U.S. Army Corps of Engineers Department of the Army

Permit Application Supplemental Information

November 22, 2019

AKLNG-6020-REG-APP-DOC-00001

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REVISION HISTORY

Rev	Date	Description	Originator	Reviewer	Approver
0	April 14, 2017	For Use	K. Stevenson	M. Thompson	F. Richards
1	May 30, 2019	For Use	K. Stevenson	L. Haas	F. Richards
2	Nov. 4, 2019	For Use	M. Holley (exp)	L. Haas	F. Richards
3	Nov. 22, 2019	For Use	M. Holley (exp)	L. Haas	F. Richards
Approver Signature*					

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

MODIFICATION HISTORY

Rev	Section	Modification
1	All	Incorporates responses to comments from USACE on June 16, 2017 and May 18, 2018
1	All	April 2017 was submitted under point-in-time DCN: AKLNG-6020-REG-APP-REC-00002. Updated DCN to reflect managed change
2	All	Updated to show DNPP as the preferred route alternative, and to answer US Army Corps of Engineers questions.
3	All	Updated to address USACE questions and feedback.

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5: USACE Seattle District Dredged Material Evaluation and Disposal Procedures – User Manual (RR03, Appendix R)
6A: Alaska LNG Project Wetland and Waterbody Construction and Mitigation Procedures (RR02, Appendix N)
6B: Analysis of Engineering Design Alternatives, Right-of-Way Width, and Construction Modes in Wetlands
6C: Segregation of the Surface Layer
7: Site-Specific Construction Drawings: Site-Specific Waterbody Crossings Plans (Revised)
8: Sediment Chemical Analytical Data from West Dock Test Trench Sites (RR02, Appendix R)
9: Least Environmentally Damaging Practicable Alternative (LEDPA) Analysis (RR10, Appendix D)
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11: List of Waterbodies Crossed by the Project (RR02, Appendix H)
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14: Hydrostatic Test Source and Discharge
15: Wetland Compensatory Mitigation Plan
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16B: Revegetation Plan (Revised)
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16E: Streambank and Bed Restoration Manual
16F: Draft Water Use Plan
17: Land Owner List (Revised)
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ACRONYMS AND ABBREVIATIONS

§ .... Section or Paragraph
ADEC............................. Alaska Department of Environmental Conservation
ADF&G........................... Alaska Department of Fish and Game
AGDC .... Alaska Gasline Development Corporation
ATWS............................. Additional Temporary Workspace
BSCF/D .... Billion Standard Cubic Feet per Day
CGF .... Central Gas Facility
C.F.R. .... Code of Federal Regulations
CRA .... Certificate of Reasonable Assurance
CY .... Cubic yard
DA................................. Department of the Army
DH .... Dock head
DOE .... Department of Energy
EPAct 2005 .... Energy Policy Act of 2005
FERC .... Federal Energy Regulatory Commission
FTA .... Free Trade Agreement
GIS .... Geographic Information Systems
GTP .... Gas Treatment Plant
H_2S............................... Hydrogen Sulfide
HP .... Horse power
LEDPA .... Least Environmentally Damaging Practicable Alternative
LNG............................... Liquefied Natural Gas
Lo-Lo............................. Lift-on/Lift-off
Mainline .... An approximately 807-mile long, large-diameter pipeline
MAOP .... Maximum Allowable Operating Pressure
MLBV .... Mainline Block Valve
MLLW .... Mean Lower Low Water
MMTPA .... Million Metric Tonne per Annum
MMSCF/D .... Million Standard Cubic Feet per Day
MOF.............................. Material Offloading Facility
NACE .... National Association of Corrosion Engineers
NGA .... Natural Gas Act
PBU............................... Prudhoe Bay Unit
PBTL.............................. Prudhoe Bay Gas Transmission Line
PJD................................ Pre-Jurisdictional Determination
Plan .... Draft Wetland Mitigation Plan
PLF .... Product Loading Facility
Project........................... Alaska LNG Project
Psig .... Pounds per square inch

PTTL...............................Point Thomson Gas Transmission Line
PTU................................Point Thomson Unit
ROW ....Right-of-Way
Ro-Ro.............................Roll-on/Roll-off
SPMT ....Self-propelled modular transporter
STP.................................Seawater Treatment Plant
U.S. ....United States
USACE............................U.S. Army Corps of Engineers
VSM ....Vertical Support Member

1. INTRODUCTION

The Alaska Gasline Development Corporation (the Applicant) plans to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope, for export in foreign commerce and for in-state deliveries of natural gas.

The Natural Gas Act (NGA) (2006)[1] and Federal Energy Regulatory Commission (FERC) regulations (2014)[2], 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 807-mile gas pipeline (Mainline); a gas treatment plant (GTP) within the PBU on the North Slope; an approximately 63-mile gas transmission line connecting the GTP to the PTU gas production facility (Point Thomson Gas Transmission Line or PTTL); and an approximately 1-mile gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). These facilities are essential to export natural gas in foreign commerce and will have a nominal design life of 30 years.

Section 313 of the Energy Policy Act of 2005 (EPAct 2005)[3] amended the NGA to provide FERC with additional authority to coordinate the processing of permit applications required under Federal law for proposed natural gas projects. EPAct 2005 also designated FERC as the Lead Federal Agency for the National Environmental Policy Act compliance. In accordance with EPAct 2005, FERC regulations, and Regulatory Guidance Letter 07-03, the Applicant submitted an initial Department of the Army (DA) permit application to the U.S. Army Corps of Engineers (USACE) concurrent with submittal of the FERC application for the Project on April 17, 2017. This document provides supplemental information to the Applicant’s application for a USACE DA Permit for the Project where responses are too lengthy for the DA Form 4345. Specific questions answered here are: 15, 16, 18, 19, 20, 21, 22, 23, 25, and 26. The Resource Reports required by FERC contain additional and more detailed information and are provided as Attachment 1.

The USACE provided comments on the Applicant’s initial application on June 16, 2017. The Applicant provided the USACE with responses to these comments on March 19, 2018. The USACE provided follow-up comments on the initial application to the Applicant on May 18, 2018. The Applicant provided the USACE with responses to these follow-up comments on January 9, 2019. Additional correspondence between the Applicant and the USACE continued, for clarification of the requirements and preliminary wetland jurisdictional determinations, leading up to the submittal of a revised application May of 2019. The USACE provided follow-up questions and feedback on the application in June, July and October 2019, and on August 16, 2019, the Applicant submitted a route change notification to FERC indicating the

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[1] 15 U.S.C. § 717a(11)

[2] 18 C.F.R. § 153.2(d))

[3] 42 U.S.C. ch. 149 § 15801 et seq, amended by 16 U.S.C. ch. 46 § 2601 et seq and 42 U.S.C. ch. 134 § 13201 et seq.

preferred alternative had been changed to be the Denali National Park and Preserve (DNPP) route. The Applicant has incorporated information from these comment responses and the route change into this revised final application. Changes to the application based on these responses have been documented in the Preamble to this Supplemental Information document, with location of change provided.

By agreement between the USACE and Alaska Department of Environmental Conservation (ADEC), the "Public Notice of Application for Permit" public noticed by the USACE during permit review serves as the ADEC application for a Certificate of Reasonable Assurance (CRA) required by Section 401 of the Clean Water Act. In order to provide timely information to ADEC for issuance of the CRA, copies of the initial and final DA permit applications will be provided to ADEC concurrent with submittals to USACE.

2. BLOCK 15: LOCATION OF MAJOR PROJECT FEATURES

Table 1. Location of Major Project Features

Project Feature	Latitude (Centroid) °N	Longitude (Centroid) °W
Liquefaction Plant	60.6655	151.3593
Mainline Pipeline	65.4507	148.6226
Start	70.3192	148.5442
Terminus	60.6747	151.3569
Point Thomson Transmission Line	70.1588	147.4759
Start	70.1696	146.2672
Terminus	70.3192	148.5445
Prudhoe Bay Transmission Line	70.3218	148.5349
Start	70.3218	148.5256
Terminus	70.3211	148.5446
Gas Treatment Plant	70.3199	148.5573
Entire Project	65.4507	148.6226

Coordinates are in NAD-83 datum

3. BLOCK 16: OTHER LOCATION DESCRIPTIONS

Table 2. Other Location Descriptions

Section(s)	Township	Range	Meridian	Municipality/ Borough
2, 11, 14, 22-23, 27-28, 33	12N	14E	Umiat	North Slope Borough
1-4, 9-11, 14-16, 20-23, 25-29	11N	14E	Umiat	North Slope Borough
29-30, 32-34	11N	15E	Umiat	North Slope Borough
24	10N	13E	Umiat	North Slope Borough
5, 7-8, 17-19, 30-31	10N	14E	Umiat	North Slope Borough

Section(s)	Township	Range	Meridian	Municipality/ Borough
1-4, 9, 11-12	10N	15E	Umiat	North Slope Borough
5, 7-11, 13-14	10N	16E	Umiat	North Slope Borough
17-18, 20-22, 25-27, 35-36	10N	17E	Umiat	North Slope Borough
30-33	10N	18E	Umiat	North Slope Borough
34-26	10N	22E	Umiat	North Slope Borough
31-32	10N	23E	Umiat	North Slope Borough
12-13, 24-25, 36	9N	13E	Umiat	North Slope Borough
1, 6-7, 18-19, 33-34	9N	14E	Umiat	North Slope Borough
1-4, 12	9N	18E	Umiat	North Slope Borough
7-12	9N	19E	Umiat	North Slope Borough
7-8, 13-18, 21-23	9N	20E	Umiat	North Slope Borough
1-2, 7-11, 16-18	9N	21E	Umiat	North Slope Borough
1-6	9N	22E	Umiat	North Slope Borough
3-6, 8, 10, 15, 22	9N	23E	Umiat	North Slope Borough
1-7, 17-19, 30-31	8N	14E	Umiat	North Slope Borough
13, 24-25, 36	7N	13E	Umiat	North Slope Borough
4-8, 18-19	7N	14E	Umiat	North Slope Borough
1-2, 11-15, 22, 24-25, 27-28, 34, 36	6N	13E	Umiat	North Slope Borough
19, 30-31	6N	14E	Umiat	North Slope Borough
1-3, 10, 12, 36	5N	13E	Umiat	North Slope Borough
6-7, 18-20, 30-31	5N	14E	Umiat	North Slope Borough
4, 7-9, 16, 21, 26-28, 33	4N	14E	Umiat	North Slope Borough
13	3N	13E	Umiat	North Slope Borough
4, 9-10, 15, 18-23, 26-29, 34-35	3N	14E	Umiat	North Slope Borough
2, 11-14, 24-28, 35-36	2N	14E	Umiat	North Slope Borough
1-2, 11, 14, 22-23, 27-29, 32, 33	1N	14E	Umiat	North Slope Borough

Section(s)	Township	Range	Meridian	Municipality/ Borough
3-4, 9, 16, 21-22, 27, 33-34	1S	14E	Umiat	North Slope Borough
3-4, 9-10, 16, 21, 28-29, 32	2S	14E	Umiat	North Slope Borough
25, 36	3S	13E	Umiat	North Slope Borough
5-7, 18-19, 30-32	3S	14E	Umiat	North Slope Borough
1	4S	13E	Umiat	North Slope Borough
6-7, 18-19, 30-31	4S	14E	Umiat	North Slope Borough
4-5, 8-9, 16-17, 19-21, 28, 30-31	5S	14E	Umiat	North Slope Borough
6-7, 18-19, 30-31	6S	14E	Umiat	North Slope Borough
5-6, 8, 16-17, 20-21, 29, 32	7S	14E	Umiat	North Slope Borough
12-13, 23-24, 26-28, 33	8S	13E	Umiat	North Slope Borough
5-8	8S	14E	Umiat	North Slope Borough
3-5, 7-8	9S	13E	Umiat	North Slope Borough
12-15, 20-22, 28-29, 31-34	9S	12E	Umiat	North Slope Borough
12-13, 22-24, 26, 35	10S	11E	Umiat	North Slope Borough
6-7	10S	12E	Umiat	North Slope Borough
2, 11-15, 23-24, 26	11S	11E	Umiat	North Slope Borough
19, 29-30, 32	11S	12E	Umiat	North Slope Borough
4-5, 9, 16, 21, 28, 33	12S	12E	Umiat	North Slope Borough
3, 9-10, 15-16, 21-22, 28, 32-33	13S	12E	Umiat	North Slope Borough
5, 8, 17, 20-21, 29, 32	14S	12E	Umiat	North Slope Borough
23-24, 26-27, 34-35	15S	11E	Umiat	North Slope Borough
5-7, 18-19	15S	12E	Umiat	North Slope Borough
25, 35-36	16S	10E	Umiat	North Slope Borough
3-4, 9-10, 16-17, 19-20, 30	16S	11E	Umiat	North Slope Borough
2	17S	10E	Umiat	North Slope Borough/Yukon-Koyukuk Census Area
25	37N	10W	Fairbanks	North Slope Borough/Yukon-Koyukuk Census Area

Section(s)	Township	Range	Meridian	Municipality/ Borough
35-36	37N	10W	Fairbanks	Yukon-Koyukuk Census Area
2-3, 10, 15, 21-22, 28, 33	36N	10W	Fairbanks	Yukon-Koyukuk Census Area
4, 9, 16, 21, 28, 33	35N	10W	Fairbanks	Yukon-Koyukuk Census Area
4, 9, 10, 15, 22-23, 26, 35	34N	10W	Fairbanks	Yukon-Koyukuk Census Area
2, 11-14, 23-26, 34-35	33N	10W	Fairbanks	Yukon-Koyukuk Census Area
3-4, 9, 16, 21, 28-29, 32	32N	10W	Fairbanks	Yukon-Koyukuk Census Area
5-8, 17-19, 30	31N	10W	Fairbanks	Yukon-Koyukuk Census Area
25, 34-36	31N	11W	Fairbanks	Yukon-Koyukuk Census Area
3-5, 7-8, 18-20, 30-31	30N	11W	Fairbanks	Yukon-Koyukuk Census Area
36	30N	12W	Fairbanks	Yukon-Koyukuk Census Area
30	29N	11W	Fairbanks	Yukon-Koyukuk Census Area
1, 11-14, 23-26, 35	29N	12W	Fairbanks	Yukon-Koyukuk Census Area
3, 10, 15-16, 20-22, 28-29, 31-32	28N	12W	Fairbanks	Yukon-Koyukuk Census Area
6-7	27N	12W	Fairbanks	Yukon-Koyukuk Census Area
11-12, 14, 23, 26, 35	27N	13W	Fairbanks	Yukon-Koyukuk Census Area
2, 11, 14, 23, 25-26, 36	26N	13W	Fairbanks	Yukon-Koyukuk Census Area
6-7, 18	25N	12W	Fairbanks	Yukon-Koyukuk Census Area
1, 13, 23-24, 26-27, 33-34	25N	13W	Fairbanks	Yukon-Koyukuk Census Area
5, 7-8, 18-19	24N	13W	Fairbanks	Yukon-Koyukuk Census Area
13, 23-26, 34-35	24N	14W	Fairbanks	Yukon-Koyukuk Census Area
3, 9-10, 16-20, 29-32	23N	14W	Fairbanks	Yukon-Koyukuk Census Area
6-8, 18-20, 29, 31-32	22N	14W	Fairbanks	Yukon-Koyukuk Census Area
5-8, 18-19, 30-31	21N	14W	Fairbanks	Yukon-Koyukuk Census Area
2-4, 10-11, 15-17, 20, 22, 26-28, 34-35	20N	15W	Fairbanks	Yukon-Koyukuk Census Area
18-19, 30-32	19N	14W	Fairbanks	Yukon-Koyukuk Census Area
2, 11-13, 24	19N	15W	Fairbanks	Yukon-Koyukuk Census Area

Section(s)	Township	Range	Meridian	Municipality/ Borough
4-5, 9-10, 14-15, 23, 25-26, 36	18N	14W	Fairbanks	Yukon-Koyukuk Census Area
1	17N	14W	Fairbanks	Yukon-Koyukuk Census Area
6-7, 17-18, 20-21, 28, 33-34	17N	13W	Fairbanks	Yukon-Koyukuk Census Area
3-4, 9-10, 14-15, 23-25, 36	16N	13W	Fairbanks	Yukon-Koyukuk Census Area
1	15N	13W	Fairbanks	Yukon-Koyukuk Census Area
6-7, 18-19, 30-32	15N	12W	Fairbanks	Yukon-Koyukuk Census Area
6-7, 17-18, 20-21, 27-28, 34-36	14N	12W	Fairbanks	Yukon-Koyukuk Census Area
7-8, 17-18, 20-22, 26-27, 34-36	13N	11W	Fairbanks	Yukon-Koyukuk Census Area
1-2, 12	13N	12W	Fairbanks	Yukon-Koyukuk Census Area
31	12N	9W	Fairbanks	Yukon-Koyukuk Census Area
18-20, 27-29, 34-36	12N	10W	Fairbanks	Yukon-Koyukuk Census Area
1-2, 12-13, 24	12N	11W	Fairbanks	Yukon-Koyukuk Census Area
1-2	11N	10W	Fairbanks	Yukon-Koyukuk Census Area
30-32	11N	8W	Fairbanks	Yukon-Koyukuk Census Area
6-9, 14-17, 22-23, 25-26, 36	11N	9W	Fairbanks	Yukon-Koyukuk Census Area
3-5, 10-11, 13-15, 25	10N	8W	Fairbanks	Yukon-Koyukuk Census Area
18-20, 29-30, 32-34	10N	7W	Fairbanks	Yukon-Koyukuk Census Area
2-4, 11, 13-14, 24	9N	7W	Fairbanks	Yukon-Koyukuk Census Area
19, 30-32	9N	6W	Fairbanks	Yukon-Koyukuk Census Area
30-31	8N	5W	Fairbanks	Yukon-Koyukuk Census Area
5, 7-9, 15-18, 22-23, 25-26, 36	8N	6W	Fairbanks	Yukon-Koyukuk Census Area
5-6, 8, 17, 20, 29, 32, 35-36	7N	5W	Fairbanks	Yukon-Koyukuk Census Area
11-12, 20-22, 28-31	7N	4W	Fairbanks	Yukon-Koyukuk Census Area
7	7N	3W	Fairbanks	Yukon-Koyukuk Census Area
23, 26	6N	4W	Fairbanks	Yukon-Koyukuk Census Area

Section(s)	Township	Range	Meridian	Municipality/ Borough
2-3, 5, 8-10, 16-17, 21, 28, 31-33	6N	5W	Fairbanks	Yukon-Koyukuk Census Area
4, 9, 16, 20-21, 29, 31-32	5N	5W	Fairbanks	Yukon-Koyukuk Census Area
5-6, 12-13, 24-25, 36	4N	5W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
1, 12, 24-25, 36	3N	6W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
13	3N	6W	Fairbanks	Yukon-Koyukuk Census Area
31-34	2N	4W	Fairbanks	Fairbanks North Star Borough
30-31	2N	5W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
32-34	2N	5W	Fairbanks	Fairbanks North Star Borough
1, 12-13	2N	6W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
24-25, 36	2N	6W	Fairbanks	Yukon-Koyukuk Census Area
7, 16-18	1N	3W	Fairbanks	Fairbanks North Star Borough
1-7, 12	1N	4W	Fairbanks	Fairbanks North Star Borough
2-5, 11-12	1N	5W	Fairbanks	Fairbanks North Star Borough
6-7	1N	5W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
1, 12, 26, 34-35	1N	6W	Fairbanks	Yukon-Koyukuk Census Area
13, 24-25	1N	6W	Fairbanks	Fairbanks North Star Borough/Yukon-Koyukuk Census Area
35	1S	1E	Fairbanks	Fairbanks North Star Borough
3-4, 9, 16, 21, 28-29, 31-32	1S	6W	Fairbanks	Yukon-Koyukuk Census Area
1	2S	7W	Fairbanks	Yukon-Koyukuk Census Area
6-8, 17, 20, 28-29, 31, 33-34	2S	6W	Fairbanks	Yukon-Koyukuk Census Area
12-14, 22-23, 27-28, 32-33	2S	7W	Fairbanks	Yukon-Koyukuk Census Area
6	3S	6W	Fairbanks	Yukon-Koyukuk Census Area
1, 4-9, 16, 18-20, 29-30	3S	7W	Fairbanks	Yukon-Koyukuk Census Area
13, 24-26, 35-36	3S	8W	Fairbanks	Yukon-Koyukuk Census Area
2, 10-11, 14-15, 22-23, 27, 34	4S	8W	Fairbanks	Yukon-Koyukuk Census Area

Section(s)	Township	Range	Meridian	Municipality/ Borough
4-5, 8-9, 17, 19-20, 30-31	5S	8W	Fairbanks	Yukon-Koyukuk Census Area
36	5S	9W	Fairbanks	Yukon-Koyukuk Census Area
1, 12-14, 23, 26	6S	9W	Fairbanks	Yukon-Koyukuk Census Area
26, 34-35	6S	9W	Fairbanks	Denali Borough
14	7S	8W	Fairbanks	Denali Borough
3, 10, 15, 22, 27, 34	7S	9W	Fairbanks	Denali Borough
6	8S	8W	Fairbanks	Denali Borough
1, 3, 10, 13-15, 22-23, 26-27, 35	8S	9W	Fairbanks	Denali Borough
31	9S	8W	Fairbanks	Denali Borough
2-3, 11, 13-14, 23-25, 36	9S	9W	Fairbanks	Denali Borough
6-8, 17, 20-21, 28, 33	10S	8W	Fairbanks	Denali Borough
3-4, 9-10, 15-16, 21-22, 27, 34-35	11S	8W	Fairbanks	Denali Borough
17, 19-20, 30-31	12S	7W	Fairbanks	Denali Borough
2-3, 11, 13-14, 23-26, 35-36	12S	8W	Fairbanks	Denali Borough
5-6, 8-9, 16, 21, 27-28, 34	13S	7W	Fairbanks	Denali Borough
29, 30, 32	14S	6W	Fairbanks	Denali Borough
3, 10, 14-15, 23-25	14S	7W	Fairbanks	Denali Borough
4-5, 8-9, 17-20, 30-31	15S	6W	Fairbanks	Denali Borough
36	15S	7W	Fairbanks	Denali Borough
6-7, 18-19	16S	6W	Fairbanks	Denali Borough
1, 12, 24-25, 36	16S	7W	Fairbanks	Denali Borough
7, 18	17S	6W	Fairbanks	Denali Borough
1, 11-14, 23, 26, 33-35	17S	7W	Fairbanks	Denali Borough
2-8, 11	18S	7W	Fairbanks	Denali Borough
12-16	18S	8W	Fairbanks	Denali Borough
20-22	18S	8W	Fairbanks	Denali Borough/Matanuska-Susitna Borough

Section(s)	Township	Range	Meridian	Municipality/ Borough
29-31	18S	8W	Fairbanks	Matanuska-Susitna Borough
25	18S	9W	Fairbanks	Denali Borough/Matanuska-Susitna Borough
36	18S	9W	Fairbanks	Matanuska-Susitna Borough
2, 10-11, 14-15, 21-23, 27-29, 31-32	19S	9W	Fairbanks	Matanuska-Susitna Borough
5-7, 18-19	20S	9W	Fairbanks	Matanuska-Susitna Borough
24-26, 34-36	20S	10W	Fairbanks	Matanuska-Susitna Borough
2-4, 9, 16, 19-21, 28-29, 32	21S	10W	Fairbanks	Matanuska-Susitna Borough
5, 7-8, 18	22S	10W	Fairbanks	Matanuska-Susitna Borough
11-13, 23-24, 26-27, 34	22S	11W	Fairbanks	Matanuska-Susitna Borough
15-16, 20-21, 29-31	33N	2W	Seward	Matanuska-Susitna Borough
36	33N	3W	Seward	Matanuska-Susitna Borough
1-2, 8-11, 16-17, 19-20, 30-31	32N	3W	Seward	Matanuska-Susitna Borough
35-36	32N	4W	Seward	Matanuska-Susitna Borough
1-3, 9-11, 14-17, 19-20, 30	31N	4W	Seward	Matanuska-Susitna Borough
25-26, 35	31N	5W	Seward	Matanuska-Susitna Borough
2-3, 9-10, 16-17, 20-21, 28-29, 33	30N	5W	Seward	Matanuska-Susitna Borough
4, 7-9, 18-19, 30-32	29N	5W	Seward	Matanuska-Susitna Borough
5-6, 8, 17, 19-20, 30-31	28N	5W	Seward	Matanuska-Susitna Borough
6-8, 17-19, 30-31	27N	5W	Seward	Matanuska-Susitna Borough
6-8, 18-20, 30-31	26N	5W	Seward	Matanuska-Susitna Borough
5-6, 8, 17, 19-20, 29, 32-33	25N	5W	Seward	Matanuska-Susitna Borough
18-19	24N	4W	Seward	Matanuska-Susitna Borough
4-5, 8-9, 13, 16-17, 21, 24, 28-29, 32	24N	5W	Seward	Matanuska-Susitna Borough
5, 8-9, 16, 21, 28, 32-33	23N	5W	Seward	Matanuska-Susitna Borough
4, 9, 16, 21, 28, 33	22N	5W	Seward	Matanuska-Susitna Borough
4-5, 9, 16, 20-21, 29, 31-32	21N	5W	Seward	Matanuska-Susitna Borough

Section(s)	Township	Range	Meridian	Municipality/ Borough
6	20N	5W	Seward	Matanuska-Susitna Borough
1, 12-14, 23, 26-27, 33-34	20N	6W	Seward	Matanuska-Susitna Borough
3-4, 10, 15, 20-22, 29-31	19N	6W	Seward	Matanuska-Susitna Borough
36	19N	7W	Seward	Matanuska-Susitna Borough
1-2, 11, 14, 23, 26, 34-35	18N	7W	Seward	Matanuska-Susitna Borough
3, 10	17N	2W	Seward	Matanuska-Susitna Borough
3, 10, 15, 20-22, 29-31	17N	7W	Seward	Matanuska-Susitna Borough
36	17N	8W	Seward	Matanuska-Susitna Borough
1, 12-13, 23-24, 26, 34-35	16N	8W	Seward	Matanuska-Susitna Borough
3-4, 8-9, 17-18	15N	8W	Seward	Matanuska-Susitna Borough
13-14, 22-23, 26-28, 31-35	15N	9W	Seward	Matanuska-Susitna Borough
2-3, 6-7, 10, 15, 17-18, 20, 22, 27-29, 33-34	14N	9W	Seward	Matanuska-Susitna Borough
1-3, 9-12, 14-17, 20-22, 28-29	14N	10W	Seward	Matanuska-Susitna Borough
31-33	14N	10W	Seward	Matanuska-Susitna Borough/Kenai Peninsula Borough
5-8, 18-19, 30-31	13N	10W	Seward	Kenai Peninsula Borough
6-8, 15, 17, 20-23, 25-28, 33-36	12N	10W	Seward	Kenai Peninsula Borough
1	12N	11W	Seward	Kenai Peninsula Borough
6-7, 18-19, 30	11N	9W	Seward	Kenai Peninsula Borough
1-3, 10-15, 22-28, 33-36	11N	10W	Seward	Kenai Peninsula Borough
1-4, 9-11, 14-17, 20-23, 26-29, 31-35	10N	10W	Seward	Kenai Peninsula Borough
3-10, 16-21, 29-32	9N	10W	Seward	Kenai Peninsula Borough
12-13, 23-26, 34-36	9N	11W	Seward	Kenai Peninsula Borough
6	8N	10W	Seward	Kenai Peninsula Borough
1-4, 9-12, 15-16, 21-22, 28-31	8N	11W	Seward	Kenai Peninsula Borough
35-36	8N	12W	Seward	Kenai Peninsula Borough

Section(s)	Township	Range	Meridian	Municipality/ Borough
2-4, 9, 15-16, 21-23, 26-28, 33-35	7N	12W	Seward	Kenai Peninsula Borough

4. BLOCK 18: NATURE OF ACTIVITY

This section describes the integrated Project facilities, including the Liquefaction Facility in Southcentral Alaska, an approximately 807-mile Mainline; GTP within the PBU on the North Slope; an approximately 63-mile gas transmission line connecting the GTP to the PTU gas production facility (PTTL); and an approximately 1-mile gas transmission line connecting the GTP to the PBU gas production facility (PBTL).

Attachment 1 contains Resource Reports and Appendices that were provided with the original Application in April 2017. These Resource Reports are historic documents and have not changed since their submittal, although some information within them has been clarified or revised through the FERC and USACE RFI processes. Changes of significance have been identified in the Preamble to this document and/or within this revised Application. Attachment 2 contains a set of Geographic Information Systems (GIS) files, including the footprint, water crossings, and delineated Waters of the US as identified by the USACE in its preliminary jurisdictional determination (PJD). Attachment 3 provides a set of figures describing the project and its design. Attachments 4-18 contain other supplemental information required for this Application.

The descriptions below focus on facilities located within jurisdictional waters of the US. For detailed information on Project facilities, see Section 1.3 of Resource Report 1 (Attachment 1).

4.1. Liquefaction Facility

4.1.1. LNG Plant

The Liquefaction Facility would be a new facility constructed on the eastern shore of Cook Inlet in the Nikiski area of the Kenai Peninsula, within the area depicted in Resource Report 1. The Liquefaction Facility would consist of the LNG Plant and Marine Terminal. A discussion of the LNG Plant and Marine Terminal is provided below.

The LNG Plant would consist of three liquefaction processing units, called trains, which are jointly capable of producing up to 20 million metric tonne per annum (MMTPA) of LNG. The LNG Plant consists of the following main facilities:

- Inlet and pre-treatment facilities;
- Liquefaction process facilities; and
- LNG storage tanks.

LNG from the liquefaction facilities would be transferred to LNG storage tanks for subsequent delivery to LNG Carriers (LNGCs).

To operate the Liquefaction Facility, additional facilities would be built and maintained on site. These facilities include but are not limited to:

- Condensate Storage and Truck Loading Facility
- Refrigerant Production and Storage
- Communications Facilities
- Operations Buildings and Control Room

In addition to the permanent facilities identified previously, the design and preliminary construction plan anticipates that the Liquefaction Facility may require the following facilities during construction:

- Temporary construction camp and other infrastructure to support the construction workforce;
- Temporary infrastructure to support construction (e.g., concrete batch plants, construction equipment storage, site operations center, contractor and owner offices, warehousing, construction fuel storage tanks, construction water source and temporary potable water plant, temporary domestic wastewater treatment plant, construction power, telecommunications tower and radio base station, and laydown areas);
- Material sites (if required);
- Disposal areas for construction debris and for blast rock (as necessary);
- Prior to completion of the Liquefaction Facility Material Offloading Facility (MOF), an existing facility termed “Pioneer MOF” (e.g., Rig Tenders or similar facility) would be required to handle offloading of aggregate and bulk construction materials and equipment needed for the MOF, Marine Terminal, and/or the LNG Plant, as well as a potential support facility for Cook Inlet pipeline construction; and
- MOF to facilitate handling of prefabricated modules and other cargo transported from vessels and marine heavy lift vessels.

Attachment 3 provides detailed figures describing the components of the LNG Plant. Gravel, rock, and other aggregate material would be needed for construction of the Liquefaction Facility. This would include fill for the LNG Plant site, as well as materials for use offshore in support of construction of the Marine Terminal.

Geophysical and geotechnical investigations at the proposed site indicate that significant quantities of onsite aggregate are suitable for road base and structural fill[4]. The material located within the Liquefaction Facility site boundaries would be sufficient to provide the material needs of the Project for site preparation, and importation of fill material from off site is not planned. Additional details are provided in the Project’s *Gravel Sourcing Plan and Site Reclamation Measures,* Resource Report No. 6, Appendix F.

[4] Estimated volumes of fill required for the project are noted later in the application in Table 7.

In addition to the structural fill, gravel would be required for ready mixed concrete[4]. This material can be processed on site or sourced from multiple quarries that are located within 20 miles of the site. The materials sourced in the Kenai Peninsula area would be transported to the site by truck on Alaska highways, including the Seward Highway and the Kenai Spur Highway, or through the MOF on Cook Inlet. At the facility site, bulk materials would be offloaded into a temporary storage location prior to use. A portion of the bulk granular materials would be installed as base materials offshore and would be transported by barge to the location.

Approximately 1.2 million cubic yards (CY) of vegetation would be removed during clearing and disposed of at an onsite or approved offsite location. The commercial use of the trees is marginal due to the previous harvesting combined with the spruce beetle damage. Some soils contain organic materials that are unsuitable for construction. Unsuitable material would be removed during the grubbing of the site and transported to an onsite or approved offsite stockpile location.

During construction, in-plant road networks would change to address site activities, including site preparation, equipment storage and laydown, equipment and module setting, final grading, and transition to the final in-plant road system. The road surface during construction would be stabilized native soils or compacted granular material, and the roads would be periodically graded and compacted to facilitate routine traffic.

The heavy haul road from the temporary MOF would be coarse hot-mix asphalt over a crushed aggregate base to withstand the heavy loads and provide a weather-resistant surface with good friction qualities. The Haul Road is discussed in greater detail in Section 1.3.1.5.6.1 of Resource Report 1 and is depicted in Appendix B1 of Resource Report 1, Sheets B1-2 and B1-3 (Attachment 1). The road will be installed in an upland area in conjunction with the MOF utilized for offloading LNG Plant modules and is expected to remain in place after removal of the MOF to allow for future beach access.

During the operating phase, the main entry to the Liquefaction Facility would be at the southern fence line in proximity to where the Kenai Spur Highway would be rerouted around the LNG Plant (see Section 4.1.1.1, below). There would be a secondary entrance to the plant for contractors and large material deliveries from the north, again in the proximity of the Kenai Spur Highway reroute. The finish of the in-plant roads would be a mix of concrete, asphalt, and compacted granular material based on road use classification. The final elevation of the permanent road system would be designed for compatibility with the site stormwater system.

Modifications are intended for the Rig Tenders marine terminal during construction, but do not impact wetlands and are relatively minor since the facility is envisaged as a pioneer dock until the temporary MOF is operational at the Alaska LNG Liquefaction Facility site. The Rig Tenders berth is adequate for this purpose, as it contains laydown areas and offices. The minimum level of improvements to this facility consists of the following:

- Consolidate existing fenced laydown area.
- Strengthen and widen the access road bridge over a piperack.

- Increase access road horizontal & vertical geometries, and widen turning radii; to accommodate two-way oversized tractor-trailers.
- Redesign the access road intersection with the Kenai Spur Highway to achieve 90-degree intersection with adequate turning radii and traffic controls.
- Add high mast lighting to the yard and dock.

A moderate level of improvements may occur if the MOF availability is delayed or if Rig Tenders is used as a secondary workface to land modules up to 1,000 tons. In this instance, the following additional improvements would be made:

- Widen the access roadway and improve its vertical curvature & drainage, to accommodate the Self-Propelled Module Transporters (SPMT's).
- Add high mast lighting to laydown areas and roadway.
- Contract police to control traffic during module transport to the Alaska LNG site.

The marine terminal causeway and Marine Terminal Building will be constructed, as described in Resource Report 13 LNG, Appendix E.6 (Attachment 1). The structure that supports the Marine Terminal Building is approximately 3,000 ft. from the bluff and has an elevation of approximately 55 ft. above mean lower low water (MLLW). At this location the water depth is in excess of -40 ft. MLLW, as shown by the contours on the plot plan.

During construction, pumps will be installed to support collection and transport of seawater for hydrotesting of the pipeline. Hydrotest fill rates are preliminarily estimated at 3,000 gpm. A pump will be located in a column deep enough to provide for adequate suction head during low tides, and will be either electric submersible or electric vertical turbine. The pump assembly will be installed at the beginning of ice-free season (notionally April) and removed at the end of ice-free season (notionally November). The pump mount, piping, and electricals will be incorporated into jetty topsides module design and the pipe and pump will be affixed to the jetty.

The pump(s) selected by the construction contractor are expected to be temporarily suspended in the water and used to pump water for hydrotesting and then removed at the end of each construction season. Since the pump suction is offshore and above the seafloor, there will be no fill or rip-rap associated with the temporary intake. The pump will be removed once construction and hydrotesting are complete. As pumps used for hydrotest fill are temporary and portable in nature, they are not shown on the project plans; however, they would be similar to those shown in attached supplier catalogues (see Attachment 3B). Specific equipment will be selected as part of advanced engineering and final project design.

4.1.1.1. Kenai Spur Highway Re-route

Details on the proposed relocation of the Kenai Spur Highway (KSH) and the upfront evaluation process that the Applicant undertook with input from the Alaska Department of Transportation and Public Facilities (ADOT&PF) to arrive at alternatives selected for further study are provided in response to FERC's

July 28, 2017 Environmental Data Request[5]. These routes have now gone through further evaluation as described below, resulting in selection of a preferred alternative.

As part of developing the preferred alignment (or route) for the relocated segment of the KSH, the Applicant went through an iterative process of route evaluation (i.e., alternatives analysis) based on input from the ADOT&PF, USACE, Federal Highway Administration (FHWA), and Kenai Peninsula Borough (KPB), as well as the local Nikiski community.

The alternatives analysis included a public participation process that consisted of several public meetings to outline alternatives and discuss selection of the preferred alternative and a formalized public comment period. Based on consideration of overall route length, the number and type of land parcels which would be crossed, accommodation of existing and planned utilities (e.g., powerlines, cables, pipelines), environmental issues (e.g., Waters of the U.S., contamination, cultural resources), and soil/geologic conditions (e.g., drainage, soil stability), the Applicant has identified the preferred route as the West LNG Alternative. Overview Maps and Figures Describing the West LNG Alternative are provided in Attachment 3B. Information on Viereck Levels, Land Use, Visual Impacts and KOPs, Vegetation, and FEMA Flood Zone Mapping for the KSH Alternatives was provided to the USACE and to FERC in 2018.

The proposed West LNG Alternative would be approximately 3.9 miles long and would begin along the KSH near Milepost 19 at the South Miller Loop Road intersection. The route would turn northeast onto undeveloped land for approximately 1 mile before turning north-northwest around the west side of Cabin Lake. The route would then turn west and merge with the North Miller Loop alignment. The alignment continues west along North Miller Loop Road until it curves northward to merge with the existing KSH alignment on the northwest side of the proposed LNG facility.

The criteria utilized for evaluation of alternatives for the Kenai Spur Highway realignment are described below.

Wetlands – This metric is acreage of wetlands/waters of the U.S. in the Right-of-Way (ROW) based on available wetland mapping within the 200-foot ROW. Wetland impacts was the only environmental issue included in the consideration of alternatives because the potential impacts to anadromous fish stream crossings, known contaminated sites, cultural resources sites, and floodplains had the same values for all alternatives. Wetlands impacts within a potential 200ft ROW for were calculated as follows:

- East = 0 acres
- West = 0 acres
- Resident Suggested Route = 126 acres
- Resident Suggested Route w/ Miller Lp. Rd. Improvement = 126 acres
- West LNG = 0 acres
- Miller Lp. Rd. = 0 acres

[5] Applicant ID No. RFI-466- RR05-053, Accession No. 20180102-5207

Number of relocations – Parcels with improvements were identified as potential residences or businesses. This metric assumed that any parcel within the 200-foot ROW and having an improvement would require relocation of a resident or business. This is a high-side estimate of the number of relocations as the improvements are not all likely to be habitable structures.

Length of KSH bypass – This metric represents the area that is currently within the KSH corridor and would be bypassed as a result of the relocation. It assumes that development in the area that would be bypassed currently benefits from its location along the corridor (e.g., commercial and industrial facilities that are easily accessible and draw business from the highway). The new alignment could potentially reduce the amount of income these facilities generate by diverting traffic away from them.

ROW Acquisition and Ownership – This metric includes the total number of parcels to be acquired. A distinction is also made between full and partial takes. It is the "number" of parcels based upon property lines cut by the ROW, including easements and other divisions of parcels, and is a conservative estimate of the number of owners or transactions needed to secure ROW.

Interference with utilities – This metric is based on the assumption that utilities are located in or near existing road corridors and that for every collector or arterial road an alternative crosses (excluding the KSH), an existing utility would be crossed and would need to be moved or avoided. This might include relocations of utility poles carrying overhead electrical distribution or communications utilities. The project team also assumes that local streets have potential utilities as well.

Crossings of frost susceptible and unstable soils – This metric has two elements. First, it is based on whether the proposed alternative is in the vicinity of coastal bluff erosion identified near KSH MP 19. Second, it is based upon the distance along which the proposed alternative may cross over soft soils such as wetland areas (i.e., possible presence of peat or other softer ground adjacent to the wetlands).

Ability to meet design criteria – This metric is based upon the ease with which the proposed alternative can meet ADOT&PF and FHWA standards for the NHS. Known problems are simply counted, or the length of a substandard element is expressed as a percentage of the entire alignment length. It also considers the ease with which the proposed alignment can accommodate future expansion from two to four lanes. Problem alignments are flagged.

Constructability – This metric is based upon the potential for construction interferences with LNG facility construction. It also accounts for the difficulties associated with reconstructing an existing road and having to maintain traffic flow on the road and neighboring intersections during construction.

Length – This metric includes the total length of the proposed alternative in miles. A further distinction is made between the length of roadway that can be constructed using typical construction methods and length of roadway that will be constructed through wetland areas and locations affected by coastal erosion. This metric is used for calculating construction (COST) and annual maintenance costs (MAINT).

Annual maintenance cost – Maintenance is primarily an issue of cost for the operator. Maintenance costs for purposes of evaluating alternatives were determined by using a value per new lane mile, based on communication with ADOT&PF Central Region Maintenance and Operations.

Construction cost – This metric was calculated using the equation: # of new road miles through non-wetlands @ assigned per mile cost to construct through non-wetlands + # of new road miles through wetlands @ assigned per mile cost to construct through wetlands.

Schedule – This metric captures risk related to meeting schedule, and in evaluating alternatives for schedule impacts to LNG construction. Therefore, issues such as the need for environmental clearances, amount of ROW acquisitions needed, and the potential that events affecting road construction may affect construction of the LNG facility were considered in scoring this issue.

The West LNG Alternative was determined to be the most favorable of the alternatives evaluated based on it resulting in:

- The shortest route and smallest footprint (acreage);
- No impacts to Waters of the U.S.;
- The lowest number of resident relocations;
- The least number of land parcels affected (i.e., property owners);
- The least number of road crossings;
- The lowest maintenance costs; and
- Bypassing of the least amount of existing highway frontage (e.g., businesses).

As noted, above, the preferred West LNG Alternative route avoids impacts to wetlands. The East, West, and Miller Lp Rd Alternatives also avoid impacts to wetlands. The Resident Suggested Alternative(s) would impact approximately 126 acres of wetlands, including relict glacial lakebed wetlands. Approximately 4.9 miles, or about half, of the Resident Suggested Alternative(s) would require construction through wetlands.

See the following sections of Resource Report 1 for more information:

- 1.3.1 Liquefaction Facility
- 1.3.1.1 LNG Plant
- 1.3.1.4 Associated Infrastructure
- 1.3.1.5 Temporary Facilities Associated with the Construction of the Liquefaction Facility
- 1.3.4.1 Liquefaction Facility Access Roads
- 1.3.7.1 Liquefaction Facility
- 1.5.2.2.1.2 Site Preparation

4.1.2. Marine Terminal

4.1.2.1. Temporary Material Offloading Facility

Existing facilities in the area would be used for a Pioneer MOF until the MOF is constructed. The Pioneer MOF would support construction prior to completion of the MOF and during peak construction periods. The Pioneer MOF would make use of an existing dock facility along with laydown areas and storage and office space.

The MOF, once constructed, would enable direct delivery of cargos to the construction site. The cargos would include equipment modules, bulk construction materials, and construction equipment to support the construction of the Liquefaction Facility. Cargos would be unloaded at Roll-on/Roll-off (Ro-Ro) berth or at the Lift-on/Lift-off (Lo-Lo) berth. Direct delivery of modules is critical for maintaining the construction schedule, minimizing the number of vessels delivering materials to the site, and reducing the number of trucks on local roads and highways. The MOF would be designed as a temporary facility with a nominal design life of 10 years. The MOF would be removed early in operations when it is no longer needed to support construction of the Liquefaction Facility. Preliminary plans and schedule for MOF construction are detailed below, and may be modified during later phases of the project, including during final engineering.

The outside dimensions of the MOF will be approximately 1,049 ft long and 600 ft wide with a deck elevation above +32 feet MLLW, which would provide sufficient space for cargo discharge operations, up to three module shipments, and accommodate 200,000 square feet of staging area at the base of the bluff adjacent to the heavy haul road. To provide access to the MOF, a maneuvering area on the water side of the facility would be dredged to -30 MLLW. MOF dredging and equipment are described, below, in Section 4.1.2.2.

The berths at the MOF would be constructed of local fill materials with site-specific erosion and shoreline protection measures based upon final design. In summary, design would include:

- One Lo-Lo berth with a maintained depth alongside of -32 feet MLLW. Lo-Lo vessel cargo is loaded and unloaded by cranes and derricks;
- One Ro-Ro berth with a maintained depth alongside of -32 feet MLLW. Ro-Ro vessels are designed to carry wheeled cargo that is rolled off of the vessel on their own wheels or using a SPMT; and
- One grounded barge bed with a ground pad elevation of +10 feet MLLW.

The number and variability of vessel deliveries due to volume, timing, unforeseen circumstances, and the reasonably short open-water season requires that the MOF receive more than one vessel at a time. The vessels may also remain at the MOF over a period of days while equipment and materials are being unloaded.

Initially a laydown area would be placed at the top of the bluff, but set away from it so that its placement it would not entail fill discharge or bank cut. This area and associated facilities would be used during the construction of the MOF. The location of the initial laydown area is within the LNG Facility boundary and will remain integral within the Facility site. When initial laydown needs have ended, the area will be incorporated into the operational plant layout to meet operational needs.

Following construction of the Marine Contractor Staging Area in the footprint of the MOF, work will commence on the installation of the MOF Quay combi-wall (combination of cylindrical steel pile connected by interlocking sheet pile) and tie-back anchor wall using this area as the construction platform. The MOF will be built from the shore using crawler cranes to drive the piling and traditional grading equipment to backfill and compact inside a combi-wall structure from the toe of the bluff extending offshore[4]. The combi-wall face will be tied back to a sheet pile anchor wall that will be buried under the top of the MOF fill. Then for portions further offshore, the structure will be founded on closed cell sheets progressively extending into the deeper water. The leading edge of the MOF will require dredging before advancing the combi-wall, setting the coffer cell wall template, and commencing coffer cell wall construction.

The offshore face of the MOF will be dredged to final elevation (-20 ft MLLW under the coffer cells and -32 ft for the berth area) before installing the coffer cell sheet pile as shown in Attachment 3. The construction of the sheet pile coffer cell wall will require driving the set of sheet piles (188 per cell) in a template to form a complete circle (see Attachment 20 for a summary of piling information). The driving of the sheets will be accomplished using vibratory pile driving hammers and crawler cranes operating on top of completed cells. Once a cell is complete, it will be filled with granular material to provide mass before removing/relocating the template to the next cell. The fill portion will arrive via haul trucks from local quarries and loaded into the cells using a conveyor.

Piling operations will be started on the north and south sides by two separate crews in coordination with the localized dredging operation and pioneer roadway excavation. When piling is advanced into the tidal zone, fill material will be placed with Super Sacks positioned on the leading water edge to prevent the loss of material to the ebb and flow of the tides. As the piling work progresses the Super Sacks will be “leap frogged” with the advancing work front. At the conclusion of Season 1, the MOF leading edge will be stabilized for the winter months.

The entire MOF area will be backfilled and compacted once all of the coffer cells and interconnecting arcs are installed and backfilled. On closure of the coffer cell wall in Season 2, the MOF Quay will be back filled and compacted to just below finished grade. Lastly, the concrete coffer cell caps, drains, surface topping (pavers), and mooring equipment (bollards and fenders) will be installed. Estimated quantities of fill[4] required to backfill the marine terminal MOF are as follows:

- 432,000 CY of general fill from LNG site excavation
- 118,000 CY of general fill from local borrow sources
- 300,000 CY of engineered fill from local borrow sources
- 23,500 CY of crushed rock from local borrow sources
- 47,200 CY of cement base imported from local borrow sources

Small amounts of additional fill may be required to complete the MOF. The LNG site location fill estimates are shown, below, in Table 6 include MOF fill. In addition to this fill volume, 650,000 square feet of pavement will be required at the MOF from local sources.

Geotubes filled with sand will be used to provide shoreline stabilization at the Cook Inlet MOF. The proposed top of the Geotubes is elevation +35 MLLW. Five layers of Geotubes are planned, resulting in a planned bottom of the Geotubes at elevation +15 MLLW. The estimated volume of the sand filled Geotubes is 18,000 CY. The estimated volume placed below mean high water (MHW) is 4,400 CY.

Wetland acreage impacts associated with development of the MOF are included in Table 6 and Attachments 2 and 10.

When construction is complete, the MOF will be removed using a combination of two landside crews and one marine spread crew. The sequence of work will be as follows:

Landside Crews:

- Remove top features to include; bollards, fenders, concrete caps, concrete pavers, and drains
- Excavate inside coffer cells and offshore side to equalize pressure using long reach excavators and cranes with clam shell buckets
- Two 400-ton cranes will commence removal of coffer cells starting at the middle and moving towards the edges in opposite directions
- Excavation for the combi wall tie rod system will occur when the shore side coffer cells are completed
- Removal of the combi walls system will follow
- Mass excavation for the removal of MOF bulk material will then proceed
- Excess material will be hauled offsite for proper disposal
- All metal material will be hauled to recycling facilities
- Beach will be restored to original conditions by the grading crews
- Pioneer Road is expected to remain in place for future beach access

Marine Crews:

- Marine crew will mobilize by mid-summer
- Derrick barge and material barge will be positioned to start the removal of the RO/RO breasting system structures
- Catwalk will be disconnected and placed on a barge
- Dolphin system will be removed by cutting the top of piles under the caps
- Piles will be extracted
- Derrick barge will be equipped with a dredge bucket and used to clean up and grade the sea bed after the removal of the MOF foundation

During the MOF deconstruction, the geotubes will be opened and the fill material will be excavated for disposal. The empty geotubes will be transported to the laydown area and transported offsite for proper disposal. When all removal work is completed and material hauled offsite, the grading crew will restore the beach area to its original shape and demobilize from the project.

See the following sections of Resource Report 1 for more information:

- 1.3.1.2.3 Temporary Material Offloading Facility
- 1.3.1.2.3.1 MOF Berth
- 1.3.1.5.6.2 Marine Terminal Temporary Infrastructure

4.1.2.2. MOF Dredge and Disposal Areas

The Project would require dredging of the approach and berths at the MOF to a depth of -32 feet MLLW, with the potential for approximately two feet of over-dredge. Discharge of dredged material (fill) in Cook Inlet will occur to prepare the seafloor at the Marine Terminal MOF. Initial dredging will require removal and disposal of 800,000 CY of native sediment. This will be followed by up to two subsequent maintenance dredging and disposal events during construction. Each maintenance dredging event will require removal and disposal of up to 140,000 CY of material. The total estimated volume of dredged material removed from the MOF area and disposed of in the disposal area over the construction period is 1,080,000 CY of material (see Table 6, below). These estimates supplant the initial projections noted in the resource reports (Attachment 1) and in Section 1.3 of the Nikiski Capital Dredge Material Characterization Report – 2017 Sampling (Attachment 4B). Current plans for the dredge and disposal areas are detailed below and may be modified during final engineering.

The typical anticipated dredge fleet (floating equipment[6]) to perform the first season mechanical dredging for the Terminal MOF is as follows:

- One mechanical dredge consisting of either a dredge barge – a spud-secured barge-mounted crane with different clamshell buckets (ranging from 7 to 26 CY), or an excavator barge – a barge mounted long-reach /long-arm excavator with varying buckets.
- Split-Hull Dredge Barge of varying capacities may be employed. The split-hull dredge barges are maneuvered by tugs. Anticipate a fleet of three barges of 5,000 CY total capacity (4,000 CY effective capacity) for transport and placement of the dredged material at the disposal site.
- Deck Barge/Material Barge of varying sizes may be employed to transport fuel, equipment, and other raw materials to and from fleet vessels and land. The deck barges would be maneuvered by tugs. One deck barge will support the first season mechanical dredge.

[6] Types of floating equipment to be employed include derrick barges for the construction of the docks, dolphins, and piers and mechanical or suction type dredges and hopper barges for the performance of the required dredging. Tugs and support vessels are also included in this category and will be used to support both the facility construction and dredging.

- Tugboats will position dredge and haul scows to and from dredge and disposal/offloading sites. Anticipate one tender tug (approximately 1,800 horse power (HP)), and one ocean-going tug (approximately 3,000 HP).
- Work Boats will carry personnel and equipment to and from fleet vessels and land.
- A Survey Vessel performs before dredge and after dredge hydrographic surveys.

The typical anticipated dredge fleet (floating equipment) to perform the second season hydraulic cutterhead dredging for the Terminal MOF is as follows:

- One Hydraulic Suction Cutterhead Dredge.
- One Derrick Barge to pull out any obstructions such as boulders.
- One Barge Mounted Booster Pump with Onboard Power Plant.
- Deck Barge/Material Barge of varying sizes may be employed to transport fuel, equipment, and other raw materials to and from fleet vessels and land. The deck barges would be maneuvered by tugs. One deck barge will support the second season hydraulic cutterhead dredge.
- Tugboats will position dredge and haul scows to and from dredge and disposal/offloading sites. Anticipate one tender tug (approximately 1,800 HP).
- A Work Boat will carry personnel and equipment to and from fleet vessels and land.
- A Support Vessel as necessary to repair and maintain discharge pipeline and booster pump barge.

The typical anticipated dredge fleet (floating equipment) to perform the second season mechanical dredging for the Terminal MOF is as follows:

- Two mechanical dredges consisting of either two dredge barges – a spud-secured barge-mounted crane with different clamshell buckets (ranging from 7 to 26 CY), or two excavator dredges – a barge mounted long-reach /long-arm excavator with varying buckets, or a combination of the two.
- Split-Hull Dredge Barge of varying capacities may be employed. The barges are maneuvered by tugs. Anticipate a fleet of five barges of 5,000 CY total capacity each (4,000 CY effective capacity) for transport and placement of the dredged material at the disposal site.
- Deck Barge/Material Barge of varying sizes may be employed to transport fuel, equipment, and other raw materials to and from fleet vessels and land. The deck barges would be maneuvered by tugs. One deck barge will support both the second season mechanical dredges.
- Tugboats will position dredge and haul scows to and from dredge and disposal/offloading sites. Anticipate one to two tender tugs (approximately 1,800 HP), and two ocean-going tugs (approximately 3,000 HP).
- Work Boats will carry personnel and equipment to and from fleet vessels and land.

As stated in Resource Report No. 10, Section 10.6.4.1.3.1 & Section 10.6.4.1.3.2 (Attachment 1), the dredged material is generally not suitable for use in upland construction as fill in site works or for haul roads. In addition, placement of the dredged material in an upland location would potentially increase environmental impacts, such as vehicle impacts and emissions, and would have significant cost impacts. There is also no beneficial use for the material. Accordingly, the Applicant's preferred option is ocean disposal, in which dredged material would be disposed of in the two disposal locations identified in the 'Nikiski Capital Dredge Material Characterization Report - 2017 Sampling Program' (Attachment 4B.). Detailed dredging information is provided in Resource Report 1 (Attachment 1) and in the aforementioned Dredge Material Characterization Report (Attachment 4B). More specific information pertaining to equipment types, capacities, and dredge material management will be developed by a dredging contractor prior to construction.

The Applicant initially evaluated options for the capital dredging material disposal and identified two areas, each approximately 1,200 acres in size, about 4 miles offshore and west of the MOF (DP-1 and DP-2). Both proposed disposal locations were selected because of their relatively deep water (between -50 feet to -130 feet MLLW) and strong currents (over 6.5 knots peak flood and over 5.5 knots peak ebb), which should disperse dredged sediment placed at either site and prevent mounding of the material. Smaller 230 acre sections of DP-1 and DP-2 were studied in greater detail in 2016 for potential site optimization. Ten surface grab samples were collected from each of the two sections, providing adequate coverage to characterize the seafloor within those two optimized sections (See Attachment 4B for additional details). The grab samples were evaluated for physical characterization and investigation of the species composition, diversity, richness, evenness, and similarity of the benthic infauna communities across and among the study areas. The samples contained coarse gravel and cobble, and benthic infauna were generally low in species abundance and diversity, as noted in 'Nikiski Capital Dredge Material Characterization Report - 2017 Sampling Program' (Attachment 4B, see Figure 1, Figure 8, and Section 5.3).

Based on these studies, the Applicant is seeking a DA permit for the two optimized 230-acre disposal sites contained within the original larger study areas where sample coverage exists. No additional sampling is planned for these optimized sites. The disposal sites have the capacity to receive all of the anticipated dredged material.

The temporary facilities at the Marine Terminal to support construction include:

- A road constructed along the alignment of the haul road from the MOF, contained within the haul road;
- The MOF construction staging area located within the footprint of the MOF and containing an area of fill to allow construction to proceed; and
- Shoreline stabilization to prevent erosion of the shoreline undermining the MOF and beach access road.

Additional details on the Marine Terminal are provided in Section 1.3.1.2 of Resource Report 1.

Appendix Q to Resource Report 2 provides Analytical Results of Sediment Sampling near the Marine Terminal in Cook Inlet. Dredge material disposal, site management, sediment testing, and monitoring would follow USACE Seattle District Dredged Material Evaluation and Disposal Procedures – User Manual, Chapter 13 – Dredging and Disposal. The User Manual is provided as Appendix R to Resource Report 3 (Attachment 1).

See the following sections of Resource Report 1 for more information:

- 1.4.1.2.1 Marine Terminal Dredging
- 1.3.1.5.6.2 Marine Terminal Temporary Infrastructure

4.1.2.3. Product Loading Facility

The Product Loading Facility (PLF) is anticipated to consist of the following components at the current time, subject to final engineering

- LNGCs would be moored at a berth, consisting of mooring and breasting dolphins and interconnecting walkways. The berths would be located in natural water depths greater than -53 feet MLLW and would be approximately 1,600 feet apart (the distance measured between the centerline of each berth, see Figure 1.3.1-3). The direction of the berth orientation would be with the predominant peak current direction for safe LNGC maneuvering and to minimize mooring loads while LNGCs are berthed. Each berth would include:
  - Four breasting dolphins that include marine fenders. Breasting dolphins assist moored LNGCs by absorbing loads generated by sea state conditions that are transmitted to the berth from the ship, as well as by serving as mooring points to restrict longitudinal movement of the vessel. The breasting dolphin structures would be supported by jacketed structures. The breasting dolphins would have a pre-cast concrete deck (platform) with railings for personnel engaged in the mooring process and emergency release mooring hooks and winch;
  - Six concrete pre-cast mooring dolphins with mooring hooks (three forward and three aft of the moored vessel at each berth). The mooring dolphins would be used to secure the vessel alongside the berth for cargo loading operations. The mooring dolphins would be supported by jacketed structures piled to the seabed. The mooring dolphins are accessible via walkways; and
  - Walkways for personnel access to breasting and mooring dolphins.
- The access trestle would be a steel jacket structure with decking that would connect the storage tanks onshore to the loading platforms at the offshore end of the trestle. The loading platforms would be connected to each other and to the shore by means of a single trestle;
- The trestle would be approximately 3,300 feet long and would support pipe rack modules and a roadway (side by side) from the shoreline to the loading platforms. The trestle support piles would be spaced at 120 feet, which corresponds to the maximum spacing practicable based on proposed engineering design. The roadway would be a one-lane, standard width of 15 feet with bypass bays

(roadway width of 30 feet) at three locations along the trestle. The trestle would slope down from the top of bluff (approximately +116 MLLW) to the berths (approximately +50 MLLW), as measured from the top of the piles; and

- The marine operations platform (see Figure 1.3.1-3) is a steel jacketed, pile-supported platform that would include the Marine Terminal Building; electrical substations; and supporting piping, cabling, and equipment used to monitor the loading operations. The marine operations platform would have a preliminary design size of approximately 0.4 acre in surface area (approximately 200 feet by 60 feet) and the deck would be capable of supporting a variety of vehicles.

The design for cathodic protection of the Marine Terminal is an impressed current cathodic protection system for the jacketed structure supports and steel piling. During construction, temporary cathodic protection consisting of sacrificial anodes would be used prior to activation of the permanent (impressed current) cathodic protection system. The individual pile and jacketed structures would be bonded to each other to form an electrically continuous steel structure.

Due to the large tidal range, and the presence of moving ice during the winter months (which precludes relying on protective coatings in the “splash zone”), a secondary system for cathodic protection would consist of additional steel pipe encasement over the “splash zone” during operations.

See the following sections of Resource Report 1 for more information:

- 1.3.1.2.1 Product Loading Facility
- 1.3.1.3.1 Cathodic Protection System

4.1.2.4. Shoreline Protection

The MOF would consist of berths and laydown areas and be constructed of local fill materials with site-specific erosion and shoreline protection measures based upon final design.

See the following sections of Resource Report 1 for more information:

- 1.3.1.2.3 Temporary Material Offloading Facility
- 1.4.1.2 Marine Terminal

4.2. Pipelines

Current plans for pipeline areas are detailed below and may be modified during final engineering

4.2.1. Mainline Onshore

The Mainline would be a 42-inch-diameter natural gas pipeline, approximately 807 miles in length, extending from the GTP in the PBU to the Liquefaction Facility on the shore of Cook Inlet near Nikiski, including an offshore pipeline section crossing Cook Inlet. The pipeline would be a buried pipeline with the exception of two planned major aerial water crossings (see Section 7), aboveground crossings of active faults, and the offshore pipeline. The Mainline would originate in the North Slope Borough; traverse the Yukon-Koyukuk Census Area, the Fairbanks North Star Borough, the Denali Borough, the DNPP, the

Matanuska-Susitna Borough, and the Kenai Peninsula Borough; and terminate at the Liquefaction Facility. The Mainline is designed for a maximum allowable operating pressure (MAOP) of 2,075 pounds per square inch (psig) and an average stream day rate of 3.1 billion standard cubic feet per day (BSCF/D), and a 3.3 BSCF/D peak capacity.

The proposed Mainline route begins at the GTP in the PBU and would generally follow the Dalton Highway (Alaska Highway 11) and Trans-Alaska Pipeline System southward from the Prudhoe Bay area to Livengood. From there, the route generally parallels the east side of the Tolovana River south, crossing west of Fairbanks near Minto Lakes, to the Tanana River and follows the Parks Highway (Alaska Highway 3) southward with about 7 miles through DNPP, to a point just south of Trapper Creek. From this point, the Mainline route would continue to the south and southwest following along the west side of the Susitna River to the Deshka River. From the Deshka River, the Mainline route runs southwest to the north shore of Cook Inlet northeast of Viapan Lake, which is between the communities of Beluga and Tyonek. The offshore portion of the Mainline route crosses Cook Inlet to the Kenai Peninsula at Boulder Point. From the south shore of Cook Inlet at Boulder Point, the Mainline route continues south and west to the termination point at the proposed Liquefaction Facility.

Typical construction ROW cross-section diagrams showing information such as widths and relative locations of existing ROWs, new ROW, and temporary construction ROW are provided in Appendix E of Resource Report 1. For the Mainline, a permanent 53.5-foot-wide ROW would be acquired (50 feet plus pipe diameter). The construction ROW width would vary depending on the type of terrain, the season of construction, and the ease of access from nearby roads. The nominal construction ROWs level surface would be 110 feet wide, plus would include travel and bypass lanes where necessary. In addition, the construction footprint would be wider in areas where Additional Temporary Workspaces (ATWS) are required, such as at river or road crossings, side bends, and for cut/fill slope areas, as required. Any additional workspace would be restricted in areas of environmental or cultural sensitivity. A discussion of the rationale for the selection of pipeline ROW widths is presented in Appendix G of Resource Report 1.

Mainline construction would be divided into four pipeline construction spreads that would be built over a two-year period of pipe-lay construction with an emphasis to balance summer and winter construction within a practical time schedule. Clearing activities would typically occur in the winter season and one to one and a half years prior to each scheduled construction season. Additional detail is provided in Section 1.5.2.3.1.1.1 of Resource Report 1 (Attachment 1). Material sites for granular and rock would be opened one year in advance to allow stockpiling.

Depending on season, terrain, geotechnical conditions, vegetation, and availability of materials (water or granular fill), the Mainline would be constructed using one of the following construction modes:

- Ice Work Pad ROW North Slope (Winter) – ROW Mode 1;
- Winter Frost Packed – ROW Mode 2;
- Matted Summer Wetlands – ROW Mode 3;
- Granular Work Pad over Thaw-Sensitive Permafrost (Winter or Summer) – ROW Mode 4;

- Graded Cross Slopes (Winter or Summer) – ROW Mode 5A; and
- Mountain Graded Cut (Summer) – ROW Mode 5B.

Details on each of these Modes is provided in Section 1.5.2.3.1.1.2 of Resource Report 1. The Project's construction and restoration methods proposed for crossing wetlands and surface waters are described in the Wetland and Waterbody Construction and Mitigation Procedures provided as Appendix N to Resource Report 2 (Attachment 1).

The construction modes were selected based on criteria as described in Section 1.5.2.3.1.1.3 of Resource Report 1. Once a segment is characterized and analyzed and a ROW Mode selected, there is potential for future changed conditions. Such conditions can be associated with changes in alignment, subsurface conditions (e.g. soil properties, permafrost conditions, groundwater conditions, geothermal conditions and effects), or weather conditions.

In addition, consistent with the FERC Draft Environmental Impact Statement (DEIS) published June 28, 2019, and Applicant's commitments and comments filed in response to the DEIS on October 3, 2019, prior to construction of the Mainline Facilities, the Applicant will review areas proposed for Mode 4 construction in the summer and confirm that winter construction would not be feasible in low slope areas (0 to 2 percent). Additionally, the Applicant will review and evaluate the use of timber/synthetic mats in place of granular fill in wetlands proposed for Mode 4 construction on slopes of 0 to 2 percent and in uplands proposed for Mode 4 summer construction on slopes of 0 to 2 percent that are underlain by thaw-stable permafrost, and indicate mats will be used or identify reasons mat use is not feasible. If any changes result from these analyses. The Applicant will prepare revised alignment sheets and resource impact tables adopting changes to Mode 4 areas reflecting the increase in winter construction segments and the replacement of granular fill with timber/synthetic mats.

Each segment selection would be documented, and if changed conditions occur during subsequent phases - construction and operation - this documentation can be checked to see if changed condition has occurred that could alter the stability or future restoration of the segment. These changes may or may not be significant in terms of influencing the selection for any given segment. If deemed significant, the proper notifications would be issued, and a prompt resolution agreed with the stakeholders.

Typical construction procedures to be implemented are described in Section 1.5.2.3.4.1 of Resource Report 1. These procedures would be modified as necessary to comply with site-specific route characteristics including environmental considerations.

Near Cook Inlet, the onshore portion of the shore approaches would be prepared utilizing standard onshore excavation and earth working tools. A site-specific crossing plan for each shore crossing is provided in Resource Report No. 2, Appendix I and is attached. Earthworks at bluffs would be required to reduce slope grade to facilitate safe access for personnel and equipment to the shoreline. Cutting of the bluffs would also allow for construction of a trench, providing stability and support for the pipeline as it crosses the shoreline. Spoil material would temporarily be stored near the shore approach and be used as backfill, if suitable. This material may be replaced to remediate the site after pipeline burial, if required, or relocated for use elsewhere on the Project or disposed.

See the following sections of Resource Report 1 for more information:

- 1.3.2.1 Mainline
- 1.3.2.1.2.1 Road, Pipeline, and Utility Crossings Onshore
- 1.4.2.1.1.1 Mainline
- 1.5.2.3.1.1.1 Construction spreads and seasons
- 1.5.2.3.1.1.2 ROW Construction Modes
- 1.5.2.3.1.1.3 Selection of the ROW Construction Mode
- 1.5.2.3.4.1 Mainline Pipeline Construction procedures

4.2.2. Mainline Offshore

The offshore portion of the Mainline (with the exception of shore approaches) would be laid on the seafloor across Cook Inlet on state submerged and submersible lands. The majority of the construction ROW for the offshore portion of the Mainline would not be disturbed during construction. The pipeline is planned to be buried at shore crossing locations to comply with applicable design codes and regulations and protect the pipeline from damage from local hazards (such as vessel grounding, ice keel scour, or dropped objects, etc.).

The shore approaches will either be excavated, then the pipe pulled from the shore to the laybarge; or excavated, then the pipe pulled from the laybarge to the shore. The exact procedures will be determined after the installation contractor is selected. There are slight variations in the shape of the excavation based on which direction the pipe is being pulled, from shore to sea, or sea to shore. Site specific drawings of the shore approaches for the Cook Inlet pipeline crossing have been provided in Appendix I of Resource Report 2 (Attachment 1) and in drawings in Attachment 3. The approach drawing sheets indicate the proposed location for excavated onshore material storage.

A nearshore, shoreline approach trench would be constructed using an open-cut method and extend seaward to ensure the pipeline is:

- Compliant with applicable design codes and regulations; and
- Protected from damage from local hazards (such as vessel grounding, ice keel scour, or dropped objects, etc.).

The nearshore portion of the trench would be constructed as follows:

- Shorty Creek (Northern Shore Approach, also referred to as Beluga Landing South, see Section 10.4.3.2 of Resource Report No. 10) – The nearshore portion of the trench would extend from landfall out approximately 655 feet in Cook Inlet where it transitions to offshore trench. Further, the pipeline would be covered with up to 6 feet of cover out to a water depth of 35 feet below MLLW; and

- Boulder Point (Southern Shore Approach, also referred to as Suneva Lake, see Section 10.4.3.2 of Resource Report No. 10) – The nearshore portion of the trench would extend from landfall out approximately 655 feet in Cook Inlet where it transitions to offshore trench. The same as Shorty Creek, the pipeline would be buried out to a water depth of 35 feet below MLLW plus another 6 feet of cover.

A shallow slope trench will be excavated in the area and is expected to naturally backfill within a matter of several days. If manual backfilling is required, the backfill would be placed by reversing the flow of the trailing suction hopper dredger or mechanically with the use of excavators. Some offshore trenching may be required as well for the same reasons listed above. Trenching would require the backfill of the trench, which may be accomplished using a variety of techniques as described in section 1.5.2.3.8.6 of Resource Report 1.

The nearshore trench for each shoreline is expected to be constructed using amphibious or barge-based excavators to trench to a transition water depth where a dredge vessel can be employed. A backhoe dredge may also be required to work in the nearshore region.

Following pipeline installation, the trench is expected to naturally backfill. Backfilling is anticipated to occur rapidly, within a matter of several days. If manual backfilling is required, the backfill would be placed by reversing the flow of the trailing suction hopper dredger used offshore or mechanically with the use of excavators. Stabilization and restoration will be in accordance with the Project Restoration Plan (Attachment 16A).

In the event the pipeline is required to be buried beyond water depths accessible by amphibious excavators, a trailing suction hopper dredger would be used to excavate the trench for the pipeline. Alternative pipeline burial techniques such as plowing, backhoe dredging or clamshell dredging, would be considered if conditions become problematic for the dredger. After installation of the near shore pipelines, a jetsled or mechanical burial sled may be used to achieve post-dredge burial depths.

The majority of the offshore Mainline would be laid on the seafloor bottom via a lay barge. The pipe will be anchored down to control buoyancy with concrete coating and screw anchors.

Based on metocean conditions, the available window for offshore pipeline installation in Cook Inlet is expected to span approximately six months from mid-April to mid-October. Based on this window, construction is planned for two summer seasons, and shore approach construction is planned to occur in the year prior to pipeline installation across the Inlet. The construction window would provide:

- Sufficient time to mobilize contractor equipment, perform the work, and demobilize; and
- Relatively ice-free weather conditions to ensure that weather downtime does not prevent completion of work within a two-season (summer) construction period and to minimize vessels operation in the vicinity of moving ice.

See the following sections of Resource Report 1 for more information:

- 1.4.2.1.1.1 Mainline

- 1.5.2.3.8 Offshore Pipeline Construction

4.2.3. PBTL

The GTP and associated facilities, located in the PBU, would receive natural gas from the PBU by way of the PBTL. The PBTL would be an approximately 1-mile, 60-inch-diameter aboveground pipeline to transport natural gas from the PBU Central Gas Facility (CGF) to the GTP, with an average stream day rate of 2.8 BSCF/D, a peak capacity of 4.0 BSCF/D and a MAOP of 720 psig. The PBTL would be constructed compliant with the National Association of Corrosion Engineers (NACE) MR0175 Sour Service Specification. The PBTL would be installed on horizontal support members connected to a steel pile, or vertical support members (VSMs), and would be located within the North Slope Borough, crossing lands managed by the State of Alaska.

A typical VSM is illustrated in the attached Project Figures and Appendix E of Resource Report 1. The VSM would be embedded and slurried at a specified depth in the ground. Design of the supports would be in accordance with appropriate codes and standards, and information received from the geotechnical and hydrology reports.

The PBTL route would begin at the edge of the PBU CGF pad and proceed west to the tie-in point at the GTP. The new pipeline would maintain a minimum of 7 feet from the tundra to the bottom of the pipe.

A 120-foot-wide nominal construction ROW would be required for the PBTL. The PBTL would be installed on typical VSMs connected to a horizontal support member. A nominal 120-foot-wide ice road would be constructed along the construction ROW. In locations where additional laydown areas are needed, a wider construction ROW may be required. The VSM installation, pipeline assembly, and erection would be accomplished from the ice road. The PBTL would be located on State of Alaska land and following construction, a 100-foot-wide ROW would be acquired.

See the following sections of Resource Report 1 for more information:

- 1.3.2.2 Prudhoe Bay Gas Transmission Line
- 1.4.2.1.1.2 PBTL

4.2.4. PTTL

The GTP and associated facilities, located in the PBU, would receive natural gas from the PTU by way of the PTTL. The PTTL would be an approximately 62.5-mile, 32-inch-diameter aboveground pipeline. Because the PTU facilities are not designed to remove hydrogen sulfide (H_2S), the proposed PTTL would be designed to carry small concentrations of H_2S that may be contained in gas received from the PTU. The PTTL would be constructed compliant with NACE MR0175 Sour Service Specification to provide mitigation for internal corrosion and stress cracking in the event of a process upset or the unplanned introduction of free water into the system. The PTTL design includes an average stream day rate of 865 million standard cubic feet per day (MMSCF/D), a peak capacity of 920 MMSCF/D, and an MAOP of 1,150 psig.

The PTTL would be located between the PTU and the GTP at Prudhoe Bay, aligned east-west and parallel to the coast of the Beaufort Sea. The PTTL would be located entirely within the North Slope Borough, crossing lands managed by the State of Alaska. Please note that wetland maps and figures in Attachment 13 (PTTL Index and Maps section) were configured to transition from State Plane Zone 4 to State Plane Zone 3 as the map extent moves east along the PTTL. Updates to maps and data in this application are based on a revised PTTL alignment (PTTL Rev D) and use USACE-approved wetlands data that were issued with the PJD letter on August 31, 2018.

The PTTL would begin at the Point Thomson Central Pad, and travel parallel to the existing and operating Point Thomson Export Pipeline until Badami, where it would deviate south to avoid existing infrastructure and align for the crossing of the East Badami Creek. The route then parallels the Badami Sales Oil Pipeline until the East Sagavanirktok River where it heads south to better align for the crossing. The PTTL then proceeds northwest and follows existing infrastructure into the Prudhoe Bay area.

The PTTL would be installed on VSMs. The VSM would be embedded and backfilled with a slurry granular material mix designed for freezing in permafrost soils at a specified depth in the ground. Excess fill would be taken to an approved disposal site. To account for potential permafrost thawing, the PTTL design basis would conservatively embed the VSM below the surface. Design of the supports would be in accordance with appropriate codes and standards, and information received from the geotechnical and hydrology reports. No heat pipes or other refrigeration methods are anticipated for the VSMs. The bottom of the pipeline would be elevated a minimum of 7 feet above the ground surface.

Crossings of three waterbodies, the Shaviovik River, Kadleroshilik River, and Sagavanirktok River Main Channel were originally planned as buried crossings with conventional open-cut methods in the winter, as shown in some of the Applicant's historic documents, including in the initial Alaska LNG 404 Application and in Resource Report 2, Appendix I (Attachment 1). However, the design for these crossings was optimized in 2018 as aboveground; the construction methods for installing the aerial crossings are consistent with Construction ROW Mode 6, the same as for the remainder of the PTTL.

Concrete coatings will not be used for the PTTL in the redesign from open cut river crossings to aerial river crossings[7]. The only fill required for these crossings will be for placement of VSMs, similar to the remainder of the PTTL. The Applicant has submitted a permit application to the US Coast Guard (USCG) for the PTTL crossing of the Sagavanirktok Main Channel.

The remaining crossings, including the West Channel of the Sagavanirktok River, an Unnamed Tributary to Putuligayuk River, and the Putuligayuk River, would remain as aboveground pipeline crossings. The West Channel of the Sagavanirktok River would be crossed by adding structural extensions to an existing pipeline bridge, while the Putuligayuk River and its unnamed tributary would be crossed using standard VSMs.

Construction of the PTTL would be completed in two pipeline construction spreads working over one winter season to install the aboveground support system and the pipeline from an ice work pad. A 100-foot-wide nominal construction ROW would be required for the PTTL. The width of the construction ROW would likely be wider in areas where additional workspace is required, such as at river crossings.

[7] see response to FERC in Accession Number 20181022-5218(33207100), Submitted to FERC 02-15-2018.

Additional workspace would be restricted in areas of environmental or cultural sensitivity. The PTTL would be located on State of Alaska land and following construction, an 80-foot-wide operational ROW would be acquired.

Intermediate natural gas compression or cooling facilities are not planned for the PTTL. The PTTL would be designed to allow passage of in-line inspection and maintenance tools. A launcher located at the PTU meter station and a receiver located at the GTP inlet are currently planned.

Details on the construction process for waterbody crossings can be found in Section 1.5.2.3.3 of Resource Report 1. Construction procedures for installation of the PTTL are described in Section 1.5.2.3.6.

See the following sections of Resource Report 1 for more information:

- 1.3.2.3 Point Thomson Gas Transmission Line
- 1.3.2.3.1 PTTL Aboveground Facilities
- 1.4.2.1.1.3 PTTL
- 1.5.2.3.3 PTTL construction process for waterbody crossings
- 1.5.2.3.6 PTTL construction procedures for installation

4.3. Pipeline Aboveground Facilities

4.3.1. Meter Stations

Meter stations would be installed for the Project to measure gas volume and composition during custody transfer from one entity to another and for verification measurement of natural gas at pipeline design boundaries (likely corresponds to fence line). The design includes four meter stations associated with the delivery of natural gas to the Liquefaction Facility, the PBU Meter Station to provide custody measurements of natural gas entering the PBTL from the PBU, the PTU Meter Station to provide custody measurements for natural gas entering the PTTL from the PTU, the GTP/Mainline Meter Station to measures natural gas entering the Mainline form the GTP, and the Nikiski Meter Station to measure the gas entering the Liquefaction Facility. These four meter stations would be constructed on gravel pads that would be constructed for other reasons, and therefore result in no additional impact. The PBU Meter Station would be located on the existing CGF pad, the PTU Meter Station on the existing PTU Central Pad, the GTP/Mainline Meter Station on the proposed GTP pad, and the Nikiski Meter Station would be located on the proposed LNG Facility.

Each meter station would typically include:

- Isolation valves;
- Above-grade piping;
- Instrument building;
- A meter-run building;

- A gas chromatograph; and
- Flow-metering.

Meter station buildings would be elevated on pilings as required to mitigate heat transfer to the underlying permafrost. Following the installation of piles, building skids would be installed along with a scrubber, meter runs, and piping.

See the following sections of Resource Report 1 for more information:

- 1.3.3 Project Meter Stations
- 1.5.2.3.7.2 Meter Stations

4.3.2. Mainline Block Valves

Mainline Block Valves (MLBVs) would be used to segment the Mainline and PTTL for safety, operations, and maintenance purposes. MLBVs would be sited at locations to meet regulatory, operational, and engineering requirements.

One MLBV would be located at each compressor station and heater station, and the remaining MLBVs would be standalone facilities along the Mainline. For the PTTL, there are three MLBVs selected based on the valve spacing requirements of 49 C.F.R. 192.179 and two isolation/sectionalizing valves coinciding with the Point Thomson Unit (PTU) Meter Station and GTP inlet. The preliminary design for the standalone block valve assemblies currently consists of an aboveground MLBV, blowdown risers on each side of the valve, and a cross-over between the risers. Control systems on MLBV assemblies would include local low pressure monitoring and, in the event of loss of inventory, automatic valve closure occurs. MLBV assemblies would be placed on a platform adjacent to an anchor support.

MLBV's will have gravel pads as shown in the attached drawings from Appendix E of Resource Report 1, Figures 102 and 102A (Attachment 1) and in Attachment 3. These pads have been included in the footprint, with impacts to waters of the U.S. accounted for in the Applicant's reported impacts to wetlands (Attachment 10). Along the PTTL, MLBVs would be constructed from ice work pads.

See the following sections of Resource Report 1 for more information:

- 1.3.2.3.1 PTTL Aboveground Facilities
- 1.3.2.5 Mainline Block Valves
- 1.5.2.3.7.3 MLBVs and Pig Launchers and Receivers

4.3.3. Compressor Stations

Eight compressor stations would be placed along the Mainline at intervals where natural gas pressure would need to increase to offset the pressure losses caused by friction. The stations would be designed for remote operation and would normally be unmanned. The design for each station includes a turbo-compressor package, which consists of one natural gas-fueled turbine rated between 20,000 and 30,000 HP, driving a centrifugal compressor. Station configuration may vary between single units (1 x 100 percent) to multi-unit configuration (2 x 100 percent, 3 x 50 percent). The turbo-compressor package would likely include the following associated equipment:

- Gas generator and power turbine skid;
- Centrifugal compressor skid;
- Self-cleaning intake air filter and silencer;
- Electric variable frequency drive starter motor;
- Gas turbine exhaust gas duct and silencing equipment;
- Lube oil systems and skids complete with lube oil cooling equipment; and
- Skid-mounted integral control panels.

The following facilities, equipment, and systems would be located at the compressor stations:

- Compressor buildings;
- Gas cooling equipment to cool the natural gas leaving station consisting of gas-to-gas exchangers and aerial coolers (specific to the stations with cooling);
- Station and unit control systems designed for remote monitoring and operation;
- Natural gas engine-driven power generators;
- Fuel gas system sourced from the Mainline, for the natural gas turbine;
- Utility and power gas systems to provide utility and power gas to auxiliary equipment;
- Glycol/hot water system, used for heating buildings, conditioning fuel gas and turbine air preheat;
- Inlet inline natural gas scrubber;
- Aviation, gasoline and/or diesel fuel tanks;
- Instrument air system to supply clean, dry, compressed air to control valves, pneumatic instrumentation, and maintenance stations;
- Living quarters to provide intermittent accommodation for four to six personnel;
- Potable water, wastewater, and solid waste systems;
- Control Room;
- Pipeline Pig Launcher and Receiver;
- Other structures, such as a storage building, barrel dock, fencing, and exterior lights;
- Helicopter landing pad; and
- Communication facilities.

Facilities would be built on granular pads with the thickness of the granular pads varying depending on site conditions, including the presence and type of permafrost. The type of foundation needed to support aboveground facilities equipment would be based on site-specific subsurface conditions.

Permafrost conditions, ranging between cold, ice-rich to warm, ice-rich, are expected in some areas north of the Honolulu Creek Compressor Station. For these northern locations, adfreeze piles with air space and thermopiles with air space are proposed for the facility design to mitigate heat transfer to the underlying permafrost. The Honolulu Creek Compressor Station and locations to the south would be built on driven steel piles.

Electric power for the compressor stations would be generated at each site using natural gas engine-driven power generators that would be adequately sized, taking into consideration sparing of units for uninterrupted operation.

See the following sections of Resource Report 1 for more information:

- 1.3.2.1.3 Mainline Aboveground Facilities
- 1.3.2.1.3.1 Compressor Stations
- 1.5.2.3.7.1 Compressor and Heater Station

4.3.4. Heater Station

As a result of Joule-Thomson cooling and pipe-to-soil heat transfer, the temperature of natural gas in the pipeline would generally decrease as it flows through the Mainline. Therefore, gas heating would be required so that the flowing natural gas temperatures are sufficiently high to:

- Avoid the freezing of soils adjacent to the pipeline in non-permafrost areas;
- Maintain the natural gas temperature above a minimum limit to ensure pipeline fracture toughness; and
- Maintain the natural gas temperature above the hydrocarbon dew point temperature to prevent hydrate formation in the natural gas stream.

The following associated facilities would be located at the standalone heater station:

- Instrument and switchgear skid;
- Gas engine-driven power generators;
- Utility and power gas system to provide utility and power gas to auxiliary equipment;
- Other structures, such as a storage building, barrel dock, fencing, and exterior lights;
- Helicopter landing pad;
- Aviation, gasoline or diesel fuel tanks; and
- Communication facilities.

The heater station would be constructed on a granular pad. The pad thickness would vary and depend on soil and permafrost conditions at the site. The heater station is location at the Theodore River Heater Station, as shown in Attachment 10.

Electric power for the heater station would be generated on site using natural gas engine-driven power generators that would be adequately sized, taking into consideration sparing of units for uninterrupted operation.

See the following sections of Resource Report 1 for more information:

- 1.3.2.1.3.3 Heater Stations
- 1.5.2.3.7.1 Compressor and Heater Station

4.4. Pipeline Associated Infrastructure

4.4.1. Access Roads

Access roads would be required during construction of the pipelines and aboveground facilities to transport equipment, material, pipe, and personnel to the ROW, compressor stations, material sites, and other locations. These access roads include existing public roads, existing non-public roads, newly built access roads, and shoo-flies. Some of which will have continued permanent use during operations. The Project's representatives would work with landowners to determine the requirements for reclaiming the land and/or leaving the access roads in place after construction.

Modifications to existing roads may include adding granular material and/or ice and snow to increase the road's load-bearing capacity, grading rough areas, filling in low spots and potholes, widening roadbeds and curves, brushing/grading of shoulders, and installing culverts or bridges. In locations where the soils are stable, driving directly on the ground is planned.

If existing roads are not readily available, or do not provide adequate access, the Project would require new temporary or permanent access roads using available native material, imported granular material, or temporary use of snow/ice, depending on the intended traffic load, duration, and timing of use.

Construction of new permanent roads to access compressor stations, the heater station, and some MLBVs may be needed.

The material for building an access road would depend on a number of factors, including:

- Seasonality of required access;
- Durability, stability or load requirements;
- Terrain contours;
- Readily available native materials; and
- Temporary or permanent usage.

To construct all-season access roads, the area to be constructed would be surveyed, staked, cleared of any trees, and graded as necessary. Compacted granular material, ice, and/or snow would then be placed to create a trafficable surface where needed. Trees and brush within the construction area would be cut and mulched or burned. If leveling is required, low areas would be filled in respect to drainage patterns with granular material or thaw-stable material and culverts would be installed to maintain surface flow during summer months (if the road is not made of ice/snow). Any fish bearing streams crossed would comply with Alaska Department of Fish and Game (ADF&G) permit conditions for maintaining flow in the streams and not impeding fish passage. Furthermore, where bridging over waterbodies or culverts is required, FERC's *Wetland and Waterbody Construction, and Mitigation Procedures*[8] generally would be followed.

Grading would be completed to establish a level area. The access road would be constructed by placing and compacting fill material directly over the surface organic layer to the specified thickness. A geotextile fabric may be placed to provide additional support and separation of the overlying fill and the native materials. Regular maintenance of roads would be provided under the Project's control as needed to maintain a trafficable surface and to control water or seasonal runoff. Constructing access roads would require water for compacting fill material, for other construction activities, and for use by personnel.

Permanent and temporary bridges would be constructed, as needed, to cross waterbodies, depending on water use. There are no permanent bridges on Project access roads (Attachment 19). A prior FERC comment response[9] addressed the location, length, width, flood state design, and duration of the bridge in place for the temporary bridges. Additional information on bridges, structures, and their proximity to OHW is provided in Attachments 1, 2, 3, and 19. Attachment 19 provides correspondence with USCG on bridges, permitting requirements, and a summary of all bridges. Removal of temporary bridges will occur after all construction activities requiring a particular bridge are complete. Restoration will occur as soon as practicable after construction activities are complete and will be in accordance with the Streambed & Bank Restoration Manual (Attachment 16E).

Temporary bridges are not expected to require placement of granular fill material below the ordinary high water mark (OHW) of freshwater streams. In some instances, placement of fill material in freshwater wetlands that are above OHW may be required for bridges, and these impacts are included in Table 6, below, and in wetland impact tables (Attachment 10). One longer temporary bridge over the Deshka River is expected to require mid-stream piers. Plans for this crossing and infrastructure are provided in Attachment 19. A more detailed description of the temporary bridge spanning the West Dock causeway breach is provided in RR1 (Attachment 1), and plans are provided in Attachment 3.

See the following sections of Resource Report 1 for more information:

- 1.3.4 Access Roads

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[8] FERC. 2013. Wetland and Waterbody Construction and Mitigation Procedures. Office of Energy Projects. May. Washington, D.C. 20426.

[9] RFI-465-RR01-012, Accession Number 20171004-2084(32435190)

- 1.3.4.2 Pipeline Access Roads
- 1.5.2.5.1.2 Onshore Pipeline

4.4.2. Additional Temporary Workspaces

ATWS would be located outside of, but adjacent to and contiguous with, the pipeline construction ROW where construction activities cannot be executed safely within the ROW or where more equipment may be necessary (e.g., waterbody, road, utility, and other crossings; at bends and timber storage locations; and in other situations). Each individual location requiring ATWS would be assessed and sized appropriately to account for terrain, soil conditions, site configuration, site-specific construction method, and construction season.

Travel lanes are needed to allow construction traffic to move along the ROW without interfering with the construction activities, as well as preventing construction activities from blocking traffic. Where easy access to the nearest existing public or private road exists, these lanes would likely not be needed. Travel lanes would be needed in locations where there are no access roads approximately every 2 to 3 miles.

In addition to travel lanes, bypass lanes would also be required when the spoil side of the ROW (i.e., location of excavated material) is next to the main access (e.g., Dalton Highway). Construction traffic reaching the ROW from that spoil side could be blocked from accessing the work side of the ROW or the travel lane by an open ditch or a welded pipe string. Use of the bypass lane would allow traffic to proceed parallel to the ROW until the next open “crossing” of the pipeline centerline before pipe is strung or the ditch excavated.

See the following section of Resource Report 1 for more information:

1.4.2.1.2 Additional Temporary Workspace (ATWS)

4.4.3. Construction Camps & Contractor Yards

Temporary construction camps would be used to house personnel during construction of the Mainline and associated aboveground facilities. Each camp would be fully self-sustaining with fuel storage, power generation, water treatment, food preparation, and wastewater treatment facilities.

Camp sizes would depend on the construction activity and locations that they are supporting. Three types of camps would be needed:

- Pioneer (or mobile) camps to house personnel involved in development of construction infrastructure such as developing borrow source material sites, constructing camps, access roads, storage and staging sites;
- Main camps for Mainline and PTTL construction; and
- Facilities camps for aboveground facility construction.

Pioneer camps would be installed approximately two to three years prior to pipeline construction to support preparing the camp sites and camps, access roads, pipe yards, and extracting the granular material required for construction. Pioneer camps would consist of 120-person, skid-mounted units and would occupy approximately 3 acres of land. Once the pads have been developed, these pioneer camps would be used for pipe and equipment hauls, as well as housing personnel used for the construction of the larger main camps. Once the main camps are operational, the pioneer camps may be relocated depending on the construction plan. However, a number of the pioneer camps would remain in place to support the last year's work of restoration and cleanup requirements.

The Pioneer Camp in Prudhoe Bay will be used to house workers who are installing the pad and roads for the GTP. Current plans for the Pioneer Camp is to either utilize an existing upland pad in Prudhoe Bay for a Project camp or to utilize existing camp facilities to house these Project startup workers. The Applicant may opt to use the planned footprint of 9.18 acre Prudhoe Bay PSY pad or the 35.24 acre Prudhoe Bay Camp pad located adjacent to the GTP Site as alternate locations for the Pioneer Camp if space is not available in existing commercial camps or on an existing pad in the Prudhoe Bay area (Attachment 3). No new gravel placement is anticipated solely for this Pioneer Camp.

Main camps would occupy approximately 20 acres of land and house approximately 1,200 persons, depending on construction requirements. The camps would consist of camp modules that are transportable by truck and placed on timbers for leveling and drainage.

Facilities camps (240 personnel on average) would support heater station, meter station, MLBVs, and compressor station construction. Generally, these camps would be located on or adjacent to facility sites and would occupy up to 8 acres. Camps established for construction of compressor stations and heater stations would be situated within the station permanent fencing.

Contractor yards would be required for staging, material storage, and other contractor needs. Contractor yards would be collocated with camps or pipe storage yards. Overall size of the combined camp contractor yard would vary from 20 to 35 acres depending on camp option selected. Imagery and construction layouts indicate the maximum use of uplands prior to wetland disturbances (see Attachment 3B).

In some cases, a pipe yard and contractor yard may be collocated together and/or with a construction camp, depending on available acreage, access, and topography. Camps, storage areas, and contractor yards would be established at previously disturbed sites to the extent practical or on the proposed Liquefaction Facility, GTP, or compressor station sites. Where new sites are established or existing sites would be expanded, the sites would be cleared of vegetation and then leveled and stabilized, as necessary, prior to installation of the site facilities. Gravel pad thickness may vary based upon site conditions. Construction camps would be located such that they take into consideration the travel distance from camp to construction site, the duration the camp would remain in the same location, the design occupancy, available water sources, and available pre-existing disturbed areas.

The amount of granular material for camps and yards that is placed on new or expanded pads of disturbed areas will vary depending on site conditions, as well as geotechnical considerations, wetlands characteristics, and other factors. Typical pad thickness will vary between two and five feet, yielding an approximate volume per acre of between 3,200 CY and 8,100 CY, respectively. Section 7, below, provides information on the aggregated volume for all camps and storage locations. These impacts associated with fill will be permanent, with ROW lease stipulations adhered to during construction, including preference of the landowner for gravel to be left in place or removed. Project wetland impacts will be mitigated through a variety of means, including compensatory mitigation.

Future design phases and construction contracting may warrant additional pipe, rail, and contractor yards beyond those currently identified. If changes are required, Project representatives would file an updated list of work areas, including construction camps, pipe, rail, and contractor yards prior to use for FERC approval.

During post-construction reclamation, temporary camps, pipe storage areas, and contractor yards would be disassembled and surface facilities removed unless other arrangements are made with the landowner or land managing agency. Granular material pads installed as part of camp or yard construction would be left in accordance with land use agreements.

See the following sections of Resource Report 1 for more information:

- 1.3.2.4.3 Language for Construction Camps, Contractor Yards and Rail Spurs
- 1.3.2.4.3.1 Construction Camps
- 1.3.2.4.3.3 Contractor Yards
- 1.4.2.3.4 Construction Camps, Pipe Storage Areas, Contractor Yards, and Rail Spurs
- 1.5.2.5.4 Construction Camps, Pipe Yards, Contractor Yards, and Rail Spurs

4.4.4. Disposal Sites

There are three types of non-liquid waste disposal sites anticipated for use by the project, and they are classified by the type of material to be disposed. Types of non-liquid material to be disposed includes hazardous waste; garbage, packaging and construction debris; and excess overburden and unusable excavation material.

Hazardous waste disposal is heavily regulated and includes requirements for tracking of waste from generation through disposal. Any hazardous waste generated by the project would be disposed at a federally-approved hazardous waste disposal site. Currently, most of those locations are outside of Alaska.

Existing permitted landfills would be used for non-hazardous solid waste such as garbage, packing and construction debris. There are four permitted non-hazardous waste landfills located at Deadhorse Oxbow Landfill, Fairbanks North Star Borough Landfill, Anchorage Regional Landfill, and Kenai Peninsula Borough Central Peninsula Landfill, which would likely have capacity for the project refuse. These are supplemented by numerous transfer stations where refuse is collected for transport to the landfills for disposal.

Native materials stockpiled during construction, including materials such as blasted rock, overburden, gravels, spoils, excess brush or cleared material, would be managed at designated material disposal locations. The average material disposal location surface area is approximately 4 acres, with at least 28 locations greater than 5 acres in size. Material at disposal sites would be placed to an average height of 5 feet. At this time, no material sites would be used as disposal sites, but existing mine sites that are no longer required will be considered for future use, depending on land owner and agency approval.

The disposal sites shown on the maps in Appendix A of Resource Report No. 1 (Attachment 1) and for which land requirements are listed in Table 1.4-1 of Resource Report No. 1, are intended for excess overburden and unusable excavation. The use of the sites would require land owner approval and a U.S. Army Corps of Engineers Section 404 permit for wetlands impacts based on site specific requirements. These sites are discussed further in Resource Report No. 6, Appendix F, Section 6, Excess Material Disposal and listed in Appendix C – Potential Disposal Sites for the Mainline within Appendix F – Gravel Sourcing Plan and Reclamation Measures (Attachment 1). However, there were some sites omitted from the list and errors that required correction[10]. An updated tabular list of proposed disposal sites for the Project is provided as Attachment 22. Also included in Attachment 22 is an updated version of Appendix F and map sheet 111 of Appendix A1 and A2 of Resource Report No. 1 showing proposed disposal site 94A which was omitted in error. Corrected sites are shown in the GIS (Attachment 2) and wetland impact tables (Attachment 10) Unsuitable material that is excavated along the pipeline ROW and cannot be placed over the pipeline would be disposed of along widened portions of the ROW or along access roads that touch the ROW.

See the following section of Resource Report 6, Appendix F for more information:

- 6.0 Excess Material Disposal

4.4.5. Double Joint / Coating Yards

The 42-inch pipe for the Mainline would be shipped coated from mills in 40-foot joint lengths. Once offloaded at the port of entry, the 40-foot pipe would be trucked or railed to a double-jointing plant in the Wasilla Area near Pitman Road (see map in Attachment 3) and to a double-jointing plant near Fairbanks that would use an existing developed site (specific location to be determined). The coated double-jointed 42-inch pipe (80 feet in length) would then either be trucked or railed to pipe storage yards or other locations along the route.

The PTTL's 32-inch, 40-foot bare pipe would be railed to a double-jointing plant near Fairbanks from either the Port of Anchorage or Seward. The pipe would then be double-jointed, coated, and insulated. Pipe would be trucked to storage and laydown areas in winter along the PTTL route.

See the following section of Resource Report 1 for more information:

- 1.5.2.1.2.2 Discussion on double jointing/coating yards

[10] Previously, the last paragraph of Section 6.0 on page 14 of 19 erroneously listed the total acreage and number of disposal sites. This should be corrected from 423 acres to 259.14 acres. The total number of sites should be corrected from 113 to 109.

4.4.6. Helipads

Where helipad sites are required outside of the construction sites for the construction camps, contractor yards, compressor station facilities, heater stations, and some MLBVs, each site would be cleared and leveled. Where required, granular pads would be constructed for stability. In some cases, the site may be sufficiently stable to allow helicopter operations without the use of a granular pad.

See the following sections of Resource Report 1 for more information:

- 1.3.5 Project Helipads
- 1.5.2.5.2 Helipads

4.4.7. Material Sites

Various materials (e.g., sand, granular material, and stone) would be required for construction of the Project, including base material for work pads, aboveground facility sites, temporary construction facilities, access roads, and other uses. Material may also be used during construction for concrete production, temporary laydown, equipment staging, and other uses. The material required for these facilities would be obtained from material sites that are either existing or would be developed for the Project. This granular fill would be sourced from multiple locations over the seven-year construction period.

The majority of the granular material required by the Project would be needed for pipeline construction. The estimated need for granular material is approximately 8.8 million CY for the work pad and an additional 1.95 million CY for bedding and padding of the pipe. Minor amounts would also be needed for weight bags, as fill to protect the ditch and workspace areas, and for slope stabilization, estimated at approximately 0.56 million CY.

A potential list of existing and new sites is provided in the Project's *Gravel Sourcing Plan and Site Reclamation Measures,* which is included in Resource Report No. 6, Appendix F. Most of the material required to support the pipeline would be for construction and either left in place or reclaimed as per landowner requirements. The material sites themselves would also be left in place or reclaimed per landowner agreements.

Access to these material sites would be by winter road, all-weather road, Project footprint (e.g., pipeline ROW), or some combination of these.

See the following sections of Resource Report 1 for more information:

- 1.3.7 Material Sites
- 1.3.7.2 Pipeline Material Sites

4.4.8. Pipe Storage Yards

Pipe storage areas approximately 6 to 15 acres in size would be constructed to store pipe that would ultimately be delivered to the ROW. Pipe typically would be delivered in double-jointed (80-foot nominal, 76-foot estimated) lengths. Exceptions would include allotments of double-random (40-foot nominal, 38-

foot estimated) joints to be used for concrete coated crossings, test manifolds, steep terrain, valve pups, and other locations, and possibly some allotments of triple random joints to be used in the stress-based design areas.

Pipe storage yards would be spaced approximately every 20 miles along or near the pipeline construction ROW. In some cases, a pipe yard and contractor yard may be collocated together and/or with a construction camp, depending on available acreage, access, and topography. To the extent practical, these sites would be located on previously disturbed areas. Where new sites are established or existing sites would be expanded, the sites would be cleared of vegetation and then leveled and stabilized, as necessary, prior to installation of the site facilities. Gravel pad thickness may vary based upon site conditions.

During post-construction reclamation, temporary camps, pipe storage areas, and contractor yards would be disassembled and surface facilities removed unless other arrangements are made with the landowner or land managing agency. Granular material pads installed as part of camp or yard construction would be left in accordance with land use agreements.

Future design phases and construction contracting may warrant additional pipe, rail, and contractor yards beyond those currently identified. If changes are required, Project representatives would file an updated list of work areas, including construction camps, pipe, rail, and contractor yards prior to use for FERC approval.

See the following sections of Resource Report 1 for more information:

- 1.3.2.4.3 Construction Camps, Pipe Storage Areas, Contractor Yards, and Rail Spurs
- 1.3.2.4.3.2 Pipe Storage Areas
- 1.4.2.3.4 Construction Camps, Pipe Storage Areas, Contractor Yards, and Rail Spurs
- 1.5.2.5.4 Construction Camps, Pipe Yards, Contractor Yards, and Rail Spurs

4.4.9. Railroad Spurs and Work Pads

It is planned to receive the line pipe and major equipment in Seward and then transfer materials to Fairbanks via the Alaska Railroad system. Most movement would be between existing facilities at Seward and Fairbanks, but some of the line pipe would be delivered to newly built railroad spurs. Eight sidings (i.e., relatively short stretch of track used to store cars or enable trains on the same line to pass) have been identified (Table 1.3.2-10) that are located in proximity to the ROW and pipe storage yards. A spur would be added to each of these sidings to facilitate the unloading of Project material onto a newly built granular pad.

Future design phases and construction contracting may warrant additional pipe, rail, and contractor yards beyond those currently identified. If changes are required, Project representatives would file an updated list of work areas, including construction camps, pipe, rail, and contractor yards prior to use for FERC approval.

Where new sites are established or existing sites would be expanded, the sites would be cleared of vegetation and then leveled and stabilized, as necessary, prior to installation of the site facilities. Gravel pad thickness may vary based upon site conditions.

See the following sections of Resource Report 1 for more information:

- 1.3.2.4.3 Construction Camps, Pipe Storage Areas, Contractor Yards, and Rail Spurs
- 1.3.2.4.3.4 Rail Spurs
- 1.4.2.3.4 Construction Camps, Pipe Storage Areas, Contractor Yards, and Rail Spurs
- 1.5.2.5.4 Construction Camps, Pipe Yards, Contractor Yards, and Rail Spurs

4.4.10. Mainline MOF

A Mainline MOF is sited on the west side of Cook Inlet in proximity to the pipeline shore crossing to support onshore and offshore pipeline and facilities construction. An existing barge landing facility in the Beluga area is not considered feasible for use in construction due to its current high level of utilization and its lack of a robust landing area suitable for larger barges that would be required by the project. In addition, the existing access road, facility, and landing would not be suitable for cargo offloading. There is a steep gradient at the landing and sharp bends in the access road. The existing barge landing would be used as an offloading and backhaul point during initial Mainline MOF construction. The Mainline MOF would be located close to, but at a reasonable distance from, the current Beluga barge landing facility such that construction and operation of the MOF would not interfere with current dock operations.

Construction activities supported by the Mainline MOF include the Cook Inlet shoreline crossing into Cook Inlet and onshore construction between Cook Inlet and the Yentna River. All of the supporting equipment, materials, and supplies would need to be delivered by water or by air because the west side of Cook Inlet is not connected to any other area of the state by road. The purpose of the Mainline MOF would be to provide a marine offloading and backhaul loading point for construction equipment and consumables, fuel, camp components, personnel, line pipe, and other construction materials. The MOF would consist of berths and space for tugs including:

- Lo-Lo Berth for unloading pipes and construction materials; and
- Ro-Ro Berth and ramp dedicated to Ro-Ro operations.

The overall size of the Mainline MOF would be approximately 600 feet long by 400 feet wide. Access roads would be constructed that lead from the MOF to a planned material laydown area that connects to the local road system.

Due to the shallow water at landing site near the Mainline MOF, it is assumed that barges delivering cargo would be grounded at the berths during low tide. An exception would be Ro-Ro barges or vessels, which would be restricted to the tidal window in which they can operate. No dredging is proposed to enhance barge docking capabilities, however adequate fill from onshore would be added at the landing to enable a barge to ground itself and provide for offloading capability.

The permanent Mainline MOF is anticipated to consist of:

- Two 30-foot-wide access roads cut through the existing bluff and leading to a quay;
- A quay constructed as a gravity structure formed by an anchored sheet-pile wall;
- A Ro-Ro ramp consisting of anchored sheet pile construction that abuts the quay; and
- Surfacing on the quay and access roads consisting of graded crushed rock.

Preliminary plans for the MOF are to install 1,340 feet of steel sheet piling, including an anchor wall complete with tie-rods. The sheet piling would be installed by both vibratory and impact

type pile driving hammers. Pile driving would occur on about 25 days over a 60-day period in April and May. The sheet pile is expected to be approximately 70 to 80 feet long and would be embedded approximately 50 feet into the Cook Inlet seafloor. The sheet pile driving would be expected to result in relatively little suspended sediment in the water column or subsequent sedimentation.

Approximately 600 linear feet of the sheet pile would be installed when the tide is out, which would therefore not result in any turbidity or sedimentation, or generate underwater sound. Approximately 670 feet of the sheet pile would be installed using marine equipment, with the first 50 percent of embedment conducted with a vibratory hammer and the remaining 50 percent with an impact hammer. At a predicted production rate of 25 linear feet per day per crew, and two crews, the in-water sheet pile driving is expected to take about 13 or 14 days, and the impact or vibratory hammer would only be operating 25–40 percent of the time during these days.

The fill material used in construction of the Mainline MOF would be locally sourced or imported granular fill[4]. In addition, 9,600 square feet of concrete placed 3 feet thick, would be required for the Roll-on/ Roll-off ramp. Approximately 64,000 CY of general fill and 70,000 CY of engineered fill will be required to backfill the Beluga MOF structure. 1,067 CY of concrete is required for the Ro-Ro ramp. The MOF fill area is 3.2 acres, and the Ro-Ro ramp would cover 0.22 acre.

See the following section of Resource Report 1 for more information:

- 1.3.2.4.1 Mainline MOF

4.4.11. Gas Interconnection Points

Interconnection points provide opportunity for connection between the Mainline and any future in-state natural gas treatment facilities and distribution systems that would convey natural gas supplies to utility or industrial users. Currently, there are no known plans for construction of facilities downstream of the interconnection points.

The assemblies required for the gas interconnection points discussed in Section 1.3.2.1 of Resource Report 1 (Attachment 1) would be prefabricated and tested prior to installation, and would be installed after hydrostatic testing of the pipeline is complete. Upon completion, the site would be fenced. Granular material may be placed at these sites, if necessary.

The Applicant has identified in-state interconnection points for the Project. Primary interconnections are expected to be operational at pipeline start-up and allow for gas delivery to existing gas transmission and distribution systems.

Commercial negotiations for interconnection will determine if offtake facilities will be co-located at MLBV sites or will be included in infrastructure developed by others not associated with the Project. Conceptual schematics of both the "Macro" and "Mini" offtake station equipment are attached (RFI-461-099 Attachment 1). While the conceptual schematics depict typical equipment layouts, final equipment layout will be completed in detailed design.

Primary interconnections are currently planned for the following MLBV locations:

1. Fairbanks (MLBV-12): Interior Region users served by the combined Fairbanks Natural Gas (FNG) and Interior Gas Utility (IGU) service areas. The current MLBV-12 footprint included in the Application is 0.14 acres (5,950 square feet) and will accommodate the conceptual "Mini" offtake station, if required by commercial agreements.
2. Cook Inlet West (MLBV-27): Southcentral Region users served by the ENSTAR Natural Gas Company (ENSTAR) service area. The current MLBV-27 footprint included in the Application is 0.14 acres (5,950 square feet) and will accommodate the conceptual "Macro" offtake station, if required by commercial agreements.
3. Cook Inlet East (Terminus MLBV-30): Southcentral Region users served by the ENSTAR service area. The current MLBV-30 footprint included in the Application is 2.73 acres (118,800 square feet) and will accommodate the conceptual "Macro" offtake station, if required by commercial agreements.

See the following sections of Resource Report 1 for more information:

- 1.3.2.1 Gas Interconnection Points
- 1.5.2.3.7.4 Proposed Gas Interconnection Points

4.5. GTP Aboveground Facilities

4.5.1. GTP Pad & Operations Center Pad

The GTP Pad would be located near existing PBU facilities, and would be built using a granular pad to protect the tundra and permafrost. The following features would be located on the GTP Pad:

- Processing trains;
- Control building;
- Flares; and
- Metering.

The layout of the GTP was evaluated for all phases of the Project as it relates to safety, accessibility (including emergency, constructability, and maintenance), plot space requirements, schedule, and execution certainty. The facility would be restricted to the south by an existing road and pipeline corridor. The facility becomes limited to the north and west by existing bodies of water, so efforts were taken to minimize the impact to those bodies of water. Approximately 2,000 feet to the east of the proposed GTP Pad is the PBU CGF.

The GTP design is considering opportunities for adaptation and resilience. Potential impacts to the GTP could result from localized geohazards in the subsoils under the facility. To minimize such risks, field surveys would be conducted to confirm equipment locations and design foundations to match subsoils. For example, a geotechnical investigation would be conducted to evaluate subsoil type and characteristics (e.g., ice-rich/ice-poor soils, ice lenses, active layer depths) and analyze such characteristics to assist design (e.g., pile capacity, pile depth, frost jacking loads, granular material thicknesses, thermosyphon requirements). In addition to design mitigations, construction strategies would also include considerations of granular material placement. Granular material placement would consider absorption into the active layer and build-up sufficient thickness to protect the tundra and permafrost during construction.

The primary access to the GTP Pad would be via the module haul road. An access road connects the GTP and PBU CGF for emergency purposes.

Based on preliminary process safety and dispersion modeling, the Operations Center would be located on a separate granular pad. The Operations Center Pad would be connected to the GTP Pad by a module haul road, and would be located approximately 3,000 feet northwest of the GTP Pad and would include the following features:

- Residential camp;
- Site offices;
- Warehouse; and
- Maintenance shop.

The Operations Center Pad would be accessed from the module haul road connected to the GTP Pad.

GTP facilities would be constructed on a granular pad of sufficient thickness to reduce the potential for heat transfer to the permafrost and reduce against damage/disturbance to the tundra. After the site has been prepared, piles would be installed to support modules, buildings, equipment, and structures. Preparation work includes road widening, pipeline crossings, GTP Pad construction, support pipeline construction, and reservoir construction. The majority of the GTP facility would consist of modules transported to the site via seagoing vessel and then transported from the dock to the site using SPMTs. It is expected that the modules would be delivered during four summer sealift seasons. The remaining facility components would be constructed on site.

Installation of work pads and road construction to support the GTP would primarily be completed in winter to avoid tundra degradation. During construction, snow blowers, dozers, graders, etc., would be used to clear snow from construction ROW and access roads. As practicable, summer construction would occur on the roads and granular pads that were constructed during the previous winter season.

To operate the GTP facility, additional facilities would be built and maintained on site. When construction is complete, the onsite construction camp would remain as a permanent operations and turnaround accommodation facility. On a normal operating basis, the operations camp facility would accommodate approximately 125 personnel. During maintenance turnaround activities, the operations camp facility would accommodate a maximum capacity of up to 1,680 beds if required. The permanent camp would include offices, dormitories, kitchen, dining, recreation, and medical and aid facilities.

See the following sections of Resource Report 1 for more information:

- 1.3.2.8 Gas Treatment Plant
- 1.3.2.8.1 GTP Pad and the Operations Center Pad
- 1.3.2.8.11 GTP Associated Infrastructure
- 1.3.2.8.11.1 Permanent Operations Camp
- 1.5.2.4 GTP Construction Procedures

4.6. GTP Associated Infrastructure

4.6.1. Associated Transfer Pipes

Several other transfer pipelines would be necessary to supply the GTP, including the following:

- Fuel gas pipeline (approximately 2 miles of 6-inch pipe) delivering fuel gas from the PBU CGF to the GTP and GTP Operations Camp;
- Propane pipeline (approximately 1 mile of 2-inch pipe) taking propane from the PBU CGF to the GTP for use in the GTP refrigeration system;
- Putuligayuk River pipeline (approximately 1 mile of 14-inch pipe) delivering water from the Putuligayuk River to the reservoir (described below in Section 4.6.7, Water Reservoir and Pump Facilities); and
- Supply water pipeline (approximately 5 miles of 6-inch pipe) taking raw water from the reservoir to the GTP and GTP operations camp (below in Section 4.6.7, Water Reservoir and Pump Facilities).

The PBU CGF to GTP pipelines would be supported on VSMs in a new elevated pipeline system for much of the route between the PBU CGF and GTP. The fuel gas and propane pipelines would be installed on the same VSM as the PBTL and share the same construction and operational ROWs. The water line from the reservoir to the GTP is above ground and would be installed on a VSM connected to a horizontal support member. An approximately 110-foot-wide nominal construction and 100-foot-wide ROW would be required for the new water supply pipeline.

See the following sections of Resource Report 1 for more information:

- 1.3.2.8.10 Associated Transfer Pipelines
- 1.4.2.4.2.1 GTP Associated Pipelines
- 1.5.2.4.1 GTP Associated Pipelines

4.6.2. GTP Related Access Roads

An access road and an emergency egress road to the GTP would be required, with a third service road connecting the GTP to the water reservoir and granular material mine. Existing roads (i.e., no additional work is required to utilize the access roads) would be used to the extent practicable for the GTP access road. The emergency egress road and service road would be new. In addition, a new service road is proposed that would connect the GTP to the southern PBU road network (e.g., Spine Road) and provide greater access to the GTP mine.

An emergency egress road to the GTP site located on the east side of the GTP pad would connect to the existing PBU CGF facility. This road would have a top width of 40–50 feet and be of limited use. It would provide additional egress from the GTP Pad while also providing for an additional access point for emergency support services via the existing PBU CGF. This configuration provides two safe egress points that are cross-wind of the GTP facility.

A third access road would connect the GTP to the water reservoir and the granular material mine. The road would be approximately 3.4 miles long and have a top width of 50 to 60 feet. In addition, a road from this gravel mine access road (southern access road) would connect to the drill site 15 access road to connect the GTP to the southern infrastructure and provide another egress route.

The main access road to the facility would double as the module haul and return roads, entering from the northwest corner of the GTP Pad. The existing portions (i.e., West Dock Causeway and K Pad Road) of the main access road would be upgraded to support module hauls, and turn-outs provided to facilitate two-way traffic during construction as modules are being transported to the site. Improvements to the existing roads include using granular material to widen the existing causeway and K Pad access road from the Dock Head (DH) 4 dock site to a location approximately 6,000 feet northeast of the K Pad. The improvements are:

- A parallel 100 - 125-foot-wide and approximately 5,000-foot-long causeway would be built on the east side from DH3 to DH4 because the existing causeway leading up to the Seawater Treatment Plant (STP) is at a much higher elevation;
- The old 150-ft breach between DH3 and the STP has been filled in for a number of years through natural fill. The proposed design is to build a solid fill road in place of the existing bridge. The volumes and area of fill required are included later in this application in Table 7.
- The other two existing segments of West Dock Causeway would be upgraded to a width of approximately 100–125 feet from the current width ranging from approximately 40 to 80 feet from the dock pad to landfall, an approximate distance of 4,500 feet from DH3 to DH2 and 3,800

feet from DH 2 to land. Widening would be conducted on the east side (within the shallow water area) because there is a pipeline along the west side; and

- The K Pad access road would be upgraded to a width of 100 feet from its current width of 40 feet. Widening would be done to the northern side since there is a pipeline along the southern shoulder.

A new section of module haul road would be constructed from the existing K Pad access road.

To construct granular roads, the route would be surveyed, staked, and cleared as necessary. Granular material would then be placed to a specified thickness to create a trafficable surface and to stabilize the footprint of the road.

See the following sections of Resource Report 1 for more information:

- 1.3.4.3 GTP Access Roads
- 1.4.2.4.2.6 GTP Access Roads
- 1.5.2.5.1.3 GTP

4.6.3. Barge Bridge

The existing bridge across the 650-foot channel/breach located between DH 2 and DH 3 is limited to single-lane, light vehicle traffic at a width of 20 feet, and an approximate load limit of 100 tons. A bridge with capacity to support the modules would be required for a successful sealift (see Resource Report 1 – Attachment 1 and Attachment 3A for specific details). A temporary barge bridge consisting of two barges ballasted to the sea floor would be used to span the gap. The barges would be placed at the beginning of the open-water season prior to each sealift.

The barge bridge would provide up to three areas for fish passage, if required during the proposed time of use (e.g., between the barges and between each barge and the adjacent bulkhead). Pre-work would be performed a year before the first sealift to prepare the seafloor and install breasting-dolphins for the barge bridge support. The surface would be prepared using minimal fill and placement of gabion mattresses to prevent scour. The barges would be removed at the end of each sealift and the surface would need to be prepared again prior to each sealift year.

The number of pilings, size, material, and installation method for installation to support the temporary barge bridge are provided in Attachment 20, which describes the piles to be installed for the Causeway Barge Bridge. The barges will be moored to mooring dolphins that will be installed within the breach (Attachment 19). Gravel will be discharged onto the sea bottom to create the barge pad and will be left in place. A projected area that is 710 feet long and 160 feet wide is included in the project footprint to account for the placement of fill and gabion mattresses, resulting in 113,600 square feet (2.61 acres). Up to 4,200 CY of gabion mattresses will be placed on top of the barge pad to prevent erosion and to provide support for the barges. Typical dimensions for gabion mattresses (marine mattresses) are 1 foot thick by approximately 5 feet wide and 35 feet long and weigh approximately 9.6 tons. These will be slung into place using either a large excavator or a crane working from the ice surface and will be permanently left in place. The resulting fill volumes of gabion mattresses are included in total wetland fill volumes, and acres of impacts have been fully accounted for in wetland impact tables (Attachment 10).

Approximately 7,500 CY of gravel is expected to be used to construct the barge pad and to fill low areas on the sea bottom. The currents are low enough and the gravel is expected to be resistant enough to erosion, that migration is not expected. In addition, the side slopes of the pad, when in fill, will be designed to be stable considering the expected currents and the gradation of the gravel to be used.

The barges will be maneuvered into position by shallow draft tugs, moored to the mooring dolphins and ballasted to sit in contact with a barge pad to be constructed on the sea bottom. The barges will be ballasted with sea water. At the completion of each seasons sealift, the barges will be de-ballasted and then removed by shallow draft tugs.

As additional data is acquired and further guidance received on fish passage requirements, the barge bridge surface, structures, and mooring systems would be re-analyzed and may require updates. Dredging is not planned at the proposed barge bridge at this time.

See the following sections of Resource Report 1 for more information:

- 1.3.4.3.1 Barge Bridge
- 1.4.2.4.2.4 Barge Bridge

4.6.4. Material (Mine) Site

The Project representatives propose to use granular material excavated from the water reservoir to support the construction of other Project infrastructure. Additional details are provided in the Project's *Gravel Sourcing Plan and Site Reclamation Measures,* which is included in Resource Report No. 6, Appendix F (Attachment 1). Discussions are underway to determine whether existing mine sites could be used for early granular material supply until the reservoir and/or mine site is/are opened. Preliminary discussions indicate that the Put-23 mine could accommodate the initial granular material volumes required for the early stages of construction of the GTP.

A new granular material site approximately 1.4 miles (straight-line distance) south-southwest of the GTP site, 1 mile west of the existing Put-23 mine site, and less than 1 mile north of the Putuligayuk River has been defined. The mine site is depicted in Attachment 3B . In addition, it is estimated that development of the new reservoir (adjacent to the mine site) would generate material to support GTP construction. Once the reservoir excavation meets design requirements, it would be filled and no longer be used as a granular resource.

Third-party material would be required until the new mine site is producing. It is anticipated that approximately 1 million CY of granular material could be acquired from the Put 23 mine or possibly from the Alaska Department of Transportation and Public Facilities Pit 103, located south of the Deadhorse Airport.

See the following sections of Resource Report 1 for more information:

- 1.3.7.3 GTP Material Site

- 1.3.7.3.1 Mine Site

4.6.5. Module Staging Pad

A new module staging area (approximately 86 acres) would be constructed for placement of the modules immediately following offload. The staging area would be an extension off the northwest side of the K Pad road just south of the existing West Dock staging area. Following construction, the module staging area would remain in place for future equipment deliveries, turnarounds, and decommissioning and dismantling of the facility.

Over-summering of ice work pads for module storage and staging is not practical from a construction standpoint because the modules would be delivered in the summer months, requiring an ice work pad to be made the previous winter and maintained until the delivery of the module. Previous over-summering of ice pads on the North Slope occurred when ambient temperatures trended cooler. The modules for the GTP are very heavy (9,400 tons), which could be problematic with ice pads.

See the following section of Resource Report 1 for more information:

- 1.3.2.8.12.2 Module Staging Area

4.6.6. Water Reservoir and Pump Facilities

The GTP water systems would provide water to various users in the GTP and operations camp including process makeup requirements, firewater, and potable water. A planned water reservoir would likely not be available early enough to provide a portion of the construction water needs. Water supply to the GTP and Integrated Construction and Operations camp would originate from the Putuligayuk River.

The Put River is extremely responsive to precipitation and snowmelt events. The Put is completely frozen in winter, but during break-up in the late spring / early summer, water levels peak. Most rivers and streams on the North Slope reach or exceed their high-water marks at this time, and in some cases, over-top their banks as all of the snow melts. Due to the low flow in the winter and presence of fish within the river, year-round withdrawal of sufficiently large quantities is unlikely.

The flow of water from the reservoir to the GTP and facilities is expected to be a year-round activity, versus the reservoir fill operation, which is expected to occur only for a short duration during the spring break-up and flood season. Initial filling of the reservoir would take two years and would cause a minor and temporary drawdown of the Put River, removing less than 20 percent of flow for about 20 days during peak flow (spring break-up). In each year, the reservoir would be filled from water in the Put during flood stage. The initial fill of the reservoir would fill the reservoir to capacity (i.e., a two-year water supply for the GTP plus ice pack). This initial fill will span two breakup seasons and may utilize both pumps at peak breakup.

Even though water drawdown within that source can lower water levels for that season, spring melt/thaw in the next spring has been demonstrated to recharge these waterbodies to original levels. In addition, variable withdrawal rates would be used throughout the duration of reservoir filling to ensure the withdrawal rate is always below 20 percent of available flow.

The reservoir site will be located within a study area identified on Figure 1.3.2-3 of Resource Report 1 (Attachment 1). The preliminary reservoir design includes a footprint of approximately 35 acres with a depth in range of 35 to 60 feet. The reservoir is designed to provide year-round supply and is expected to form a surface ice pack of approximately 8 feet, which is not included in the net available capacity.

Pump requirements, silt and salinity layers, side slope, ramp design, and other factors would affect the net available capacity in comparison to the total volume of the reservoir. Pump strainers (one for each pump) would remove larger solids from the water stream (primarily to protect the pumps and the downstream flow meter). The preliminary estimate for available capacity is 250 million gallons, a two-year water supply for the GTP that would support process and potable water demands.

At the current design rate, the maximum annual GTP water requirements can be transported to the reservoir by pumping in 20–25 days; this withdrawal rate is only 3 percent of the Put River breakup flow at 200-year low-flow event rates. For average breakup flows, this design draw rate is less than 1 percent of the Put River breakup flow.

Two motor-driven pumps would be included with normally one pump in operation, and the other as a standby spare. If a faster reservoir fill-rate is desired, the pumps would be run in parallel. The pump design flowrate and location would be further defined during the permitting of the water intake facility.

The Alaska LNG design requires an intake structure placed in the PUT within an oxbow backwater “lake” with a strong hydrologic connection to the river. An alternate site is located within the river itself immediately downstream of the oxbow where water is deeper and may open up earlier in the breakup process, but facilities could be subjected to small ice flow impacts.

The water intake structure would be located on the Putuligayuk River and draw water during spring breakup at acceptable flow rates through protective fish screens. River intake structures would comply with ADF&G regulations to protect fish, including suction screens to prevent biota entrainment. Flow velocity across the screen would meet ADF&G (1998) requirements.

Typical drawings of pertinent engineered structures on the North Slope are provided in Attachment 3A. Examples of commercially available pumps that are representative of what might be used are provided in Attachment 3B. Alaska LNG’s Draft Water Use Plan is provided with this application (Attachment 16F).

A 14-inch pipe would draw water from the PUT River, delivering it through a transfer pump house to the GTP reservoir. There would be a gravel pad at the edge of the PUT River where the intake would be located. This pad would be connected to the end of the gravel haul road. A 1-mile long pipeline would transport water from the Put River to facilities. An approximately 5-mile-long, 6-inch-diameter supply water pipeline would then draw water from the reservoir.

Water system transport pipelines would be constructed on aboveground VSMs. The water is anticipated to be about 35 °F, so in the winter season heat-trace is important to protect against freeze-up. The water pipeline travels for most of its route to the GTP using typical pipe supports. At the general area of the south-west GTP Pad, it runs parallel to the existing PBU Gas Handling Expansion pipeline, and travels north along the east side of the GTP Pad, where it ties into the onsite GTP piping proper;

Flow meters would be downstream of the pumps and would be sized and spanned to cover single flow from each pump; these meters would need to show instantaneous flow readings, as well show the total volume taken up from the river and transferred to the reservoir. Electrical equipment, metering equipment, and air handling equipment would be housed at the pump stations.

See the following sections of Resource Report 1 for more information:

- 1.3.2.8.11.2 Water Reservoir
- 1.4.2.4.2.5 Water Reservoir

4.6.7. West Dock Modification/DH4

The West Dock Causeway, which runs approximately 2.5 miles from the shoreline to the west end of Prudhoe Bay, is a solid fill granular material structure that was constructed in three segments between 1974 and 1981. The first segment is approximately 4,000 feet long extending from land to West Dock DH 2. During the summer of 1975, the second segment was constructed and extended the causeway approximately 5,000 feet to DH 3. In 1981, a third extension elongated the causeway approximately 5,000 additional feet to accommodate construction of the STP. Due to concerns that the causeway could potentially affect coastal currents and marine resources, a 650-foot channel/breach located between DH 2 and DH 3 was constructed between 1995 and 1996.

GTP construction requires large modules that can only be transported to the North Slope by sealift. A new dock near the STP, to be named DH4, would be used to offload modules arriving by sealift, and a new staging area would be located south of the existing West Dock staging area. The dock face would be approximately 1,000 feet wide and elevated approximately 8 feet above sea level. The five or more new berths would be dedicated to Project activities. The new dock would provide a working area of approximately 31 acres. The West Dock DH4 addition would require the installation of sheet piling and the placement of fill material behind the sheet piling. Mooring dolphins would also be required (Attachment 20). The piling for DH4 will be installed using a combination of vibratory and impact type pile driving hammers. A barge bridge would be required to facilitate construction as discussed above. Further information concerning modifications to West Dock is provided in Resource Report 2, Section 2.3.11.2.2.1 (West Dock Modifications) and Resource Report 10, Section 10.5.7.1 (West Dock) (Attachment 1).

The dimensions, plan view, and cross section of the West Dock improvements are shown in Attachment 3A. Current plans are for the Project to install five boat berths at DH4, and there will be twelve 48”-diameter Mooring Dolphins (Attachment 20).The fill for the DH4 improvements will be contained by sheet piling, as is shown on the attached drawing. Gravel bags will also be used elsewhere, as is shown on the attached drawings, to prevent migration. The fill material for DH4 will originate from the construction of the GTP Water Reservoir and Mine Site. Alternatively, up to 1 million CY of gravel may be sourced from the existing PUT-23 or ADOT&PF Pit 103 Mine Sites, until the GTP Water Reservoir and Mine Sites are ready to produce gravel. No additional material, such as rip rap, is planned to be discharged in front of the pile for added protection. The causeway and barge bridge improvements, including widening, and the buildout of DH4 to finished elevation will result in the discharge of up to 1,800,000 CY of fill into the Beaufort Sea (550,000 CY applied to causeway + 1,250,000 applied to DH4).

The fill for the West Dock Causeway and DH4 (DH4) improvements will be contained by sheet piling at the DH4 bulkhead and at the North and South abutments to the barge bridge, as shown in Attachment 3. Gravel bags will be used elsewhere on the causeway to prevent fill migration, as they are used now by the operator.

The MHW data is +0.59 feet as per the NOAA site at West Dock. The MLLW (Elevation +0.0) line is identified in the bathymetry and topographic data along the West Dock Causeway. As a result, MLLW was used as upper limit of the sub-tidal fill calculation. A high tide line of +0.8 feet was used for the intertidal calculation. Gravel fill will be placed below MLLW (Elevation +0) and between the High Tide line (Elevation +0.8) and MLLW (Elevation +0.0) during the construction of the West Dock Causeway and DH4 improvements.

All cargo barges would be grounded for the modules offloaded at DH4. The grounding pad for the barges would be prepared in advance of each sealift. The barge berthing area will be screeded to elevation as needed, and these impacts are accounted for in wetland impact tables (Attachment 10).

The proposed DH4 design does not require dredging a navigation channel. The proposed DH4 location/size/orientation is based on preliminary navigational requirements, PBU interface discussions, and currently available field data. Although very recent bathymetric survey data (2016) was used for DH4 placement, the seafloor will continue to change by sediment erosion/deposition up until construction, which may require adjustments. Based on the development of this and similar items, the DH4 location/size/orientation may require updates during future Project phases. The latest bathymetric and sedimentation studies have been utilized to select the location of DH4, which is centered at the required berthing basin depth.

Additional West Dock related information is provided in Attachments 1, 2, 3, 5, 8, and 20.

See the following sections of Resource Report 1 for more information:

- 1.3.2.8.12.1 West Dock Modifications
- 1.4.2.4.2.3 West Dock Modifications and Dredging
- 1.5.2.4.2 West Dock Modifications and Dredging

5. BLOCK 19: PROJECT PURPOSE AND NEED

5.1. Purpose and Need

The purpose of the Project is to commercialize the vast natural gas resources[11] on Alaska's North Slope, principally by converting the available natural gas supply to LNG for export and to provide opportunities for in-state use. There have been numerous unsuccessful efforts to bring this gas to market, including past

[11] *See* DeGolyer and MacNaughton, "Report on a Study of Alaska Gas Reserves and Resources for Certain Gas Supply Scenarios as of December 31, 2012" at Figure 5 (April 2014).

projects to transport gas by pipeline to the continental United States.[12] As indigenous Lower 48 natural gas supply has increased, an interstate pipeline project from Alaska is currently not economically viable. Foreign demand for natural gas has increased,[13] making LNG export the best and only viable option to commercialize these abundant Alaskan resources at this time.

The Project's intention is to deliver natural gas from the PBU and PTU, which is a subset of total North Slope resources.[14] The U.S. Department of Energy (DOE) has conditionally approved an application for the Project to export 20 million metric tons per annum of LNG produced from Alaska for a 30-year period to Free Trade Agreement (FTA) or non-FTA nations.[15] Yet no infrastructure exists to deliver this natural gas to market.

Taking these and other factors into account, including economics, technical requirements and environmental considerations,[16] the Applicant, determined the location, throughput, and timing for the Project. A new LNG terminal[17] to export up to 20 MMTPA of LNG,[18] with projected startup in approximately 2024-2025, would include year-round accessible marine facilities near Nikiski, Alaska, as well as liquefaction, pipeline, and gas treatment facilities, connecting North Slope natural gas to foreign LNG markets. This integrated LNG terminal would be the largest LNG project constructed in the United States, with an estimated cost of $40 to $45 billion.

Several important objectives support this substantial investment.

The Project would:

- Commercialize natural gas resources on the North Slope during the economic life of the PBU field and achieve efficiencies through the use of existing common oil and gas infrastructure and economies of scale;
- Bring cost-competitive Alaska LNG to foreign markets in a timely manner; and
- Provide interconnection points to allow for in-state gas deliveries, benefiting in-state gas users and supporting long-term economic development.

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[12] http://www.arlis.org/docs/vol1/AlaskaGas/Report/Report_CRS_2011_AK_NGP_IssuesCongress.pdf

[13] https://www.mckinseyenergyinsights.com/insights/positive-outlook-for-lng.aspx

[14] DeGolyer and MacNaughton at 11.

[15] DOE/FE Order No. 3554 (granting authorization to export LNG to FTA nations); DOE/FE Order No. 3643 (granting authorization to export LNG to non-FTA nations conditioned on FERC's environmental review process). DOE's non-FTA approval is conditioned on the satisfactory completion of the ongoing FERC-led National Environmental Policy Act (NEPA) review process, in which DOE is a cooperating agency. DOE Order No. 3643, at 9, 42.

[16] *See* Resource Report No. 10 for a full discussion of the alternatives and reasons for selecting the Project.

[17] *See* 18 C.F.R. 153.2(d)(defining "LNG terminal" to include "all natural gas facilities used to … transport, gasify, liquefy, or process natural gas that is … exported to a foreign country from the United States"); *supra* Section 1.1.

[18] DOE/FE Order No. 3554 and Order No. 3643.

In commercializing North Slope natural gas, the Project would offer multiple benefits, all of which are consistent with the public interest. The Project would:

- Stimulate local, state, regional, and national economies through job creation, an enhanced tax base, increased economic activity, and improved U.S. balance of trade, producing unequivocally positive economic impacts in Alaska and the United States as a whole;
- Provide a long-term source of revenue to Alaska state and local governments, supporting public services;
- Create up to 12,000 jobs during peak construction and approximately 730 jobs for operation of the Project;
- Create numerous opportunities for Alaska businesses and contractors during construction and operation of the Project;
- Provide infrastructure that may provide opportunity for expansion and incentivize further investment, exploration, and production, leading to more industry activity in the state;
- Support the economic and national security interests of the United States by providing a secure source of energy for its trading partners and contributing to the long-term stability of international energy supply; and
- Produce local, regional, and global environmental benefits by providing, through natural gas and LNG, a cleaner source of energy than many existing alternatives.

5.2. Project Schedule

The Project representatives intend to request that FERC issue authorization to site, construct, and operate the Project no later than 2020. It is anticipated that construction and commissioning of the facilities would take approximately eight years to complete. Construction activities would be divided into phases. The first phase is planned to last from 2020–2025 and would include construction related to the first LNG and GTP trains, marine facilities, Mainline, PBTL, and PTTL, resulting in first production of LNG. After 2025, the installation of the remaining Project facilities needed for full production would take place. The table below summarizes the planned Project schedule. Details on the Project construction schedule are provided in Resource Report 1, Section 1.5.1 and construction procedures are included in Resource Report 1, Section 1.5.2.

Table 3. Project Schedule

Major Milestone	Start Date	End Date
Application Submittal		2Q 2017
Draft EIS		2Q 2019
Anticipated Final EIS		1Q 2020
Anticipated FERC Order		2Q 2020
Anticipated FERC Notices to Proceed for Construction Start	3Q 2020	4Q 2020
LNG Facility		

Major Milestone	Start Date	End Date
Construction Infrastructure Development (Camps, Granular Material, Access, etc.)	1Q 2020	2Q 2022
Site Preparation Activities, Commence Piling and Equipment Concrete Foundations	1Q 2020	3Q 2023
Commence LNG Tank Construction	2Q 2021	4Q 2024
Installation and Interconnection of Train 1 and 2 Modules and Equipment, Power and Utilities	2Q 2022	2Q 2025
Mechanical Complete of Train 1, Power and Utilities. LNG Product Loading (Trestle) Mechanically Complete. Installation and Interconnection of Train 2 and 3 Modules/Equipment. Commence Pre-Commissioning.	1Q 2024	3Q 2025
Train 2 and Train 3 Mechanically Complete	1Q 2025	4Q 2025
LNG Train 1 Commissioning and Start-up (with GTP Train 1 Gas)	3Q 2024	4Q 2025
LNG Train 2 Commissioning and Start-Up (with GTP Train 1 Gas)	4Q 2025	1Q 2026
LNG Train 3 Commissioning and Start-Up (with GTP Train 2 Gas)	2Q 2026	3Q 2026
Kenai Spur Highway Relocation	1Q 2019	1Q 2020
Marine Terminal		
Site Preparation Activities, MOF Construction	1Q 2020	2Q 2021
Dredging, Complete MOF	1Q 2021	2Q 2021
Commence Installation of Trestle and Berths, Quadropod Installation	1Q 2022	4Q 2022
Complete Installation of Trestle, Continue Installation of Berths, Commence Installation of PLF Modules, Berths, and Mooring Dolphins	1Q 2023	4Q 2023
Complete Installation of PLF	1Q 2024	4Q 2024
MOF Reclamation/Demobilization	3Q 2026	3Q 2027
GTP		
Construction Infrastructure Development (Camps, Granular Material, Access, Etc.)	1Q 2020	1Q 2023
Site Preparation Activities and Field Erected Equipment Delivery/Setting	1Q 2020	2Q 2023
Sealift # 1		
Offload/Set Modules	3Q 2023	3Q 2023
Install Plant Utilities, Flares and Flare Pipe-Racks	3Q 2023	1Q 2024
Make Utility Interconnects and Start-Up	1Q 2024	2Q 2024
Sealift # 2		
Offload/Set Modules	3Q 2024	3Q 2024
Install Train 1 and Propane Modules and Make Interconnects	3Q 2024	1Q 2025
Commissioning and Start-Up Train 1 and Propane Refrigeration	4Q 2024	2Q 2025
Sealift # 3		
Offload/Set Modules	3Q 2025	3Q 2025
Install Train 2 and Make Interconnects	3Q 2025	1Q 2026
Commissioning and Start-Up Train 2	4Q 2025	2Q 2026
Sealift # 4		
Offload/Set Modules	3Q 2026	3Q 2026
Install Train 3 and Make Interconnects	3Q 2026	1Q 2027
Commissioning and Start-Up Train 3	4Q 2026	2Q 2027
PBTL Construction		
Install VSMs and Supports	1Q 2022	3Q 2022
Pipeline Construction	1Q 2022	3Q 2023

Major Milestone	Start Date	End Date
Hydrostatic test and Final Tie-In	3Q 2023	3Q 2023
Mainline		
Spread 1		
Construction Infrastructure Development (Camps, Borrow Sites, Access and Pads)	2Q 2020	4Q 2022
Site Preparation Activities (ROW Construction)	2Q 2021	3Q 2023
Pipeline Construction	4Q 2022	4Q 2024
Hydrostatic test and Final Tie-In (Summer months only)	2Q 2023	4Q 2024
Spread 2		
Construction Infrastructure Development (Camps, Borrow Sites, Access and Pads)	2Q 2020	4Q 2022
Site Preparation Activities (ROW Construction)	4Q 2020	4Q 2022
Pipeline Construction	4Q 2022	4Q 2024
Hydrostatic test (Summer months only) and Final Tie-In	2Q 2023	4Q 2024
Spread 3		
Construction Infrastructure Development (Camps, Borrow Sites, Access and Pads)	2Q 2020	3Q 2022
Site Preparation Activities (ROW Construction)	3Q 2020	3Q 2022
Pipeline Construction	4Q 2021	4Q 2023
Hydrostatic test (Summer months only) and Final Tie-In	2Q 2022	4Q 2023
Spread 4		
Construction Infrastructure Development (Camps, Borrow Sites, Access and Pads)	2Q 2020	4Q 2022
Site Preparation Activities (ROW Construction)	4Q 2020	1Q 2023
Pipeline Construction	4Q 2021	4Q 2023
Hydrostatic test (Summer months only) and Final Tie-In	2Q 2022	4Q 2023
Aboveground Mainline Facilities Construction [a]		
Sagwon Compressor Station	2Q 2025	2Q 2026
Galbraith Lake Compressor Station	2Q 2024	2Q 2025
Coldfoot Compressor Station	2Q 2025	2Q 2026
Ray River Compressor Station	2Q 2023	2Q 2024
Minto Compressor Station	2Q 2024	2Q 2025
Healy Compressor Station	2Q 2023	2Q 2024
Honolulu Creek Compressor Station	2Q 2025	2Q 2026
Rabideux Creek Compressor Station	2Q 2024	2Q 2025
Theodore Heater Station	2Q 2023	2Q 2024
Point Thomson Meter Station	1Q 2024	1Q 2025
GTP/Mainline Meter Station	1Q 2024	1Q 2025
Nikiski Meter Station	1Q 2024	1Q 2025
Fill Main Pipeline and Commissioning/Start-up Facilities (with GTP Gas)	2Q 2024	3Q 2025
Offshore (Cook Inlet) Spread		
Offshore Pipeline Construction	2Q 2022	1Q 2023
Hydrostatic test and Final Tie-In	2Q 2023	3Q 2023
PTTL		
Spread 1		
Construction Infrastructure Development (Ice Road Construction)	4Q 2022	1Q 2023
Site Preparation Activities (ROW Construction)	4Q 2022	1Q 2023

Major Milestone	Start Date	End Date
Pipeline Construction	4Q 2022	1Q 2023
Hydrostatic test and Final Tie-In	2Q 2023	3Q 2023
Spread 2		
Construction Infrastructure Development (Ice Road Construction)	4Q 2022	1Q 2023
Site Preparation Activities (ROW Construction)	4Q 2022	1Q 2023
Pipeline Construction	4Q 2022	1Q 2023
Hydrostatic test and Final Tie-In	2Q 2023	3Q 2023
Project Commissioning/In-Service		
First LNG Product, Train 1 Start-up	3Q 2024	4Q 2025
Intermediate LNG Product, Train 2 Start-Up		1Q 2026
Full LNG Product, Train 3 Start-Up		3Q 2027

[a] The construction schedule for compressor stations and the heater station is preliminary and subject to further optimization.
Note:
Construction Quarters (Q)
1Q = Jan-01 to Mar-31; 2Q = Apr-01 to June-30; 3Q = Jul-01 to Sept-30; 4Q = Oct-31 to Dec-31

6. BLOCK 20: REASONS FOR DISCHARGE

6.1. Basic Purpose

The basic purpose for the placement of dredged and/or fill material into waters of the United States is to build the infrastructure required to commercialize the vast natural gas resources on Alaska's North Slope and deliver natural gas to foreign and potentially in-state LNG markets.

6.2. Reasons for Discharge

Features of the Project would require the placement of gravel fill to preserve the thermal integrity of the permafrost, and to provide stable roads, working surfaces, and foundations for the installation of facilities. These features include the Liquefaction Facility, Mainline aboveground facilities (compressor stations, heater station, pig launching/receiving stations, and Mainline block valves) and pipeline associated infrastructure (temporary workspaces, access roads and shoo-flies, helipads, new material sites), and the GTP and associated GTP infrastructure. Other project features will require fill, backfill, dredging, or disposal and are described below. For details on the construction procedures for the Project facilities and components, see Section 1.5.2 of Resource Report 1.

The Project intends to leave gravel in place, unless otherwise required by the land owner, and wetlands impacts will be compensated in accordance with Clean Water Act guidelines as it pertains to the Project's Wetlands Compensatory Mitigation Plan (Attachment 15). The gravel material that would be left in place would provide thermal and physical stabilization of the land as opposed to a potentially more damaging impact to that land (and adjacent lands) that could occur when attempting to remove it. A summary by project component is provided, below.

Prudhoe Bay Area: The buildout of DH4 using gravel is permanent impact. The gravel placed at the causeway breach to provide a stable surface for the barge bridge is permanent fill and will be left in place.

Over time, this would wash out and / or be covered by natural material. The modifications to the West Dock causeway that involve gravel (i.e., road-widening) are permanent improvements that will require the gravel to be left in place.

Cook Inlet: The MOF at Nikiski is a temporary structure in navigable waters and is planned to be removed after 10 years. The Mainline MOF at Beluga is a permanent structure and will not be removed. The pipeline laying on the bottom of Cook Inlet will be a permanent structure. The transition areas at the shoreline may involve some permanent gravel placement that will be left in place to naturally erode and wash away by the tides and waves. Any trenching from a barge resulting in a buried section of pipe between the workpad and laying it directly on the bottom would be temporary impact.

Pipeline: The crossings of freshwater navigable waters by open cut with the pipeline are temporary impacts to those streams, as there would be placement of natural gravel or cobbles on top of the backfilled trench and bank cuts. Additional natural settlement over the pipeline would occur over the weeks and months following installation, allowing the temporarily impacted areas to return to original condition.

6.2.1. Liquefaction Facility

The proposed Liquefaction Facility site would be cleared and graded to the extent necessary to install the facility and provide a level platform and sufficient space to execute the work safely, as well as provide for site drainage. Onsite material would be used as structural backfill where permitted by engineering specifications.

The marine terminal constructed adjacent to the LNG plant would include a product loading facility and temporary MOF. The facilities would require mooring and breasting dolphins and interconnecting walkways, an access trestle, and pile supported platforms. The MOF would consist of berths and laydown areas and be constructed of local fill materials with site-specific erosion and shoreline protection measures.

A Mainline MOF will be constructed on the west side of Cook Inlet consisting of a quay constructed as a gravity structure formed by an anchored sheet pile wall, a ro-ro ramp consisting of anchored sheet pile, graded crushed rock on the surface of the quay and access roads (two 30-foot wide access roads). The MOF is designed to consist of a combi-wall of pilings and sheets backfilled with granular materials and tied back to a sheet pile anchor wall. As pilings are set, fill material would be stabilized with erosion control measures as necessary.

Dredging will be required at the marine terminal for the MOF foundation preparation, the MOF berths and approach. Maintenance dredging is expected to be necessary at the MOF berths and approach during the later construction seasons to provide sufficient depth for the vessels. Dredge material is planned for disposal in a new offshore unconfined aquatic disposal site. The Project has identified a proposed open water disposal location approximately 4 miles west of the MOF and an alternative open water disposal location in deeper water.

6.2.1. Interdependent Project Facilities

6.2.1.1. Mainline

The Mainline pipeline would be a buried pipeline with the exception of two planned aerial water crossings, aboveground crossings of active faults, and the offshore pipeline. Burial of the pipeline will require placement of the ditch spoil back into the ditch, and where necessary, select fill will be brought in to replace ice-rich ditch spoil that is deemed unsuitable for use as backfill.

For certain ROW construction modes, the methodology employed may also require additional fill or backfill of materials. When using ROW Mode 3 to cross inundated wetlands in the summer, limited matting will be placed on the surface to support equipment and materials. Limited matting can be used over short durations in certain conditions to help to distribute loads across a wide surface and reduce compaction of the underlying vegetation and soils. In areas where the pipeline would be installed in areas with thaw-sensitive permafrost, ROW Mode 4 requires that gravel fill be placed over the working side and trench area leaving the vegetation in place and providing a level working surface with the required traction and structure support for safely operating construction equipment in summer or winter. The placement of gravel fill along the ROW also prevents the breaching of the organic layer, maintains the ROW surface above existing ground level, and prevents short-term thermal degradation and erosion of the underlying permafrost.

Once the trench is backfilled, the thicker section of granular work pad material may be spread from the working side across the trench to provide a uniform cover over the existing surface. When used in wetlands, ROW Mode 5A would require grading where the pipeline is on a side-slope, and not where it is perpendicular to the slope. The technique involves using standard earth-moving equipment to create a level work surface by cutting the upslope side of the hill and moving that material to the downslope side of the ROW as fill.

Thermal modeling along the ROW is described in two technical memos provided as Attachment 21. While ground surface disturbances during construction can lead to changes in heat energy balance that creates a potential for lateral thaw extending beyond the edge of the workpad by several dozen feet, this thaw potential exists only in select areas (thaw sensitive terrain within discontinuous permafrost) and occurs in a manner for which adaptive management and mitigation can be applied during the monitoring phase, if needed. Areas containing discontinuous permafrost can vary widely in elevation, slope, ground temperature, terrain type, and wetlands type. Therefore, long-term changes to hydrology related to settlement could also vary in these select areas. Aiding predictability is the fact that certain wetland types are often associated with permafrost presence or absence, and delineated wetlands can be classified as low, medium, or high potential for permafrost to be present beneath them. For instance, streambeds are typically thawed and would generally be regarded as thaw stable with no potential for settlement. Past studies indicate that the potential indirect impact to wetlands along the pipeline route would range from 10 to 15% of wetlands that are impacted directly. However, just because the potential for lateral thaw exists in some areas does not necessarily mean that subsidence would occur or that additional fill would be required.

In areas containing continuous permafrost, the ground is characterized as having an active layer thickness of around 2ft, and since the sub-freezing pipe will be surrounded by perennially frozen soils, the cold ground temperature will limit lateral thaw in these areas (Attachment 21). The annual thaw depth (i.e., active layer depth) above the pipe and at the edge of the restored trench is expected to be very small in continuous permafrost, on the order of less than a few feet. A short distance out from the pipe centerline, the pipe and trench would have practically no influence on the active layer depth.

The area of sporadic permafrost (or 'non-permafrost' area) traversed by the Mainline (beginning at MP 634) is characterized by a general lack of permafrost or by sporadic, patchy permafrost areas. There is a very low probability of permafrost occurring in this region and therefore indirect impacts to wetlands due to permafrost thaw, thaw settlement, and drainage are not likely to occur (Attachment 21). Negligible indirect impacts are expected in these more southerly areas.

The Mainline at fault crossings is an aboveground pipeline sitting on grade beams (or sleepers). The crossing sites will require grading and a granular pad to support the beams.

MLBVs would be sited at locations to meet regulatory, operational, and engineering requirements and require granular fill placement where not incorporated into the footprint of a compressor station.

6.2.1.2. PBTL and PTTL

The PBTL and PTTL would be elevated aboveground on VSMs. The VSMs would be embedded and backfilled with a slurry granular material mix. Excess fill would be taken to an approved disposal site. For the PTTL, fill material may be required for the construction camp, pipe storage yard, one MLBV, helipad, and ATWS associated with road and stream crossings.

6.2.1.3. Gas Treatment Plant

In addition to the gravel placement required for the GTP and associated GTP infrastructure, work would be required at West Dock. As stated earlier, causeway widening and development of DH4, would be required to facilitate offload of modules arriving by sealift, as would a barge bridge paralleling the 650-foot weight-limited bridge between DH3 and DH2.

The GTP water supply systems would consist of pump station modules at the Putuligayuk River and water reservoir, as stated earlier. The water pipeline travels for most of its route to the GTP using typical pipe supports.

6.3. Water dependency

Access or proximity to or siting within a special aquatic site is not required in order to build the infrastructure required to complete the project. Therefore, the project would not be considered a water-dependent activity. As required by the Section 404(b)(1) Guidelines, practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. Analysis of the alternatives and factors considered by the project demonstrating that the proposed project is the least environmentally damaging practicable alternative is provided in Resource Report 10, Appendix D, which is attached.

7. BLOCK 21 AND 22: TYPE OF MATERIAL BEING DISCHARGED, AMOUNT OF EACH, AND SURFACE AREA

The Applicant and design team are continually evaluating avoidance and minimization features to reduce the overall Project footprint impacts where practicable; therefore, fill volumes and surface area impacts will be adjusted as the exact construction footprint is refined during the design and permitting/approval process. Based on the current level of engineering, the volumes and acreage provided in the table below are preliminary estimates subject to adjustment through engineering refinement and design optimization. The types of discharged material would consist of select borrow, native material fill, crushed aggregate, and graded armor rock.

The List of Waterbodies to be crossed by the Project were originally listed in Resource Report 2, Appendix H. The list of major waterbody crossings along the Mainline Pipeline including the DNPP route are shown in Table 4 below (adapted and updated from the DEIS, Table 4.3.2-5).

Table 4. Major Waterbody Crossings along the Mainline Pipeline [a]

Approximate Milepost	Waterbody Name	Construction Wetted Width (feet)	Crossing Method	Construction Season	Sub-watershed (HUC8)
211.1	Middle Fork Koyukuk River	280	DMT	Summer	Upper Koyukuk River
356.5	Yukon River	2,000	DMT	Summer	Ramparts-Yukon River
473.0	Tanana River	2,200	DMT	Summer	Lower Tanana River
476.0	Nenana River No. 1	180	Dry-ditch open-cut	Winter	Nenana River
532.1	Nenana River No. 3	160	Aerial span	Summer	Nenana River
537.1	Nenana River No. 5	626	Aerial span	Summer	Nenana River
543.1	Nenana River No. 6	230	Wet-ditch open-cut	Summer	Nenana River
561.0	Nenana River No. 4	200	Wet-ditch open-cut	Summer	Nenana River
641.8	Chulitna River	1,830	DMT	Summer	Chulitna River
704.7	Deshka River	220	DMT	Summer	Lower Susitna River
720.9	Yentna River	400	Dry-ditch open-cut	Winter	Yentna River
757.2	Beluga River	120	Dry-ditch open-cut	Winter	Redoubt-Trading Bay
779.5	Cook Inlet [b]	141,400	Open-cut / pipelay	Summer	Redoubt-Trading Bay and Upper Kenai Peninsula

Sources: Draft Environmental Impact Statement, FERC, June 28, 2019 Table 4.3.2-5 as amended by AGDC comments and updated tables submitted for the DNPP route 10/2/2019.

Waterbodies based on Project mapping supplemented by USGS National Hydrography and Watershed Boundary Datasets, aerial photography, and LiDAR.

[a] A major waterbody is greater than 100 feet wide at the water's edge at the time of crossing.

[b] The Cook Inlet crossing is discussed in section 4.3.3.

The results of the assessment of wetland resources within the Project footprint are described in Table 6 and Attachment 10 (Wetland Impact Tables), and wetland mapping is provided in Attachments 12 and 13.

The maps show wetland data within the Project footprint to the extent of the Construction and Operations ROWs. Actual impact widths will vary by construction method and may not extend to the ROW boundaries (e.g., offshore portions of the Mainline). For the Liquefaction Facility, the LNG Plant boundary, temporary MOF with dredging area, shoreline protection, PLF, and Construction Camp are mapped. For the Mainline, the extent of the Construction and Operations ROWs for onshore and offshore portions of the pipeline, access roads, ATWS, compressor stations, heater station, meter stations, mainline block valves, construction camps, pipe storage yards, disposal sites, material sites, railroad spurs and work pads, and helipads are mapped. For the PTTL, the extent of the Construction and Operations ROWs, pipeline centerline, and associated infrastructure are mapped. For the PBTL, the extent of the Construction and Operations ROWs are mapped. For the GTP, the GTP pad, Operations Center Pad, and associated infrastructure are shown, including the module staging area, West Dock modifications, DH4 construction, access roads, material (mine) site, water reservoir, and associated transfer pipelines. For the Mainline, PTTL, and GTP, although there is no fill required, the proposed ice roads and ice pads are shown to demonstrate avoidance of impacts to wetlands.

The fill material for the GTP and the creation of DH4 will originate from the GTP Mine Site and reservoir, which are shown in Attachments 2, 3, and 12. A summary of the material requirements for the GTP are provided in Table 7, below.

Alternately, approximately 1 million CY of gravel may be sourced from the existing PUT-23 or ADOT&PF Pit 103 Mine Sites, until the GTP Water Reservoir and Mine Sites are ready to produce gravel. The proposed Docks and Mooring Structures are shown in Resource Report No. 1, Appendix E, Figures E-15, 16, & 17 (Attachment 1) and in Attachment 3. A Mooring Dolphin Typical (Attachment 3) provides a typical elevation drawing of the proposed Mooring Dolphins shown at DH4 and the Barge Bridge locations.

Table 5 describes the volume of granular fill that will be placed within the three primary freshwater wetland categories. This information was previously provided to FERC through an RFI response.

Table 5. Estimated Volume of Grandular Fill (CY), by Primpary Freshwater Wetland Type

Facility Group / Feature Name [a]		PEM [b] (CY of Granular Fill)	PFO [b] (CY of Granular Fill)	PSS [b] (CY of Granular Fill)
Mainline ROW [c]		2,090,051	547,395	6,180,301
Mainline Associated Facilities	Access Roads	892,971	454,038	1,412,880
	Additional Temporary Workspaces	177,183	48,028	370,891
	Compressor Station	172,746	38,513	445,210
	Compressor Station Camp	2,256	5,733	61,870
	Helipad	2,474	14	1,911
	Mainline Block Valve Pad	12,450	8	1,094
	Meter Station	22,000	--	--

	Railroad Spur	49	--	2,283
	Railroad Work Pad	9,290	1,971	22,439
	Camp Pad	224,324	145,578	231,505
	Disposal Site	280,878	129,651	1,263,791
	Double Joint Yard	31,608	24,780	151,844
	Pipe Storage Yard	174,973	56,950	260,378
GTP [d]		3,853,830	--	--
Liquefaction Facility (LNG)		19,562	--	648
Point Thomson Transmission Line (PTTL) [d]		7,916	--	1,365
Preliminary Granular Fill Volume Estimate		***7,974,562***	***1,452,660***	***10,408,411***

a. Preliminary estimate of Volume Granular Fill by Wetland Type for Project Facilities is based on the Rev C2 route for the Mainline ROW and Associated Facilities and Rev C route for the PTTL.

b. This table uses wetland data provided to FERC with the original Application (April 2017) to derive gravel estimates in three primary freshwater wetland types. The data in this table was previously provided to FERC as part of an RFI response on gravel fill in wetlands. Wetland data provided to FERC was based on earlier wetland extent estimates.
   - PEM – Palustrine, Emergent, may be Temporarily, Seasonally, or Semi-Permanently Flooded
   - PSS – Palustrine, Scrub/Shrub, may be Temporarily or Seasonally Flooded
   - PFO – Palustrine, Forested

c. Volumes do not include change to DNPP Alternative. Volumes should be similar between the two alternatives, and exact volumes will be calculated during final design.

d. PTTL, PBTL and GTP pipelines would be above ground on VSMs; ice roads and ice work pads would be used for construction and operations. Construction/Operations camp is located on a pad connected to the GTP Pad. The flare pad is contained within the footprint for the GTP Pad.

Notes:

- Impacts do not include ice roads or ice workpads for construction, since ice roads were determined to be a non-intrusive means to construct across the tundra.
- ROW widths vary by construction method across the proposed route. Granular workpads (fill) will be left in place, leaving the organic layer intact beneath the gravel pad that provides thermal protection from permafrost degradation. Compacted granular workpads would be ripped to mitigate the compaction effects of construction traffic, graded to facilitate drainage, covered with any available growth media, and scarified to allow natural revegetation by native plants.
- Total volumes do not reflect a probable reduction due to avoidance and minimization measures recommended by USACE and accepted by AGDC after publication FERC's DEIS.

Table 6 describes the impact of the Project to Wetlands by NWI Class. Acreages affected during construction and operations are shown. More detailed wetland impact acreages are provided in the wetland impact tables in Attachment 10.

Table 6. Impacts to Wetlands, by NWI Class and Project Phase

Project Facility [a, b]	NWI Class [c]	Acreage Permanently Affected During Construction [d]	Acreage Permanently Affected During Operations [d]
Gas Treatment Plant Area			
GTP Aboveground Facilities			
GTP Pad	PEM	210.61	210.61
	PUB	9.88	9.88
Operations Center Pad	L1	0.33	0.33
	PAB	0.07	0.07
	PEM	50.64	50.64
	PUB	4.95	4.95
GTP Aboveground Facilities Total		***276.48***	***276.48***
GTP Associated Infrastructure			
Associated Transfer Pipelines [i]	PEM	0.02	0.02
	PUB	0.00	0.00
	R2	0.00	0.00
	R4	0.00	0.00
Access Roads	E1	14.62	14.62
	E2	3.27	3.27
	L1	0.37	0.37
	M1	15.62	15.62
	PEM	88.85	88.85
	PUB	12.17	12.17
	R4	0.07	0.07
Barge Bridge	E1	2.00	-
	M1	0.57	-
Mine Site	PEM	135.39	135.39
	PUB	4.60	4.60
Module Staging Pad	L1	0.42	-
	PEM	78.80	-
	PUB	7.35	-
Water Reservoir and Pump Facilities	PEM	27.19	27.19
	PUB	7.93	7.93
West Dock Modification/Dock Head 4 Construction	M1	30.19	-
GTP Associated Infrastructure Total		***429.44***	***310.11***
Gas Treatment Plant Total		***705.92***	***586.59***
Liquefaction Facility Area			
Liquefaction Facility			
LNG Plant	E2	9.74	9.74
	PAB	2.22	2.22
	PEM	6.01	6.01
	PSS	0.20	0.20
	PUS	0.07	0.07

Project Facility [a, b]	NWI Class [c]	Acreage Permanently Affected During Construction [d]	Acreage Permanently Affected During Operations [d]
Marine Terminal			
Dredge Disposal Area	M1	459.14	-
Temporary MOF [e,f]	E1	0.69	-
	E2	27.27	-
MOF Dredging Area	E1	30.75	-
	E2	19.95	-
PLF	E1	17.71	17.71
	E2	0.96	0.96
Shoreline Protection	E2	1.17	-
Liquefaction Facility Area Total		***575.87***	***36.90***
Pipelines ROW			
Mainline Pipeline			
Mainline Onshore [g]	L1	0.00	-
	L2	0.06	-
	PAB	0.01	-
	PEM	1,230.59	538.97
	PFO	702.8	274.87
	PSS	3,406.19	1,397.55
	PUB	3.79	1.37
Mainline Offshore [h]	E1	59.95	12.79
	E2	4.16	0.89
PBTL Pipeline			
PBTL [i]	PEM	0.00	0.00
	PUB	0.00	0.00
PTTL Pipeline			
PTTL [i]	L1	0.00	0.00
	L2	0.00	0.00
	PAB	0.00	0.00
	PEM	0.40	0.40
	PSS	0.01	0.01
	PUB	0.02	0.02
	R1	0.00	0.00
	R2	0.02	0.02
	R4	0.00	0.00
Pipelines ROW Total		***5,407.55***	***2,226.88***
Mainline Aboveground Facilities			
Coldfoot Compressor Station	PEM	1.60	1.60
	PFO	4.82	4.82
	PSS	22.29	22.29
Galbraith Lake Compressor Station	PEM	0.27	0.27
	PSS	7.27	7.27
Healy Compressor Station	PSS	30.30	30.30

Project Facility [a, b]	NWI Class [c]	Acreage Permanently Affected During Construction [d]	Acreage Permanently Affected During Operations [d]
Honolulu Creek Compressor Station	PEM	0.40	0.40
	PFO	1.31	1.31
	PSS	4.57	4.57
	PUB	0.10	0.10
Rabideux Creek Compressor Station	PFO	0.98	0.98
	PSS	0.52	0.52
Ray River Compressor Station	PSS	1.94	1.94
Sagwon Compressor Station	PEM	19.86	19.86
	PSS	10.05	10.05
Theodore River Heater Station	PSS	0.12	0.12
GTP Mainline Meter Station	PEM	0.00	0.00
MLBVs	PEM	1.54	1.54
	PFO	0.75	0.75
	PSS	0.18	0.18
Mainline Aboveground Facilities Total		***108.88***	***108.88***
PTTL Aboveground Facilities			
MLBVs	PEM	0.14	0.14
Point Thomson Meter Station	PEM	0.26	0.26
	PSS	0.17	0.17
	PUB	0.04	0.04
PTTL Aboveground Facilities Total		***0.61***	***0.61***
Pipeline Associated Infrastructure			
Mainline Associated Infrastructure			
Access Roads [f]	E2	0.00	-
	PAB	0.71	-
	PEM	208.95	10.36
	PFO	111.18	41.35
	PSS	369.23	72.99
	PUB	6.54	0.24
	PUS	0.24	-
	R2	0.07	-
	R3	0.85	0.13
	R4	1.68	0.01
Additional Temporary Workspace (ATWS) [f]	E2	1.22	-
	PEM	75.87	-
	PFO	65.82	-
	PSS	329.55	-
	PUB	0.48	-
	R3	0.17	-
	R4	0.83	-
	PEM	0.00	-
	PFO	0.00	-

Project Facility [a, b]	NWI Class [c]	Acreage Permanently Affected During Construction [d]	Acreage Permanently Affected During Operations [d]
Compressor Station Construction Camps [f]	PSS	0.00	-
	PUB	0.00	-
Construction Camp [f]	PEM	45.85	-
	PFO	29.92	-
	PSS	60.80	-
	PUB	12.39	-
Disposal Sites [f]	PEM	17.23	-
	PFO	9.32	-
	PSS	80.86	-
	R3	0.04	-
	R4	0.18	-
Double Joining Yards [f]	PEM	6.47	-
	PFO	5.07	-
	PSS	31.09	-
Helipads	PEM	0.48	0.48
	PFO	0.00	0.00
	PSS	0.25	0.25
Material Offloading Facility [f]	E2	5.04	-
Material Sites [f]	PAB	0.10	-
	PEM	305.92	-
	PFO	363.41	-
	PSS	972.75	-
	PUB	20.85	-
	PUS	0.56	-
	R2	237.29	-
	R3	0.01	-
	R4	30.05	-
Pipe Storage Yards [f]	PEM	35.76	-
	PFO	12.05	-
	PSS	58.11	-
	PUB	0.08	-
Railroad Spur [f]	PEM	0.01	-
	PSS	0.59	-
Railroad Work Pad [f]	PEM	2.74	-
	PFO	0.41	-
	PSS	4.86	-
Mainline Associated Infrastructure Total		***3,523.93***	***125.81***
PTTL Associated Infrastructure			
Helipad (PTTL)	PEM	0.57	0.57
PTTL Associated Infrastructure Total		***0.57***	***0.57***
Pipeline Associated Infrastructure Total		***3,524.50***	***126.38***
Wetlands Impact Total			

Project Facility [a, b]	NWI Class [c]	Acreage Permanently Affected During Construction [d]	Acreage Permanently Affected During Operations [d]
Wetlands Impact Total		**10,323.78**	**3,086.24**

Notes:
Acreage affected is from permanent impact to wetlands which result in the loss of waters of the US. Impacts are currently not included for Gas Interconnection Points. Acreage total does not reflect a reduction of impacts as a result of avoidance and minimization measures recommended by USACE and accepted by AGDC after publication of FERC's DEIS (the reduction affects less than 1% of the total).
a. Preliminary estimate of Wetland Impacts by Facility is for the Rev C2 route. ROW widths vary by construction method across the proposed route. Forested wetlands within the operational maintenance corridor would be permanently converted to scrub-shrub and/or emergent wetlands.
b. Compressor Station footprint includes block valves in some cases and construction camps in all cases. Where the MLBV is not included in the Compressor Station footprint, it is included in the table. PTTL MLBV footprint includes Helipad, and GTP Operations Center footprint includes the construction camp. GTP mainline meter station is included in the GTP Pad. Nikiski mainline meter station is include in the LNG Plant.
c. Data source: USACE-approved PJD Wetlands Data for Alaska LNG. NWI Wetland Classification System as defined in Cowardin et al. (1979)[19]: PEM - Palustrine Emergent; PSS - Palustrine Scrub-Shrub; PFO - Palustrine Forested; E1 - Estuarine Subtidal; E2 - Estuarine Intertidal; M1 - Marine Subtidal; M2 - Marine Intertidal; L1 - Lacustrine Limnetic;
L2 - Lacustrine Littoral; PAB - Palustrine Aquatic Bed; PUB - Palustrine Unconsolidated Bottom; R1 - Riverine Tidal; R2 - Riverine Lower Perennial; R3 - Riverine Upper Perennial; R4 - Riverine Intermittent.
d. Acreage used for the construction and operation of a facility is 0.00 when it occurs within the construction or operation footprint of another facility. Additional acreage is included if the facility is placed outside of these areas.
e. Until it is removed during LNG Plant operations.
f. The permanent impact affected during operations is shown as -, as the facilities developed during construction would be left in place to stabilize the land; these facilities, including temporary access roads, could be maintained and used by other parties, but not the Project.
g. ROW maintenance practices specified in the Alaska LNG Project Procedures, a 10-foot-wide strip over the pipeline would be maintained in an herbaceous condition. Trees within 15-feet of the pipeline (centerline) with roots that could compromise the integrity of the pipeline coating may be selectively cut. For buried trenchless crossings, the permanent ROW would not be maintained between the buried trenchless entry and exit points. Values rounded to nearest hundredth of an acre.
h. Cook Inlet crossing includes nearshore service berms, offshore and subsea trenchlines. The majority of the construction ROW would not be disturbed during construction with 10 to 14 anchor points for pipe lay barge moves. The operational ROW is the 42-inch pipe on seafloor plus concrete coating (assumed 6-inch).
i. PTTL, PBTL and GTP pipelines would be aboveground on Vertical Support Members (VSMs), ice roads and ice work pads would be used for construction and operations. Construction/Operations camp is located on a pad connected to the GTP Pad. The flare pad is contained within the footprint for the GTP Pad.

Table 7 describes the total amount of fill (native, granular, or otherwise) required for all project facilities, regardless of whether the facility is placed in wetland or upland.

[19] Cowardin, L.M., Carter, V., Golet, F.C., and LaRoe, E.T. 1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31, Reprinted 1992, U.S. Fish and Wildlife Service, Washington, DC.

Table 7. Estimated Volumes of Fill Required, by Facility (Wetland and Non-Wetland Ares)

Facility	Site Description	Volume (CY)
GTP	GTP and Operations Center Pad, Transfer Pipelines, Access Roads, Module Staging Pad, Water Reservoir & Pump Facilities, and GTP Meter Station	5,100,000
	Barge Bridge	550,000
	Mine Site	2,800,000
	West Dock Modification/DH4 Construction	1,250,000
	GTP Subtotal	9,700,000
LNG	LNG Plant	7,200,000
	Dredge Disposal Area	1,080,000
	Temporary MOF	1,050,000
	PLF	0
	Shoreline Protection	12,000
	LNG Subtotal	9,342,000
Pipeline	Mainline Onshore (mainline ROW) [a]	19,000,000
	Mainline Onshore (in ditch) [a]	1,800,000
	Mainline Offshore	780,000
	PBTL	1,000
	PTTL	60,000
	Mainline Compressor and Heater Stations and CS Const. Camps	1,245,000
	Mainline MLBVs	151,000
	PTTL MLBVs	1,102
	Point Thomson Meter Station	4,000
	Access Roads	3,249,320
	Additional Temporary Workspace (ATWS) [a]	2,662,000
	Construction Camp	1,895,000
	Disposal Sites	2,000,000
	Double Joining Yards	259,000
	Helipads	36,000
	Material Offloading Facility	135,067
	Material Sites	6,309,000
	Pipe Storage Yards	1,518,000
	Railroad Spur	91,180
	Railroad Work Pad	224,768
	Helipad (PTTL)	4,630
	Pipeline Subtotal	41,426,067
	GRAND TOTAL	**60,468,067**

[a] Volumes do not reflect change to DNPP Alternative. New volumes will be calculated during detailed design.

The analysis resulting in Table 6, above, uses an impact reduction for the GTP waterline and the PTTL. Details on these impacts are provided in greater detail in Tables 8 and 9. Each VSM hole was assumed to be two feet in diameter. The reduction was only taken when the VSM was off pad. The impact acres for the GTP Waterline shows the impact acres for the PTTL. The VSM radius / pipe width (in) column includes a four-inch annulus between the pipe and the drill hole for the slurry utilized for construction installation.

Table 8. GTP Waterline Impact

Name	Length (miles)	Length (ft)	VSM Radius/ Pipe Width (in.)	Area (in^2)	Area (ft^2)	# VSMs	Impact (acres)
GTP ROW	3.48	18374.4	12	452.39	3.14	348	0.025098

Table 9. PTTL Impact

Name	Length (miles)	Length (ft)	VSM Radius/ Pipe Width (in.)	Area (in^2)	Area (ft^2)	# VSMs	Impact (acres)
PTTL ROW	62.5	330,000	12	452.39	3.14	6250	0.450757

The impact reduction for the PBTL has been recalculated based on current engineering. This pipeline system is slightly different in that the 60-inch PBTL only requires horizontal support member (HSM) spacing of 100-feet, however the six-inch line requires an additional HSM at 50-foot spacing.

The PBTL is unique compared to the other project above grade pipelines because of the size and weight of the pipe. Current engineering requires a pair of 24-inch VSMs for each anchor, a pair of twelve-inch VSMs for the other supports for the 60-inch line, and an additional eight-inch VSM intermediate support for the smaller lines. It is estimated that for support of the PBTL pipeline suite four 24-inch anchor VSMs; 44 twelve-inch or other support VSMs; and 22 eight-inch VSMs for the smaller lines are required. The VSM Radius/Pipe Width (in) column includes a four-inch annulus for the slurry utilized for construction installation. Full details are provided in Table 10, below.

Table 10. PBTL Impact

Name	Length (miles)	Length (ft)	VSM Radius/ Pipe Width (in.)	Area (in^2)	Area (ft^2)	# VSMs	Impact (acres)
PBTL Anchor	0.46	2428.8	16	804.25	5.59	4	0.000513
PBTL Other Supports	0.46	2428.8	11	380.13	2.64	44	0.002666
PBTL Small Line	0.46	2428.8	12	452.39	3.14	22	0.001587
						Total	**0.004766**

8. BLOCK 23: DESCRIPTION OF AVOIDANCE, MINIMIZATION, AND COMPENSATION

The Project has prepared a Draft Wetland Compensatory Mitigation Plan (Plan) to address avoidance, minimization, and introduce potential plans for mitigation. The original Plan was located within Resource Report 2 as Appendix O and an updated version is attached to this application. The Plan would be completed following finalization of the Project footprint, additional agency consultation, and completion of the aquatic site assessment. The final Plan would be approved by the USACE and incorporated into the individual permit by reference.

The Plan refers to several other attached documents: Appendix P of Resource Report 3, Draft Restoration Plan; Resource Report 10, Project Alternatives; and, Appendix D of Resource Report 10, Least Environmentally Damaging Practicable Alternative Analysis. Supporting documents describing the LNG siting alternatives, minor Mainline route variations, and the PTTL design crossing report for the Shaviovik River, Kadleroshilik River, and the Sagavanirktok River are also provided as appendices to Resource Report 10.

9. BLOCK 25: ADJOINING PROPERTY OWNERS, LESSEES, ETC.

The list of affected landowners and adjacent landowners is attached to this application. It was originally in Resource Report 1 as Appendix K and the updated version including landowners associated with the original and the DNPP route is Appendix A17 and filed under a separate cover as “Privileged and Confidential.”

10. BLOCK 26: LIST OF OTHER CERTIFICATES OR APPROVALS FROM OTHER FEDERAL, STATE, OR LOCAL AGENCIES

The Project will require other federal, state, and local permits and authorizations. Applications for selected federal permits and authorizations are being submitted concurrent with the FERC application. Remaining federal, state, and local permits and authorizations will be applied for and obtained as appropriate prior to construction. The list of federal, state, and local authorizations anticipated for the Project are listed in Appendix C of Resource Report 1 and is also attached.

The Applicant is working with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to address potential impacts to marine mammals in Prudhoe Bay and in Cook Inlet that may be result from construction, including development of infrastructure and/or the placement of fill in the marine environment. The Applicant intends to fully comply with the Marine Mammal Protection Act and the Endangered Species Act in the development of the Alaska LNG Project.

The potential impacts to marine mammals and the mitigation offered to offset those potential impacts are described in the Applicant’s separate petitions to NMFS (whales and seals) and USFWS (sea otters – filed jointly with Hilcorp) for incidental take regulations (ITRs) for marine mammals in Cook Inlet. The Applicant intends to acquire Letters of Authorization (LOAs) from the Services to complete this work. The Applicant has also submitted an application to NMFS for an incidental harassment authorization (IHA) for work in Prudhoe Bay, as construction could potentially impact whales and seals during construction. ITRs currently exist and are being renewed for Beaufort Sea polar bear for oil and gas development that would provide coverage for the Prudhoe Bay area. AGDC expects to request an IHA from USFWS for Beaufort Sea polar bear under these ITRs at a later date.

APPENDIX 1

Resource Reports

APPENDIX 2

Project GIS Files

APPENDIX 3A

Engineering Drawings

APPENDIX 3B

Supplemental Figures

APPENDIX 4A

Analytical Results of Sediment Sampling near the Marine Terminal in Cook Inlet
(See Appendix 1 - RR02, Appendix Q)

APPENDIX 4B

Nikiski Capital Dredge Material Characterization Report – 2017 Sampling Program

APPENDIX 4C

USACE Letter Stating Characterization Complete

APPENDIX 5

USACE Seattle District Dredged Material Evaluation and Disposal Procedures – User Manual (See Appendix 1 - RR03, Appendix R)

APPENDIX 6A

Alaska LNG Project Wetland and Waterbody Construction and Mitigation Procedures
(See Appendix 1 - RR02, Appendix N)

APPENDIX 6B

Analysis of Engineering Design Alternatives, Right-of-Way Width, and Construction Modes in Wetlands

APPENDIX 6C

Segregation of the Surface Layer

APPENDIX 7

Site-Specific Construction Drawings: Site-Specific Waterbody Crossings Plans (Revised)

APPENDIX 8

Sediment Chemical Analytical Data from West Dock Test Trench Sites
(See Appendix 1 - RR02, Appendix R)

APPENDIX 9

Least Environmentally Damaging Practicable Alternative (LEDPA) Analysis
(See Appendix 1 - RR10, Appendix D)

APPENDIX 10

Wetland Impact Tables (Revised)

APPENDIX 11

List of Waterbodies Crossed by the Project
(See Appendix 1 - RR02, Appendix H)

APPENDIX 12

Wetland Mapping (Revised)

APPENDIX 13

Wetland Field Survey Report
(See Appendix 1 - RR02, Appendix G)

APPENDIX 14

Hydrostatic Test Source and Discharge

APPENDIX 15

Wetland Compensatory Mitigation Plan

APPENDIX 16A

Restoration Plan (Revised)

APPENDIX 16B

Revegetation Plan (Revised)

APPENDIX 16C

Invasive Species Prevention and Management Plan

APPENDIX 16D

Draft Storm Water Pollution Prevention Plan (SWPPP)

APPENDIX 16E

Streambank and Bed Restoration Manual

APPENDIX 16F

Draft Water Use Plan

APPENDIX 17

Land Owner List (Revised)

APPENDIX 18

Federal, State, and Local Authorization Anticipated for the Project
(See Appendix 1 - RR01, Appendix C)

APPENDIX 19

Aerial Spans

APPENDIX 20

Pilings

APPENDIX 21

Thermal Modeling Reports

APPENDIX 22

Disposal Sites