) the Interdependent Facilities. Examples of plans and/or BMPs references will include:

- A multi-sector general permit (MSGP) for gravel extraction activities (Sector J); and
- An SPCC Plan.

2.5 FLOODPLAINS

There are both riverine floodplains and coastal floodplains along the Project area. The Federal Emergency Management Agency (FEMA) has delineated numerous floodplains in Alaska as part of the National Flood Insurance Program (NFIP) and presented these on Flood Insurance Rate Maps. The delineation of floodplains is intended to be used in land use planning activities to reduce flood damage and impacts to waterbodies. The State of Alaska has the responsibility of managing the floodplains included in the NFIP. A great number of additional floodplains in Alaska have not been studied or delineated by FEMA.

Currently, portions of the Mat-Su Borough are the only areas along the Project corridor that FEMA has delineated. The delineation generally shows undetermined, but possible flood hazards (Class D), from Trapper Creek/Talkeetna to Willow along the Parks Highway and Susitna River. These areas are shown in Figure 2.5-1.

The focus of the FEMA mapping and the local requirements for construction in a floodplain is habitable structures. Habitable structures (homes) typically are required to have the first habitable floor above the flood elevation. Non-habitable structures are allowed to use flood-proofing measures to protect against flooding. An important feature of the development and analysis of facility siting is to conduct engineering-level analyses of the floodplains that are crossed.

2.5.1 Liquefaction Facility

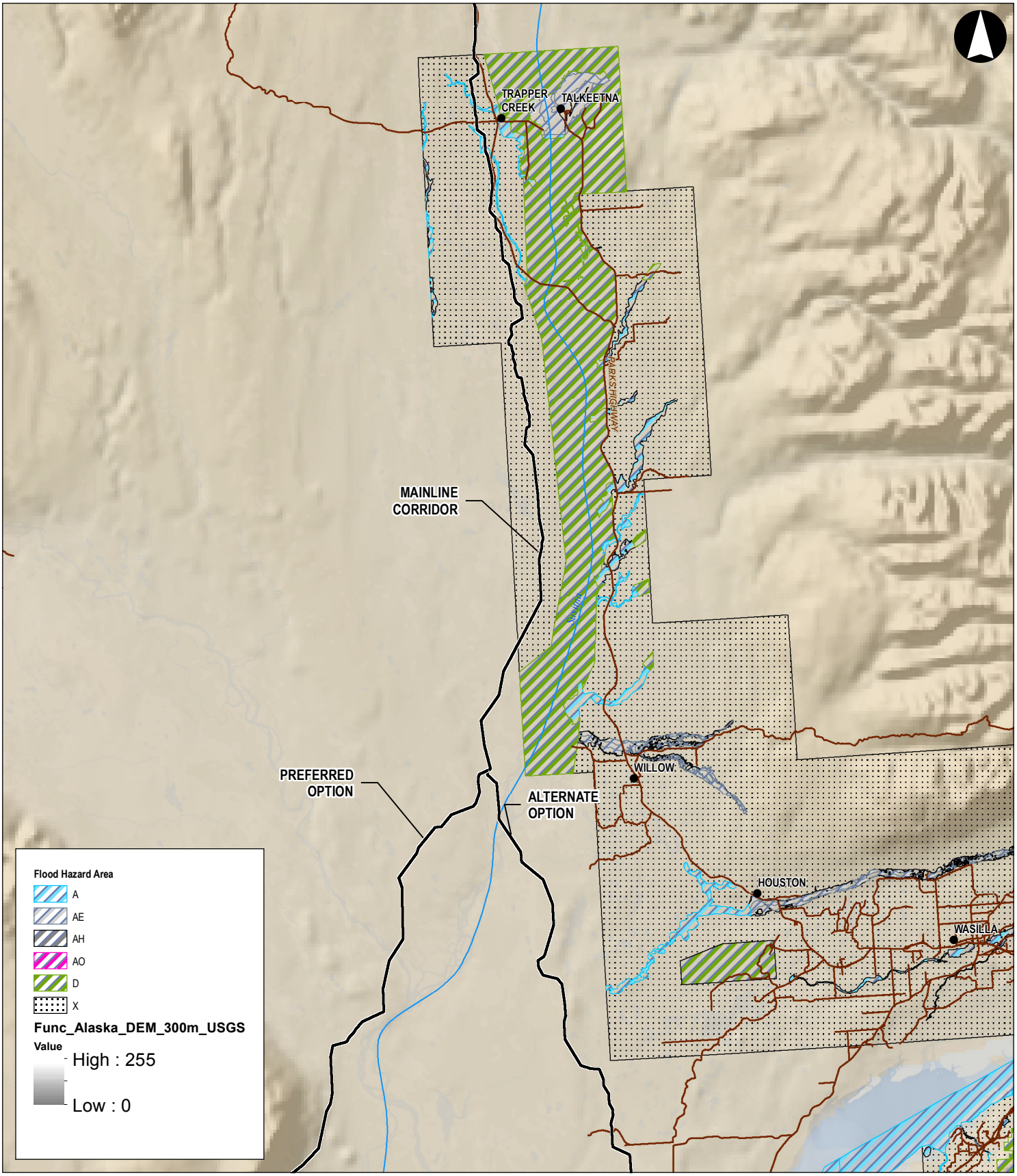
The Liquefaction Facility will be located along Cook Inlet near Nikiski, this is predominately an area of coastal flooding. There are no major rivers or streams in the vicinity of the facility, but there are large lakes less than a mile away.

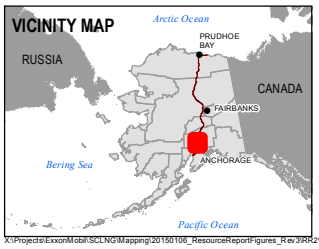
The limits of coastal flooding are determined through an analysis that considers tidal height and storm surge. The Marine Terminal will be located within the coastal zone floodplain and is susceptible to flooding and wave-caused erosion. Once the footprint of the Liquefaction Facility has been determined, the extent of coastal flooding can be calculated and compared with Project siting criteria. This information will be provided in a subsequent draft of this Resource Report.

2.5.2 Interdependent Facilities

The GTP will be located on the North Slope where potential flooding sources include coastal flooding, rivers, and the numerous lakes that dominate the area. Coastal flooding results from a combination of high tide and storm surge and can travel inland for some distance depending on the topography. Several rivers cross the North Slope and discharge to the Beaufort Sea. There are floodplains associated with these rivers although they have only been estimated by FEMA's NFIP Program in populated areas (Barrow, Deadhorse, and Kaktovik). Near Deadhorse, FEMA has identified the floodplain through approximate methods rather than a detailed hydraulic study. The floodplain in this area is extensive, covering a large area, suggesting the Project would be in this floodplain. Localized lakes, which may increase in surface area during extreme rainfall or breakup events and flood adjacent land, present another source of potential flooding. Once the footprint of the GTP has been determined, the extent of coastal and potential riverine flooding can be calculated and compared with Project siting criteria. This information will be provided in a subsequent draft of this Resource Report.

The Mainline corridor contains the Class D flood hazard area described in 2.5; however, the current preferred routing option builds the Mainline to the west of the flooding area. The remaining pipeline facilities cross a large number of rivers and each will need to be reviewed to determine their floodplain limits and areas of concern in relation to the floodplain. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific floodplain conditions.





X:\Projects\ExxonMobil\SCLNG\Mapping\20150106_ResourceReportFigures_Rev3\RR2\Figure 2_5-1 Fema Flood Zone Areas.mxd

LEGEND

- Alaska Place Names
- Project Corridor
- Major Roads
- Major Rivers

0 3 6 12 Miles

DISCLAIMER

The information contained herein is for informational or planning purposes only, It does not nor should it be deemed to be an offer, request or proposals for rights or occupation of any kind. The Alaska LNG Project Participants and their respective officers, employees and agents, make no warranty, implied or otherwise, nor accept any liability, as to the accuracy or completeness of the information contained in these documents, drawings or electronic files. Do not remove or delete this note from document, drawing or electronic file.

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FEMA FLOOD ZONE AREAS

FIGURE 2.5-1

Alaska LNG

2.5.3 Potential Construction Impacts and Mitigation Measures for Floodplains

Where the Project will cross delineated or non-delineated floodplains, the potential exists for impacts to the facilities during flooding events. Operational impacts to floodplains occur if the facility presents an encroachment into the floodplain thereby altering the flood depth, velocity, or extends the flooding area. Other potential impacts could occur at river crossings where additional bed scour may occur because of piers or the pipeline. General activities that could impact floodplains or impede flooding includes:

- Clearing and grading;
- Trenching;
- Vertical Support Members (VSMs) for bridging;
- Docks/above water work.
- Construction of ice roads/access roads; and
- Gravel pads or structures;

A general summary of potential impacts to floodplains from construction of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific potential impacts to floodplains crossed by the (1) Liquefaction Facility and (2) the Interdependent Facilities. Plans and/or BMPs references may include:

- Applicant's Procedures;
- SWPPP (Appendix I); and
- HDD Inadvertent Release Plan (Appendix J).

2.5.4 Potential Operational Impacts and Mitigation Measures for Floodplains

A general summary of potential impacts to floodplains from operation of projects similar to this Project is provided in Appendix A. This Appendix also includes a summary of the types of plans, as examples, that can be developed to address potential impacts. As additional Project details become available, a subsequent draft of this Resource Report will identify site-specific potential impacts to the floodplains crossed, or in the vicinity of, the (1) Liquefaction Facility and (2) the Interdependent Facilities. Included will be a discussion of site-specific proposed mitigation measures. General mitigation measures will be incorporated into aboveground facility designs.

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APPENDIX A GENERAL IMPACTS FROM SIMILAR PROJECTS IN ALASKA

Potential Impact	Project Activity												*Potential Plans to Address Impacts
	Grading, Clearing, Excavating (incl. Blasting), Trench, Pipelay, Backfill, Reclamation	Water Crossings (Pipelines & Bridges)	Ice Roads & Pads	Erosion Control & Drainage Control	Water Withdrawal & Usage	Water Discharge	Solid Waste Storage & Disposal	General Infrastructure Activities	Facility Construction	Facility Operations	Offshore Construction	Resource Report No.	
Air Emissions (including dust) from Construction	X	X	X	X	X	X	X	X	X		X	1, 9	C, J, O, T, W
Air Emissions from Operations										X		9	J, W, LL
Surface Water Quality Impacts (Increased Turbidity [TSS] / Sedimentation in Surface Water)	X	X	X	X	X	X	X	X	X	X	X	2, 3, 7	G, H, J, T, V, Y, II, KK
Contamination Migration	X	X				X	X	X		X		1, 2, 3, 7	G, I, GG
Disruption / Loss of Wildlife, Fish or Marine Mammal Habitat	X	X	X	X	X	X		X	X	X	X	2, 3	A, B, C, G, H, K, N, R, V, DD, EE, JJ
Disturbance & Vessel Strikes from Vessel Traffic								X		X	X	3	B, N
Disturbance of Known Historic Archaeological or Architectural) and Paleontological Resources	X	X	X					X	X		X	1, 4, 6, 7	C, D, E, Z, AA
Erosion	X	X		X		X			X		X	1, 2, 6, 7, 8	G, H, II, KK
Groundwater Impacts (Withdrawal, Drawdown, Vertical & Horizontal Hydraulic connectivity, Wells)	X	X	X		X				X	X		1, 2	Y, MM
Hazards to Aviation								X	X	X		1, 11	M
Hazards to Marine Navigation		X						X			X	1, 11	B, M
Inadvertent HDD Mud Release		X										1, 2, 3, 7	I
Incidental Take of Wildlife, Birds, & Marine Mammals	X	X	X		X	X	X	X	X		X	3	A, B, C. F, G, H, N, R
Increased Surface Water Runoff	X			X		X			X	X		2, 3, 7	Y, II
Introduction of Non-native Species	X	X	X			X		X	X	X	X	2, 3	G, K, KK
Impact to Public Use or Public Land	X	X						X	X	X	X	1, 2, 3, 8	B, F, H, L, BB, CC, FF
Impacts to existing infrastructure	X							X	X	X	X	1, 2, 3, 7, 8	M, S, U
Construction Noise Impacts	X	X						X	X			3, 9	C, F, P, N, FF, JJ
Operational Noise Impacts										X		9	F, P, FF
Potential Impacts to Vegetation, Wildlife, Fish, Birds, & Threatened Species	X	X	X	X	X	X	X	X	X	X	X	1, 2, 3, 6, 7, 8, 9	A, C. G, H, K, Q, R, T, DD,EE, JJ
Fish passage impacts		X										3	H, DD, JJ
Reduced Surface Water Recharge Rates	X		X		X	X						2, 3, 6	V, Y, MM
Watercourse Realignment and Scouring		X		X		X		X	X			2	G, H, V
Seismic Hazards / Mass Wasting, Soil Liquefaction	X	X						X	X	X	X	1, 6, 11	X
Tundra Degradation, Thermokarst	X	X	X	X	X				X	X		2, 3, 6, 7	G, X, KK
Unanticipated Discovery of Cultural Resources	X	X	X					X	X		X	1, 4	D, E
Unanticipated Discovery of Paleontological Resources	X	X						X	X		`	1, 4, 6	C, Z, AA
Unplanned spills/releases		X							X	X	X	2	G, I, HH, II
Vegetation & Topsoil Degradation or Loss	X		X	X				X				3, 7	G, II, KK

Potential Impact	Project Activity												*Potential Plans to Address Impacts
	Grading, Clearing, Excavating (incl. Blasting), Trench, Pipelay, Backfill, Reclamation	Water Crossings (Pipelines & Bridges)	Ice Roads & Pads	Erosion Control & Drainage Control	Water Withdrawal & Usage	Water Discharge	Solid Waste Storage & Disposal	General Infrastructure Activities	Facility Construction	Facility Operations	Offshore Construction	Resource Report No.	
Vertical and Horizontal Hydraulic Connectivity of Ground Water and Surface Water (Groundwater Discharge to Surface Water)	X	X	X		X	X			X		X	2, 3	C, G, X, Y, MM
Visual Impacts	X	X					X	X	X	X	X	1, 8	L, V, CC
Waste from Construction and Operations - Liquid and Solid, Hazardous and Non-Hazardous									X	X		2, 8	T
Impacts to Wetlands – footprint and functionality									X			2	DD, EE
***Potential Plans to Address Activity**	**A, C, D, E, G, K, L, O, P, R, Z, GG, II, KK**	**D, E, G, H, I, K, L, O, V, Y, DD, EE, II, JJ**	**G, L, O, R**	**G, L, O, V, II, KK**	**G, L, O, MM**	**G, K, L, O Y, MM**	**G, O, T, Y, GG, HH**	**D, G, M, O, R, S, HH, II**	**D, E, F, G, K, M, P, R, S, T, W, X, Z, FF, GG, HH, JJ, II, MM**	**F, HH, J, K, O, P, R, T, W, FF, MM**	**D, E, G, M, N, O, P, Q, R, W**	**All**	

List of Potential Plans*

A.	Avian Protection Plan
B.	Marine Logistics Shipping Plan
C.	Blasting Plan
D.	Unanticipated Cultural Resource Discovery Plan
E.	Cultural Resources Data Recovery Plans and/or Treatment Plans
F.	Ambient Noise Level Studies
G.	FERC 2013 Wetland and Waterbody Construction and Mitigation Procedures with Requested Project-Specific Variances (the Applicants' Procedures) AKLNG Procedures
H.	Site-specific Waterbody Crossing Plans
I.	HDD Inadvertent Release Plan (Project Specific HDD Contingency Plan)
J.	Health Impact Assessment
K.	Invasive Species Mitigation Plan
L.	Public Land Construction Plan
M.	Project Logistics Plans
N.	Marine Mammal Mitigation and Monitoring Plan
O.	Mobile Emissions Control Plan
P.	Noise Control and Mitigation Plan
Q.	Plan of Cooperation (POC)
R.	Polar Bear and Wildlife Interaction Plan
S.	Project Transportation Plan
T.	Project Waste Management Plan
U.	Project-specific Railroad crossing Plans
V.	Riparian Buffer Planting Plan
W.	Modeling Site-specific Impacts to Air Quality Emissions
X.	Site-specific Geohazards Plan
Y.	Water Monitoring Plan
Z.	Unanticipated Paleontological Discovery Plan
AA.	Paleontological Resources Management Plans
BB.	Site-specific Public Land Use and Recreational Use Coordination Plans
CC.	Visual Aesthetics Study
DD.	Site-specific Wetland Resources Crossing Plans (as required)
EE.	Wetland Mitigation Plans
FF.	Site-specific Noise Mitigation Plans (as required)
GG.	Unanticipated Contamination Discovery Plan
HH.	Spill Prevention, Control, and Countermeasure Plan (SPCC)
II.	Storm Water Pollution Prevention Plan (SWPPP) – general and spread specific
JJ.	Species-specific Wildlife Protection Plan
KK.	FERC 2013 Upland Erosion Control, Revegetation, and Maintenance Plan with Requested Project-Specific Variances (the Applicants' Procedures) AKLNG Plan
LL	Design/Operations Emissions Management Plan
MM	Groundwater Management Plan

* In addition to the potential plans listed above, FERC requires implementation plans that outline how the Project will meet all required environmental permits and stipulations. The applicants will also prepare overarching Construction Environmental Management Plans and Operations Environmental Management Plans for the Project.

APPENDIX B PUBLIC AND PRIVATE WATER WELLS WITHIN 150 FEET OF THE ALASKA LNG PROJECT

Appendix B

Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
LIQUEFACTION FACILITY							
Liquefaction Facility	Kenai Peninsula Borough	TBD	410	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16756	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16757	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16758	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16759	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16760	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16761	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16762	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16763	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16764	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16765	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16766	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16767	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16768	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16769	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16770	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16771	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16773	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16774	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16775	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16776	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16779	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16780	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	16781	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17059	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17191	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17192	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17224	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17999	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19107	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21341	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21342	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21343	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21344	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21345	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21346	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21347	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21348	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21349	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21350	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21351	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21352	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21518	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24782	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24783	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24784	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25226	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	25233	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25234	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25237	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25238	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25239	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25240	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25241	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25242	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25243	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25244	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27811	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27812	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27813	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27814	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27815	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27816	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	31756	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	32916	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	33268	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	9949	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	12161	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13565	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15972	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17032	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17033	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17034	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17035	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17036	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17037	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17038	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17039	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17041	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17044	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17047	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17048	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17049	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17050	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17051	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17052	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17053	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17055	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17056	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17057	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17058	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17188	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17194	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17195	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17196	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17197	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17198	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17199	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17200	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17201	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17202	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17203	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17204	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17205	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17206	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17207	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17208	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17209	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17210	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17212	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17213	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17214	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17215	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17216	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17217	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17218	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17219	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17220	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17221	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17223	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17225	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17226	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17227	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17228	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17229	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17230	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17231	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17232	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17233	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17234	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17235	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17236	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17237	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17238	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17239	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17240	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17241	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17242	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17243	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17244	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17245	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17246	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17247	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17768	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17826	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17866	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18002	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20656	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20657	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20658	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20659	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20660	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20661	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20662	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20663	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20664	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20665	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20667	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20668	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20669	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20670	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20671	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22467	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22468	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	23334	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24245	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24246	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	24247	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24248	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24249	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24250	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24251	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24252	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24253	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24254	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24255	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24256	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24257	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24258	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24259	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24260	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24261	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24262	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24263	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24265	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24850	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25223	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25224	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25225	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25227	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25228	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	25229	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25230	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25231	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25232	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25235	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25236	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	32973	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	1562	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	3876	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	3888	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	5495	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	5496	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	5497	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	5534	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13560	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13561	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13562	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13635	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13664	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15733	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16090	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17065	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17066	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17068	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17069	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17070	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17071	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17072	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17073	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17073	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17074	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17075	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17076	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17077	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17078	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17079	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17080	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17081	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17082	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17083	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17084	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17085	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17086	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17087	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17088	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17089	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17090	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17091	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17092	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17093	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17094	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17095	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17096	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17097	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17098	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17099	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17100	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17101	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17102	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17103	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17104	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17105	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17106	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17107	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17347	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17348	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17349	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17442	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17445	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17446	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17448	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17450	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17451	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17453	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17454	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17455	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17456	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17457	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17458	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17459	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17460	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17466	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17467	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17468	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17469	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17471	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17504	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17518	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17521	TBD	Unknown	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17523	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17524	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17525	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17526	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17527	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17528	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17530	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	18310	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18679	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19245	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19479	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20785	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21517	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21560	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22017	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22261	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22265	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22387	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	23230	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	23408	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24342	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24786	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24787	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24788	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24789	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27710	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	175	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13558	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13563	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13564	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13566	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	13567	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13568	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17108	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17109	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17110	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17111	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17112	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17113	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17114	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17115	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17116	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17117	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17118	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17119	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17120	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17121	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17122	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17123	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17124	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17125	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17126	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17127	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17128	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17129	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17130	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17131	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17132	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17133	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17134	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17135	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17136	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17137	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17138	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17139	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17179	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17193	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17250	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17522	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18127	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18253	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18279	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18570	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18688	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19955	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19956	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20719	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20722	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20723	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	20724	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20725	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	21519	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22388	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22389	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25669	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	25670	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17140	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17141	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17142	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17143	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17144	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17145	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17146	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17190	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20718	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20720	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20721	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27817	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27818	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27819	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	27820	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	3013	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17147	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17148	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17149	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17150	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17151	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17152	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17153	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17422	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17592	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17823	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18242	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18656	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19957	TBD	Unknown	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19958	TBD	Unknown	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19967	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22390	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22461	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	23483	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	2079	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	2268	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	13445	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15086	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15520	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15966	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	15977	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	16281	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16384	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	16397	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17154	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17155	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17156	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17428	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17430	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17431	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17432	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17433	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17434	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17435	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17436	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17437	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17438	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17439	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17440	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17441	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17483	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17484	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17485	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17486	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17488	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	17489	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17490	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17491	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17492	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17493	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17494	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17495	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17496	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17497	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17498	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17499	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17501	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17502	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17517	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17595	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17596	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17597	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	17776	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18214	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18347	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18368	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18424	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18447	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18451	TBD	TBD	TBD	TBD

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Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Liquefaction Facility	Kenai Peninsula Borough	TBD	18455	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18477	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18649	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18666	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18690	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18693	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18711	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18797	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	18154	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19334	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19339	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19340	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19959		Unknown		
Liquefaction Facility	Kenai Peninsula Borough	TBD	19960	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19961	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	19962		Unknown		
Liquefaction Facility	Kenai Peninsula Borough	TBD	19963	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	20081	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	22945	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	23022	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24861	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24863	TBD	TBD	TBD	TBD
Liquefaction Facility	Kenai Peninsula Borough	TBD	24867	TBD	TBD	TBD	TBD
PIPELINES							

Appendix B

Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Mainline	Kenai Peninsula Borough	TBD	TBD	TBD	TBD	TBD	TBD
	Cook Inlet Crossing	TBD	TBD	TBD	TBD	TBD	TBD
	Matanuska-Susitna Borough	TBD	TBD	TBD	TBD	TBD	TBD
	Denali Borough	TBD	TBD	TBD	TBD	TBD	TBD
	Fairbanks North Star Borough	TBD	TBD	TBD	TBD	TBD	TBD
	Yukon-Koyukuk Census Area	TBD	TBD	TBD	TBD	TBD	TBD
	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
PBTL	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
PTTL	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
PIPELINE ABOVEGROUND FACILITIES							
Compressor Stations	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Heater Station	TBD	TBD	TBD	TBD	TBD	TBD	TBD
PTU Meter Station	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
PBU Meter Station	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Mainline Meter Station	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Liquefaction Facility Meter Station	Kenai Peninsula Borough	TBD	TBD	TBD	TBD	TBD	TBD
MLBVs (not on Compressor sites)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
PIPELINE ASSOCIATED INFRASTRUCTURE							
Access roads	TBD	TBD	TBD	TBD	TBD	TBD	TBD
ATWS	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Contractor yards	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Pipe yards	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Construction camps	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Disposal sites	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Material sites	TBD	TBD	TBD	TBD	TBD	TBD	TBD
GTP							
GTP	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
ASSOCIATED GTP INFRASTRUCTURE							
Offshore West Dock	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Module Staging Area							

Appendix B

Public and Private Water Wells Within 150 Feet of the Alaska LNG Project

Facility Name	Segment/Borough or Census Area	Approx. Milepost	Well ID	Approximate Distance (feet) and Direction	Public and Private	Depth (feet)	Type
Access Roads	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Construction Camp	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Material Sites	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD
Water Reservoir, Pump Facilities, Transfer Line	North Slope Borough	TBD	TBD	TBD	TBD	TBD	TBD

Sources:
[1] WELTS Database (2014).

APPENDIX C LIST OF WATERBODIES CROSSED BY THE PROJECT

To be filed in a subsequent draft of this resource report

Appendix C

Waterbodies Crossed by the Project
(To Be Updated in a Subsequent Draft of this Resource Report)

Alaska LNG Waterbody Crossing Identification Number	Segment / Waterbody Name / Sub-Basin	Milepost [a]	Flow [b]	Summer Wetted Width [c] (feet)	Wetted Width at Time of Construction (feet) [d]	Special Designation [e]	State WQ Class	Proposed Construction Season [f]	Proposed Crossing Method [g]
LIQUEFACTION FACILITY									
LNG plant									
Marine Terminal									
PIPELINES									
Mainline									
PTTP									
PBU Gas Transmission Pipeline									
PIPELINE ASSOCIATED INFRASTRUCTURE									
Access roads									
ATWS									
Contractor yards									
Pipe yards									
Construction camps									
Disposal sites									
Material sites									
GTP									
GTP									
ASSOCIATED GTP INFRASTRUCTURE									
Module Staging Area									
Access Roads									
Construction Camp									
Material Sites									

Appendix C

Waterbodies Crossed by the Project
(To Be Updated in a Subsequent Draft of this Resource Report)

Alaska LNG Waterbody Crossing Identification Number	Segment / Waterbody Name / Sub-Basin	Milepost [a]	Flow [b]	Summer Wetted Width [c] (feet)	Wetted Width at Time of Construction (feet) [d]	Special Designation [e]	State WQ Class	Proposed Construction Season [f]	Proposed Crossing Method [g]
Water Reservoir, Pump Facilities, Transfer Line									
ANCILLARY FACILITIES									

a PMP = Point Thomson Gas Transmission Pipeline milepost, AMP = Alaska Mainline milepost.

b Flow characteristics were obtained from field surveys, knowledge of the area, and from USGS topographic maps.
I - Intermittent flow
P - Perennial flow

c Crossing widths are estimated from 2010 aerial photographs and are based on water's edge to water's edge or cumulative edge to edge for braided channels at the time when the aerial photographs were taken.

d Crossing widths at the time of crossing.

e "Major" waterbody - defined by FERC has having a water's edge to water's edge width at time of construction great than 100 feet; "Intermediate" = >10 ft. to ≤100 ft.; "Minor" = ≤10 ft.;

f [Note: ***The construction schedule is preliminary and subject to change.***

g OC - Open-cut conventional method
HDD – Horizontal directional drill
MT - Microtunnel
DRY – Dry open-cut method
AERIAL – Aerial crossing method

h Denotes crossings that may involve blasting.

APPENDIX D HYDROLOGY MAPS

PROVIDED UNDER SEPARATE COVER