ALASKA
PipelineProject

Draft Resource Report 1 – Rev 0
General Project Description

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TransCanada ExxonMobil

DRAFT

Notes:

Yellow highlighting is used throughout this draft Resource Report to highlight selected information that is pending or subject to change in the final report.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
§	Section
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resource
AMP	Alaska Mainline milepost
ANGPA	Alaska Natural Gas Pipeline Act of 2004
ANILCA	Alaska National Interest Lands Conservation Act
ANS	Alaska North Slope
API	American Petroleum Institute
APP	Alaska Pipeline Project
ATWS	additional temporary workspace
bscfd	billion standard cubic feet per day (standard conditions: 14.73 pounds per square inch absolute and 60º Fahrenheit)
CPCN	Certificate of Public Convenience and Necessity
C.F.R.	Code of Federal Regulations
CGF	Central Gas Facility
CGP	Construction General Permit
CO_2	carbon dioxide
DH	Dock Head
EI	Environmental Inspector
FERC	U.S. Federal Energy Regulatory Commission
GTP	Gas Treatment Plant
HAP	Hazardous Air Pollutant
HDD	horizontal directional drill
IR	ice road
MAOP	maximum allowable operating pressure
MLBV	mainline block valve
MMPA	Marine Mammal Protection Act
MP	milepost
MPRSA	Marine Protection, Research, and Sanctuaries Act
N/A	not applicable
NWR	National Wildlife Refuge
PBU	Prudhoe Bay Unit
PMP	Point Thomson Gas Transmission Pipeline milepost
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
pt.	Part
PT Pipeline	Point Thomson Gas Transmission Pipeline
PTU	Point Thomson Unit
Put-23	Putuligayuk-23 (mine)
SCADA	supervisory control and data acquisition
SPCC	Spill Prevention, Control, and Countermeasures
SPMT	Self-Propelled Modular Transporter
TA	Tentatively Assigned

TAPS	Trans-Alaska Pipeline System
UIC	Underground Injection Control
WDP	Wastewater Disposal Permit

1.0 RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

The location information, facility descriptions, resource data, construction methods, and mitigation measures presented in this report are preliminary and subject to change. APP is conducting engineering studies, environmental resource surveys, agency consultations, and stakeholder outreach efforts to further refine and define the details of the Project.

The Project described in this resource report is being designed and developed based on estimated volumes of natural gas from projected shipper commitments. If final shipper commitments are significantly different from those estimated, the Project may be adjusted accordingly.

1.1 PROJECT OVERVIEW

TransCanada Alaska Company, LLC and Foothills Pipe Lines Ltd., working with ExxonMobil Alaska Midstream Gas Investments LLC, are developing a joint project to treat, transport, and deliver natural gas from the Alaska North Slope (ANS) to pipeline facilities in Alberta, Canada for markets in the contiguous United States and North America. This joint project is referred to as the Alaska Pipeline Project (APP or Project)[1].

As required by Title 18 Code of Federal Regulations (C.F.R.) Section (§) 380.12 and consistent with the Alaska Natural Gas Pipeline Act of 2004 (ANGPA), APP has prepared this draft resource report in support of its application to the U.S. Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity (CPCN) under Section 7(c) of the Natural Gas Act (NGA) to construct, own, and operate the portion of the Project in Alaska. This draft resource report pertains only to that portion of the Project in Alaska, and unless the context otherwise requires, references in this draft resource report to APP refer only to the Alaska portion of the Project[2].

As shown in Figure 1.1-1, APP will comprise the following major components[3,4]:

- The Point Thomson Gas Transmission Pipeline (PT Pipeline)[5], consisting of approximately 58.4 miles of buried 32-inch-diameter pipeline from the Point Thomson Unit (PTU) to an APP Gas Treatment Plant (GTP) and associated facilities near Prudhoe Bay;
- The GTP, which will have the capacity to process gas received from the Point Thomson Unit and the existing Central Gas Facility (CGF) on the Prudhoe Bay Unit (PBU) in order to deliver an annual average capacity up to 4.5 billion standard cubic feet per day (bscfd)

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1 Depending on the context, the term APP refers to the joint project or, collectively, to the sponsoring entities.

2 The Canadian Section refers to the portion of the Project from the Yukon border to the pipeline facilities in Alberta, Canada.

3 In previous FERC filings, the Point Thomson Gas Transmission Pipeline was referred to as Zone 1, the Gas Treatment Plant was referred to as Zone 2, and the Alaska Mainline was referred to as Zone 3 of the Alaska-Canada Pipeline.

4 As part of the Project, APP proposes to construct compressor stations, meter stations, various mainline block valves (MLBVs), pig launcher and receiver facilities, as well as associated ancillary and auxiliary infrastructure, including additional temporary workspace, access roads, helipads, construction camps, pipe storage areas, contractor yards, borrow sites, and dock modifications at Prudhoe Bay.

5 The origin of the PT Pipeline is assumed to be located at an outlet from the PTU. The final length may vary depending on the final gas development plan for the PTU.

(standard conditions: 14.73 pounds per square inch absolute and 60 degrees Fahrenheit [°F]) of sales quality gas; and

- The Alaska Mainline, consisting of approximately 745.1 miles of 48-inch-diameter pipeline, all of which is buried except as otherwise described in this Resource Report. The Alaska Mainline extends from the GTP to the Alaska-Yukon border east of Tok, Alaska, and includes provisions for intermediate gas delivery points within Alaska.

Table 1.1-1 lists the FERC's filing requirements and additional information applicable to Resource Report 1 taken from FERC's Guidance Manual for Environmental Report Preparation.

Mileposts (MPs) are commonly used markers along linear projects, such as APP. Where necessary to distinguish the PT Pipeline from the Alaska Mainline, APP has prefixed its MP identifier with a PT Pipeline MP (PMP) or an Alaska Mainline MP (AMP). This convention is used in APP's application and supporting maps and alignment sheets (refer to Appendix 1O) to identify resources and features along the respective pipeline routes.

The purpose of Resource Report 1 is to describe the facilities associated with the Project, procedures for construction and operation of the facilities, timetables for construction, future plans for related construction, compliance with regulations and codes, and permits and consultations required for the Project.

Figure 1.1-1
Alaska Pipeline Project
Project Overview

TABLE 1.1-1

Alaska Pipeline Project
Resource Report 1 Filing Requirements Checklist

Requirement	Where Found in Document
FERC REQUIREMENTS FROM 18 C.F.R. § 380.12	
1. Provide a detailed description and location map of the Project facilities. (§ 380.12[c][1]). • Include all pipeline and aboveground facilities; • Include support areas for construction or operation; and • Identify facilities to be abandoned.	Sections 1.3, 1.8, and 1.10 and Appendices 1B, 1D, 1F, 1G, 1H, 1I N/A
2. Describe any non-jurisdictional facilities that would be built in association with the Project. (§ 380.12[c][2]) • Include auxiliary facilities (§ 2.55[a]); • Describe the relationship to the jurisdictional facilities; • Include ownership, land requirements, gas consumption, megawatt size, construction status, and an update of the latest status of federal, state, and local permits/approvals; • Include the length and diameter of any interconnecting pipeline; and • Apply the four-factor test to each facility (§ 380.12[c][2][ii]).	Section 1.9
3. Provide current original U.S. Geological Survey 7.5-minute series topographic maps with mileposts (MPs) showing the Project facilities. (§ 380.12[c][3]) • Maps of equivalent detail are acceptable if legible (check with staff); • Show locations of all linear Project elements, and label them; and • Show locations of all significant aboveground facilities, and label them.	Appendix 1A
4. Provide aerial images or photographs or alignment sheets based on these sources with MPs showing Project facilities. (§ 380.12[c][3]) • No more than 1 year old; and • Scale no smaller than 1:6,000.	Appendix 1O
5. Provide plot/site plans of compressor stations showing the location of the nearest noise-sensitive areas within 1 mile. (§380.12[c][3,4]) • Scale no smaller than 1:3,600; and • Show reference to topographic maps and aerial alignments provided above.	Appendix 1B
6. Describe construction and restoration methods. (§ 380.12[c][6]) • Include this information by MP. • Make sure this is provided for offshore construction, as well. For the offshore this information is needed on a mile-by-mile basis and will require completion of geophysical and other surveys before filing.	Sections 1.6 and 1.7, Appendices 1J and 1K N/A
7. Identify the permits required for construction. (§ 380.12[c][9]) • Include the status of all permits. • For construction in the federal offshore area be sure to include consultation with Bureau of Ocean Energy Management. File with the Bureau of Ocean Energy Management for rights-of-way grants at the same time or before you file with the FERC.	Table 1.11-1 in Section 1.11 N/A
8. Provide the names and addresses of all affected landowners and certify that all affected landowners will be notified as required in § 157.6(d). (§ 380.12[c][10]) • Affected landowners are defined in § 157.6(d); and • Provide an electronic copy directly to the environmental staff.	Appendix 1M
OTHER INFORMATION OFTEN MISSING AND RESULTING IN DATA REQUESTS PER FERC'S GUIDANCE MANUAL FOR ENVIRONMENTAL REPORT PREPARATION	
• Describe all authorizations required to complete the proposed action and the status of applications for such authorizations.	Sections 1.11 and 1.12 and Appendix 1L
• Provide plot/site plans of all other aboveground facilities that are not completely within the right-of-way.	Appendix 1B

TABLE 1.1-1

Alaska Pipeline Project
Resource Report 1 Filing Requirements Checklist

Requirement	Where Found in Document
• Provide detailed typical construction right-of-way cross-section diagrams showing information such as widths and relative locations of existing rights-of-way, new permanent right-of-way, and temporary construction right-of-way.	Appendix 1E
• Summarize the total acreage of land affected by construction and operation of the project.	Section 1.4
• If Resource Report 5, Socioeconomics, is not provided, provide the start and end dates of construction, the number of pipeline spreads that would be used, and the workforce per spread.	Section 1.5 and Resource Report 5
• Send two additional copies of topographic maps and aerial images/photographs directly to the environmental staff of the Office of Energy Projects.	To Be Included

1.2 PROJECT PURPOSE AND NEED

The purpose of the APP is to treat and condition natural gas from the ANS and to provide reliable transportation to the U.S.-Canada border. The need for the Project is to deliver this gas to markets in North America. APP's application will be processed under ANGPA. Congress recognized in ANGPA that construction of a pipeline to provide natural gas from the ANS to the contiguous United States is in the national interest and would enhance national energy security by providing access to the significant gas reserves in Alaska to meet future demand for natural gas. Congress mandated expedited processing of any application for an Alaska natural gas transportation project. In ANGPA, Congress concluded that there is a public need to construct and operate the proposed Alaska natural gas transportation project, and that sufficient downstream capacity will exist to transport the Alaska natural gas moving through the Project to markets in the contiguous United States.

To assist in fulfilling ANGPA's intent, the proposed Alaska Mainline, as discussed in Section 1.3.1.2, is currently planned to connect to the Canadian Section of the pipeline at the U.S.-Canada border. The location of the international border interconnect is fixed by the fact that the Project already has a certificated route in Canada and is subject to an international agreement reflecting that certificated route.

1.3 LOCATION AND DESCRIPTION OF FACILITIES

The Project will involve construction and operation of a GTP and natural gas pipeline system and related aboveground, ancillary, and auxiliary facilities. The overall APP system will consist of Pipeline Facilities, Aboveground Facilities, and Associated Infrastructure. The Pipeline Facilities will consist of two large-diameter natural gas pipeline segments: The PT Pipeline between the Point Thomson Unit and the GTP and the Alaska Mainline between the GTP and the U.S.-Canada border, as discussed in Section 1.3.1. Aboveground Facilities include the GTP, eight compressor stations, three custody meter stations, various MLBVs, pig launchers, pig receivers, provisions for intermediate gas delivery points, and cathodic protection facilities as discussed in Section 1.3.2. Other Associated Infrastructure and land required to construct and operate APP include additional temporary workspace (ATWS), access roads, helipads, airstrips, construction camps, pipe storage areas, contractor yards, borrow sites, and dock modifications, as discussed in Section 1.3.3. Detailed facility and site land use requirements and construction and operational land use impacts associated with the Project are discussed in Section 1.4.

An overview map of the Project's location and facilities is provided in Figure 1.1-1. Detailed pipeline corridor route locations are depicted on U.S. Geological Survey maps, provided in Appendix 1A. Aboveground Facility plot plans and Associated Infrastructure location maps are provided in Appendix 1B.

1.3.1 PIPELINE FACILITIES

Table 1.3.1-1 provides a summary of the proposed APP Pipeline Facilities, including the pipeline diameters, approximate MPs, and lengths located within the boroughs and census areas that are currently expected to be crossed. Based on review of aerial photography, the Pipeline Facilities will be constructed within Class 1 locations as described in Resource Report 11, Section 11.3.1. Preliminary information on land requirements needed for the Pipeline Facilities is provided in Section 1.4.

TABLE 1.3.1-1

Alaska Pipeline Project
Location of Proposed Project

Segment/Borough or Census Area	Pipeline Diameter (inches)	Milepost Begin [a]	Milepost End [a]	Length (miles)
POINT THOMSON GAS TRANSMISSION PIPELINE				
North Slope Borough	32	0	58.4	58.4
ALASKA MAINLINE				
North Slope Borough	48	0	185.2	185.2
Yukon–Koyukuk Census Area	48	185.2	430.2	245.0
Fairbanks North Star Borough	48	430.2	518.2	88.0
Southeast Fairbanks Census Area	48	518.2	745.1	226.9
Subtotal				745.1
GRAND TOTAL				**803.5**

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.

1.3.1.1 Point Thomson Gas Transmission Pipeline

The 32-inch-diameter PT Pipeline is currently planned to be designed for an annual average receipt capacity of 1.1 bscfd with a maximum allowable operating pressure (MAOP) of 1,130 pounds per square inch gauge (psig). A custody transfer meter station (Point Thomson Meter Station) is planned to be located at the PTU. The PT Pipeline will be constructed of American Petroleum Institute (API) 5L X65 steel pipe with a minimum nominal wall thickness of 0.387 inch. The natural gas from PTU will be cooled to temperatures below freezing prior to delivery to the PT Pipeline in order to maintain stability of thaw-sensitive soils[6], thereby reducing thaw-related movement of the pipeline. The PT Pipeline will cross public lands managed by the State of Alaska.

[6] Thaw-sensitive soils are soils that, upon thawing, may experience substantial thaw-settlement and reduced strength to a value much lower than that for similar material in an unfrozen condition.

The PT Pipeline will begin at the PTU[7] and extend west along the ANS coastal plain to a terminus at the GTP at PMP 58.4 (refer to Figure 1.1-1). The PT Pipeline will cross a proposed north to south Point Thomson Project (liquids) pipeline[8] near the PTU, and then remain south of the proposed Point Thomson Project (liquids) pipeline. The route will then continue west generally parallel to and south of the existing Badami pipeline for approximately one-third of the PT Pipeline's length. After diverging away from the Badami pipeline, the PT Pipeline route will continue to the west, crossing the existing Endicott Pipeline, Shaviovik, Kadleroshilik, Sagavanirktok, and the Putuligayuk Rivers, to its endpoint at the GTP. APP routed the PT Pipeline to avoid multiple crossings of the existing oil pipelines.

Approximately 24 percent (14.2 miles) of the PT Pipeline will be generally collocated with other pipelines in existing rights-of-way (refer to Table 1.3.1-2), where "generally collocated" is defined as within 500 feet or less center-to-center of the collocated right-of-way and the proposed pipeline centerline. Appendix 1A depicts the PT Pipeline route on U.S. Geological Survey topographic maps and Appendix 1C, Table 1C-2 provides detailed information regarding the PT Pipeline's proximity to existing rights-of-way by milepost. Appendix 1C is submitted under a separate cover and marked "**CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE**". [Note: APP right-of-way proximity data is based on preliminary data about the locations and nature of existing infrastructure in the vicinity of the PT Pipeline route. Additional analysis of adjacent rights-of-way is ongoing and will continue as the PT Pipeline route is finalized and adjacent right-of-way data is acquired. This information will be updated as appropriate as part of the final report.]

TABLE 1.3.1-2

Alaska Pipeline Project
Generally Collocated Rights-of-Way with the Alaska Pipeline Project – Point Thomson Gas Transmission Pipeline [a]

Category/Facility	Length (miles)
NORTH SLOPE BOROUGH	
Overlapping Existing Rights-of-Way (0 To 100 Feet)	
Trans-Alaska Pipeline System	–
Other Pipeline [b]	0.4
Highways or Major Roads	–
Abutting/Minimal Offset (100 To 250 Feet)	
Trans-Alaska Pipeline System	–
Other Pipeline [b]	2.2
Highways or Major Roads	–
Offset Existing Rights-of-Way (250 To 500 Feet)	
Trans-Alaska Pipeline System	–
Other Pipeline [b]	11.6
Highways or Major Roads	–
GRAND TOTAL	**14.2**

[a] Source data provided in Appendix 1C, Table 1C-1. In all cases, the totals shown in this table may not equal the sum due to rounding.
[b] Other Pipeline - any pipeline other than the Trans-Alaska Pipeline System.

[7] PTU is located approximately 60 miles east of the GTP. PTU is a defined development area overlaying a high-pressure hydrocarbon reservoir that would be developed by the unit-operator, ExxonMobil.

[8] The Point Thomson Project pipeline is a 10,000 barrel per day light oil/condensate (liquids) pipeline that is currently under regulatory review by the U.S. Army Corps of Engineers.

1.3.1.2 Alaska Mainline

The 48-inch-diameter Alaska Mainline is designed for an annual average receipt capacity of up to 4.5 bscfd with a MAOP of 2,500 psig. A custody transfer meter station (Alaska Mainline Meter Station) is currently planned to be located at the GTP. Compressor stations will be located along the pipeline at intervals of approximately 70 to 100 miles, with provisions to be made for a minimum of five potential intermediate gas delivery points in Alaska. The pipeline is planned to be constructed of grade American Petroleum Institute (API) 5L X80 steel pipe with a minimum nominal wall thickness of 0.932 inch. North of the Brooks Range, the natural gas in the pipeline is proposed to be cooled to below freezing to maintain the stability of thaw-sensitive soils, thereby reducing thaw-related movement of the pipeline. For stations located south of the Brooks Range, seasonal variation in station discharge gas temperature is planned to range from approximately 25 degrees Fahrenheit (°F) in the winter to approximately 45°F in the summer, resulting in an annual average temperature between 30°F to 35°F.

The Alaska Mainline will begin at AMP 0 at the proposed GTP in the PBU and traverse approximately 745 miles to the U.S.-Canada border (refer to Figure 1.1-1). The Alaska Mainline will traverse:

- The North Slope Borough;
- The Yukon-Koyukuk Census Area (area between the North Slope Borough and the Fairbanks North Star Borough);
- The Fairbanks North Star Borough; and
- Southeast Fairbanks Census Area (area between the Fairbanks North Star Borough and the Canadian border).

The Alaska Mainline route will generally follow the Trans-Alaska Pipeline System (TAPS) and adjacent highway "infrastructure corridor" southeast to the vicinity of Delta Junction, Alaska. From there, the proposed route will diverge from the TAPS route and continue southeast, generally following the Alaska Highway to the U.S.-Canada border. Table 1.3.1-3 summarizes the lengths of the Alaska Mainline that are generally collocated with highway, major road, TAPS, and other pipeline rights-of-way. Appendix 1C contains more detailed information regarding the pipeline's proximity to existing rights-of-way by AMP. [Note: APP right-of-way proximity data is based on preliminary data. Additional analysis of adjacent rights-of-way is ongoing and will continue as the Alaska Mainline route is finalized and adjacent right-of-way data is acquired. This information will be updated as appropriate as part of the final report.]

TABLE 1.3.1-3

Alaska Pipeline Project
Generally Collocated Rights-of-Way with the Alaska Pipeline Project – Alaska Mainline [a]

Category/Facility		Length (miles) [b]
NORTH SLOPE BOROUGH		
Overlapping Existing Rights-of-Way (0 to 100 Feet) [c]		
Trans-Alaska Pipeline System		0.6
Other Pipeline [d]		0.1
Highways or Major Roads		38.1
Abutting/Minimal Offset (100 to 250 Feet) [c]		
Trans-Alaska Pipeline System		3.6
Other Pipeline [d]		0.3
Highways or Major Roads		49.0
Offset Existing Rights of Way (250 to 500 Feet) [c]		
Trans-Alaska Pipeline System		41.3
Other Pipeline [d]		0.8
Highways or Major Roads		26.8
	Subtotal (Approximate)	160.6
YUKON-KOYUKUK CENSUS AREA		
Overlapping Existing Rights-of-Way (0 to 100 Feet) [c]		
Trans-Alaska Pipeline System		0.2
Other Pipeline [d]		–
Highways or Major Roads		14.7
Abutting/Minimal Offset (100 to 250 Feet) [c]		
Trans-Alaska Pipeline System		13.6
Other Pipeline [d]		–
Highways or Major Roads		72.6
Offset Existing Rights of Way (250 to 500 Feet) [c]		
Trans-Alaska Pipeline System		56.4
Other Pipeline [d]		–
Highways or Major Roads		33.6
	Subtotal (Approximate)	191.1
FAIRBANKS NORTH STAR BOROUGH		
Overlapping Existing Rights-of-Way (0 to 100 Feet) [c]		
Trans-Alaska Pipeline System		<0.1
Other Pipeline [d]		–
Highways or Major Roads		<0.1
Abutting/Minimal Offset (100 to 250 Feet) [c]		
Trans-Alaska Pipeline System		0.8
Other Pipeline [d]		–
Highways or Major Roads		0.2
Offset Existing Rights of Way (250 to 500 Feet) [c]		
Trans-Alaska Pipeline System		22.9
Other Pipeline [d]		–
Highways or Major Roads		1.6
	Subtotal (Approximate)	25.5
SOUTHEAST FAIRBANKS CENSUS AREA		
Overlapping Existing Rights-of-Way (0 to 100 Feet) [c]		
Trans-Alaska Pipeline System		<0.1
Other Pipeline [d]		0.2
Highways or Major Roads		9.1
Abutting/Minimal Offset (100 to 250 Feet) [c]		

TABLE 1.3.1-3

Alaska Pipeline Project
Generally Collocated Rights-of-Way with the Alaska Pipeline Project – Alaska Mainline [a]

Category/Facility	Length (miles) [b]
Trans-Alaska Pipeline System	1.1
Other Pipeline [d]	0.1
Highways or Major Roads	7.9
Offset Existing Rights of Way (250 to 500 Feet) [c]	
Trans-Alaska Pipeline System	8.2
Other Pipeline [d]	0.3
Highways or Major Roads	39.2
Subtotal (Approximate)	66.1
GRAND TOTAL	**443.3**

[a] Source data is provided in Appendix 1C, Table 1C-2. In all cases, the totals shown in this table may not equal the sum due to rounding.
[b] The length totals may be greater than the corresponding length of the pipeline because the pipeline may be collocated with more than one existing facility.
[c] These dimension ranges represent the distances from the centerline of the existing rights-of-way to the alignment shown on the route maps within the current APP route corridor.
[d] Other Pipeline - any pipeline other than the Trans-Alaska Pipeline System.

Although most of the Alaska Mainline is generally collocated either with TAPS or highway rights-of-way, there are numerous locations and reasons where it is not practical to collocate, several of which are noted below:

- Minimize impacts to environmental resources (e.g., waterbody crossing locations, cultural sites, National Wildlife Refuges, length of route);
- Minimize impacts from existing infrastructure (e.g., pump stations, pinch points between TAPS and highway, subdivisions, occupied buildings, private lands);
- Minimize impacts from geohazards (e.g., cross slopes, pinch points with infrastructure and mountains, slopes, watercourses, floodplains, seismic fault lines); and
- Minimize construction impacts (e.g., level terrain).

1.3.2 ABOVEGROUND FACILITIES

1.3.2.1 Gas Treatment Plant

The GTP is planned to be constructed and operated on the ANS near the Beaufort Sea coast (refer to Figure 1.1-1). The GTP site will be located entirely within the PBU, which is located on state land within the North Slope Borough. Section 1.4.3.1 describes the land requirements associated with the GTP site. Appendix 1B includes a plot plan of the GTP site and Associated Infrastructure.

Figure 1.3.2-1 depicts a block flow diagram for the GTP that shows the main gas flow streams in and out of the GTP.

The GTP is designed to treat and condition natural gas received from various producers, and to deliver sales quality gas to the Alaska Mainline. Currently, the sources of feed gas to the GTP are anticipated to be the PBU's CGF and the PTU. Gas from the CGF will be transported to the GTP through an approximately 4,600-foot-long feed line, or alternatively, two smaller diameter parallel feed lines with capacity equal to the single line. The total capacity of the CGF feed

line(s) will be designed for an annual average capacity of up to 5.3 bscfd. The GTP will use approximately 1,000,000 horsepower to deliver an average annual capacity up to 4.5 bscfd of sales quality gas, depending on final shipper commitments and gas sources.

The GTP consists of four identical and parallel sets of gas-processing equipment, known as trains, which treat the feed gas to remove carbon dioxide (CO_2), hydrogen sulfide (H_2S), and water from the feed gas to meet sales quality specifications. After this processing, each train then compresses the gas, and the gas from each of the four trains recombines to be routed to a gas chilling unit. This unit utilizes propane refrigerant to cool the sales-quality gas, which will help maintain the stability of the thaw-sensitive soils within the North Slope Borough section of the Alaska Mainline. After refrigeration, the gas is to be delivered to the Alaska Mainline at pressures up to 2,500 psig.

In addition to the sales quality gas being delivered to the Alaska Mainline, the GTP also produces a CO_2 stream from the CO_2 removal units found in each of the four trains. These streams also contain trace amounts of hydrogen sulfide as well as being saturated with water. After being compressed and having water removed, the CO_2 stream from each of the four trains recombines and is transported via a 12-inch-diameter line to the producers. The CO_2 transfer line is being designed to transport an annual average of up to 600 million standard cubic feet per day and will be routed through the same right-of-way as the CGF feed line.

Not depicted on the block flow diagram are two additional 6-inch-diameter transfer lines being planned in order to transport fuel gas and propane to the GTP from CGF. The fuel gas line will be used for GTP commissioning and initial power generation, and the propane line will be used to provide make-up for the GTP's gas chilling unit propane refrigeration system. These two lines will also be constructed in the same right-of-way as the CGF feed and CO_2 transfer lines.

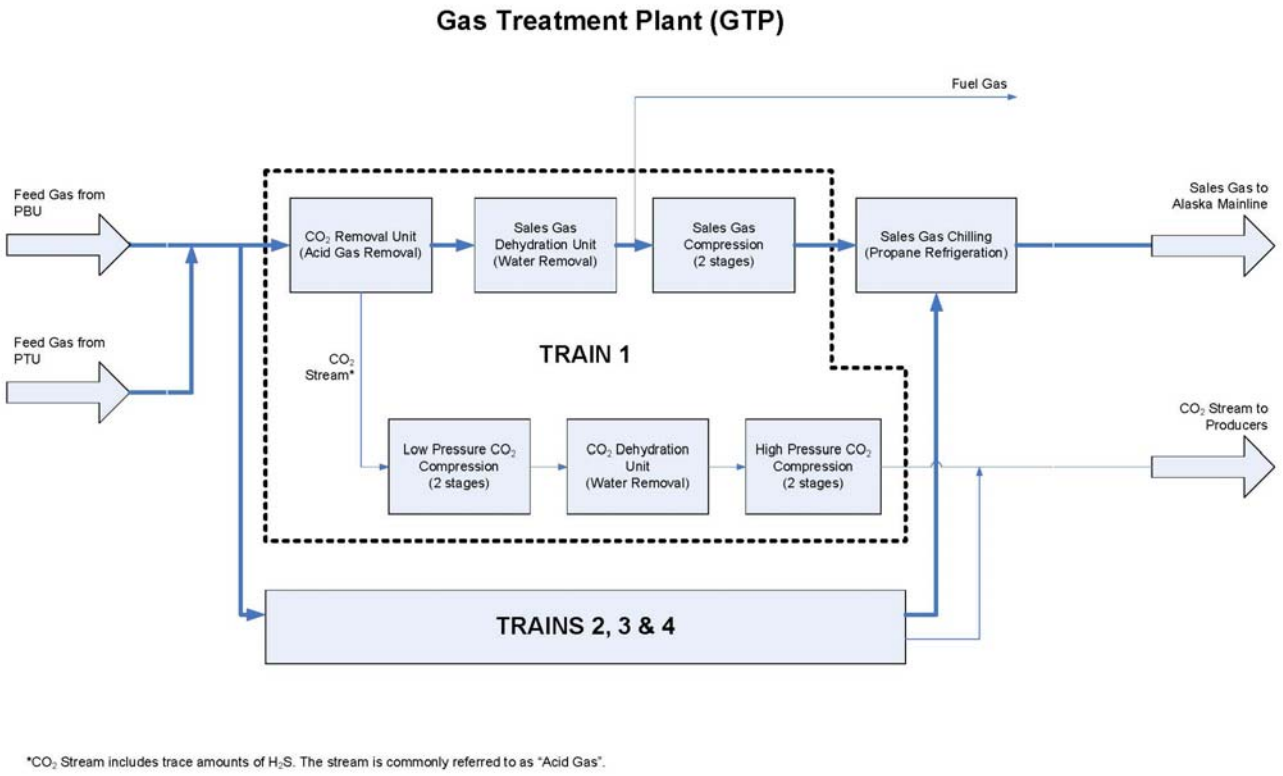

Figure 1.3.2-1 GTP Block Flow Diagram

In addition, the GTP will consist of several associated support facilities and systems including, but not limited to:

- Living quarters with approximately 230 rooms;
- Catering and housekeeping facilities, including a full-service kitchen and dining facility, cold and dry food storage areas, and laundry facility;
- A warehouse to store goods, materials, and spare parts;
- Storage tanks for process chemicals, diesel, water, and waste chemicals;
- A cold-storage pad for spare parts and storage of materials that are not sensitive to ambient weather conditions;
- A process and plant maintenance shop that will accommodate personnel and equipment for preventative and corrective maintenance services;
- A vehicle maintenance facility that supports preventive maintenance and unscheduled repair activities;
- Drain systems that include open drain and closed drain systems that will be routed to injection wells on the GTP site;
- A water reservoir at the Putuligayuk River and transfer line system to provide raw water to the GTP for various uses including firewater and process water. Water treatment facilities will be situated at the GTP site to provide process water make-up and potable water for personnel use;
- Plant sanitary wastewater handling systems. Sanitary waste will be collected and stored until transported to the North Slope Borough plant for treatment;
- On-site power generation to accommodate normal, essential, and emergency power needs. The power generators for normal power as well as compressor gas turbine drivers are fitted with waste heat recovery units to supply energy for regenerating process chemicals and to provide building heat;
- Flare systems for facility start-up, depressuring during maintenance activities, and to protect the facility from overpressure;
- A custody transfer meter station for feed gas from CGF called the Prudhoe Bay Meter Station;
- A custody transfer meter station for sales quality gas entering the Alaska Mainline called the Alaska Mainline Meter Station. Further description of meter stations is provided in Section 1.3.2.2; and
- Outlet meter for the CO_2 stream.

Most equipment requiring frequent access for operations and maintenance will be enclosed to shelter personnel from the Arctic weather elements.

1.3.2.2 Pipeline Aboveground Facilities

In addition to the PT Pipeline, Alaska Mainline and GTP, APP will install and operate compressor stations, meter stations, MLBVs, pig launchers, pig receivers, and provisions for intermediate gas delivery points in Alaska as listed in Table 1.3.2-1.

TABLE 1.3.2-1

Alaska Pipeline Project
Aboveground Facilities Associated with the Pipeline [a]

Pipeline/Facility Type/Facility Name	Milepost [b]	Borough or Census Area
POINT THOMSON GAS TRANSMISSION PIPELINE		
Meter Stations		
PTU Meter Station	0.0	North Slope Borough
MLBVs		
MLBV-PT1 (at PTU Meter Station)	0.0	North Slope Borough
MLBV-PT2	18.9	North Slope Borough
MLBV-PT3	38.8	North Slope Borough
MLBV-PT4 (at GTP)	58.4	North Slope Borough
Launchers and Receivers		
Launcher (at PTU Meter Station)	0.0	North Slope Borough
Receiver (at GTP)	58.4	North Slope Borough
ALASKA MAINLINE		
Compressor Stations		
Happy Valley Compressor Station	79.6	North Slope Borough
Galbraith Lake Compressor Station	149.9	North Slope Borough
Chapman Creek Compressor Station	256.0	Yukon-Koyukuk Census Area
Fort Hamlin Hills Compressor Station	338.0	Yukon-Koyukuk Census Area
Tatalina River Compressor Station	419.1	Yukon-Koyukuk Census Area
Johnson Road Compressor Station	494.0	Fairbanks North Star Borough
George Lake Compressor Station	579.1	Southeast Fairbanks Census Area
Tetlin Junction Compressor Station	670.2	Southeast Fairbanks Census Area
Meter Stations		
Alaska Mainline Meter Station (at GTP)	0.0	North Slope Borough
Mainline Block Valves		
MLBV-AK1 (at Alaska Mainline Meter Station)	0.0	North Slope Borough
MLBV-AK2	13.5	North Slope Borough
MLBV-AK3	29.0	North Slope Borough
MLBV-AK4	40.4	North Slope Borough
MLBV-AK5	60.0	North Slope Borough
MLBV-AK6 (at Happy Valley Compressor Station)	79.6	North Slope Borough
MLBV-AK7	97.4	North Slope Borough
MLBV-AK8	116.0	North Slope Borough
MLBV-AK9	131.5	North Slope Borough
MLBV-AK10 (at Galbraith Lake Compressor Station)	149.9	North Slope Borough
MLBV-AK11	169.6	North Slope Borough
MLBV-AK12	189.3	Yukon-Koyukuk Census Area
MLBV-AK13	208.0	Yukon-Koyukuk Census Area
MLBV-AK14	225.1	Yukon-Koyukuk Census Area
MLBV-AK15	242.7	Yukon-Koyukuk Census Area
MLBV-AK16 (at Chapman Creek Compressor Station)	256.0	Yukon-Koyukuk Census Area
MLBV-AK17	275.0	Yukon-Koyukuk Census Area
MLBV-AK18	294.7	Yukon-Koyukuk Census Area
MLBV-AK19	306.3	Yukon-Koyukuk Census Area
MLBV-AK20	322.0	Yukon-Koyukuk Census Area
MLBV-AK21 (at Fort Hamlin Hills Compressor Station)	338.0	Yukon-Koyukuk Census Area
MLBV-AK22	356.9	Yukon-Koyukuk Census Area

TABLE 1.3.2-1

Alaska Pipeline Project
Aboveground Facilities Associated with the Pipeline [a]

Pipeline/Facility Type/Facility Name	Milepost [b]	Borough or Census Area
MLBV-AK23	366.3	Yukon-Koyukuk Census Area
MLBV-AK24	380.3	Yukon-Koyukuk Census Area
MLBV-AK25	400.0	Yukon-Koyukuk Census Area
MLBV-AK26 (at Tatalina River Compressor Station)	419.1	Yukon-Koyukuk Census Area
MLBV-AK27	433.6	Fairbanks North Star Borough
MLBV-AK28	452.1	Fairbanks North Star Borough
MLBV-AK29	466.0	Fairbanks North Star Borough
MLBV-AK30	481.2	Fairbanks North Star Borough
MLBV-AK31 (at Johnson Road Compressor Station)	494.0	Fairbanks North Star Borough
MLBV-AK32	513.7	Fairbanks North Star Borough
MLBV-AK33	533.4	Southeast Fairbanks Census Area
MLBV-AK34	545.9	Southeast Fairbanks Census Area
MLBV-AK35	565.2	Southeast Fairbanks Census Area
MLBV-AK36 (at George Lake Compressor Station)	579.1	Southeast Fairbanks Census Area
MLBV-AK37	589.8	Southeast Fairbanks Census Area
MLBV-AK38	603.8	Southeast Fairbanks Census Area
MLBV-AK39	623.1	Southeast Fairbanks Census Area
MLBV-AK40	632.4	Southeast Fairbanks Census Area
MLBV-AK41	651.6	Southeast Fairbanks Census Area
MLBV-AK42 (at Tetlin Junction Compressor Station)	670.2	Southeast Fairbanks Census Area
MLBV-AK43	688.8	Southeast Fairbanks Census Area
MLBV-AK44	705.1	Southeast Fairbanks Census Area
MLBV-AK45	716.9	Southeast Fairbanks Census Area
MLBV-AK46	735.6	Southeast Fairbanks Census Area
Launchers and Receivers		
Launcher (at Alaska Mainline Meter Station)	0.0	North Slope Borough
Launcher and Receiver (at Galbraith Compressor Station)	149.9	North Slope Borough
Launcher and Receiver (at Fort Hamlin Hills Compressor Station)	338.0	Yukon-Koyukuk Census Area
Launcher and Receiver (at Johnson Road Compressor Station)	494.0	Fairbanks North Star Borough
Launcher and Receiver (at Tetlin Junction Compressor Station)	670.2	Southeast Fairbanks Census Area
Intermediate Gas Delivery Points		
[Note: The following intermediate delivery points were identified by the In-State Gas Demand Study (prepared by Northern Economics, Inc., January 2010) and are currently considered the most likely off-take points based on expected demand. The final determination of the locations for a minimum of five intermediate gas delivery points will depend on input from potential shippers and the State of Alaska. APP will make provision for delivery points along the pipeline at the locations finally selected.]		
Livengood	404.0	Yukon-Koyukuk Census Area
Fairbanks	469.0	Fairbanks North Star Borough
Delta Junction	549.0	Southeast Fairbanks Census Area
Tok	656.0	Southeast Fairbanks Census Area

[a] Cathodic protection facilities will be installed at the MLBV, compressor station, and meter station sites. Test lead posts will be located along the permanent right-of-way.

[b] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.

Compressor Stations

Intermediate natural gas compression is not expected to be required on the PT Pipeline because the natural gas pressure will be sufficient to reach the GTP.

Eight compressor stations will be constructed along the Alaska Mainline at intervals where gas pressure will need to be increased to offset pressure losses caused by friction (refer to Table 1.3.2-1). Section 1.4.2.2 describes the land requirements associated with the compressor station sites.

In general, all compressor stations will have a similar design. The compressor station site will likely be fenced and installed on a pad, built up with select fill. As described in Section 1.8.4.1, a fire buffer zone of cleared vegetation will extend approximately 130 feet beyond the fence. At stations underlain by thaw-sensitive permafrost, the buildings may be elevated and gravel pads will be thicker to avoid heat transfer to the underlying permafrost, or constructed on engineered pads with thermal mitigation provided. Each compressor station will have a capacity of approximately 50,000 horsepower in order to maintain mainline MAOP of 2,500 psig. The gas turbine compressor units will be driven by natural gas sourced from the pipeline. Gas turbine compressor packages will be housed within heated compressor buildings. The buildings will also house a gas turbine inlet air filtration and silencing system, gas-turbine exhaust system with associated ducting and silencing, a control system, and auxiliary systems.

In continuous permafrost areas, each compressor station will have cooling equipment designed to chill the discharge gas leaving each station. Natural gas cooling equipment, comprised of gas-to-gas heat exchangers and aerial coolers, will be installed at compressor stations to cool discharge gas. Warm compressor discharge gas will initially be cooled by aerial coolers and then by cold suction gas in the gas-to-gas heat exchangers prior to leaving the station.

Gas is expected to be an average year-round temperature of approximately 30°F at stations located north of the Brooks Range to maintain integrity of the pipeline in continuous permafrost conditions in this region. For stations located south of the Brooks Range where permafrost is discontinuous, seasonal variation in station discharge gas temperature will range from approximately 25°F in the winter to approximately 45°F in the summer, resulting in an annual average temperature between 30°F to 35°F.

Compressor station utilities supporting the operation of the gas compressor and cooling equipment will be housed in modularized, skid-mounted buildings, with each building being approximately 50 feet long by 15 feet wide. These buildings will be supported on piles and are currently expected to include:

- Mechanical skid, housing boilers, and pumps to provide building heating, air compressors, and dryers;
- Master Control Center/Switchgear skid providing main power distribution;
- Control skid containing station and unit control panels, uninterruptible power supply, telecommunications, and a supervisory control and data acquisition (SCADA) system;
- Power generator skids containing primary and standby generators;
- Personnel skid, containing lunch room and office;
- Storage building for spare parts and equipment;
- Living quarters for up to six personnel; and

- Waste and fresh water skid.

Communication facilities may include one or two satellite dishes and a self-supporting radio tower at each facility. The radio towers are typically self-supported steel lattice structures between 100 to 150 feet tall, depending on local topography, although higher towers may be required in some locations. The use of satellite technology such as "VSAT" (Very Small Aperture Terminal) is likely to be required and the satellite dishes are typically up to 8 feet in diameter.

To protect the compressor, an inlet scrubber will be installed in the station suction piping to remove entrained liquids and foreign material from the gas that enters the compressor station. Liquids will be stored on site for appropriate disposal.

Power will be produced on site using natural gas-fueled generators.

As listed in Table 1.3.2-1, compressor station sites will also typically include a MLBV and, at some locations, a pig launcher and a receiver.

Construction camps will be utilized for construction of compressor stations, if necessary, as described in Section 1.3.3.2, below.

Compressor stations will be designed for remote operation and will be accessible by vehicles using permanent access roads and by helicopter using new helipads. Site maps of the compressor stations are included in Appendix 1B.

Custody Transfer Meter Stations

Along the PT Pipeline, APP will construct and operate one receipt meter station at the PTU to provide custody transfer measurement of gas entering the PT Pipeline (refer to Table 1.3.2-1). This facility is referred to as the PTU Meter Station. The site will be accessible by helicopter using the landing area within the PTU.

At the GTP, APP will construct and operate one receipt meter station to provide custody transfer measurement of gas delivered to the GTP through the CFG feed line(s) from PBU. This facility is referred to as the Prudhoe Bay Meter Station. The site will be accessible by vehicles using the GTP access roads.

Along the Alaska Mainline, APP will construct and operate one receipt meter station at the GTP to provide custody transfer measurement of sales quality gas entering the Alaska Mainline from the GTP. This facility is referred to as the Alaska Mainline Meter Station. The site will be accessible by vehicles using the GTP access roads. Additional custody transfer meter stations will also be required at the intermediate gas delivery points, which are discussed in Section 1.10. No custody transfer meter station is required at the U.S.-Canada border.

Each meter station site will typically include a gas scrubber/strainer, above-grade piping, an instrument building, a meter-run building, flow-metering, gas-quality monitoring equipment, and a MLBV and pig launcher. Buildings will be elevated to mitigate heat transfer to the underlying permafrost.

Primary and standby power will be provided by the GTP for the Prudhoe Bay Meter Station and the Alaska Mainline Meter Station and by PTU for the PTU Meter Station.

Section 1.4.2.2 describes the land requirements associated with the meter station sites. Site maps of the meter stations are included in Appendix 1B.

Mainline Block Valves

MLBVs are used to segment the pipeline for safety, operations, and maintenance purposes. Section 1.4.2.2 describes the land requirements associated with the MLBV sites.

Along the PT Pipeline, APP will construct and operate four MLBVs (refer to Table 1.3.2-1). Two MLBVs will be located at associated facilities (i.e., the PTU and the GTP) and two MLBVs will be standalone facilities along the PT Pipeline. In addition to the block valve and operator, each MLBV site will typically include blowdown valves and a line break control system to close the valve upon detection of a low-pressure condition.

Along the Alaska Mainline, APP will construct and operate 46 MLBVs (refer to Table 1.3.2-1). A MLBV will be located at each of the eight compressor stations, one MLBV will be located at the Alaska Mainline Meter Station, and the remaining MLBVs will be standalone facilities along the Alaska Mainline. Access to standalone MLBVs will be by helicopter or by ground transportation.

Launchers and Receivers

Launcher and receiver sites will allow the pipeline to accommodate a high resolution in-line inspection tool, also known as a smart pig. Section 1.4.2.2 describes the land requirements associated with the launcher and receiver sites.

Along the PT Pipeline, APP will construct and operate one launcher and one receiver (refer to Table 1.3.2-1). The launcher will be located at the PTU Meter Station site and the receiver will be located at the GTP site.

Along the Alaska Mainline, APP will construct and operate five launchers and four receivers[9] (refer to Table 1.3.2-1). One launcher will be located at the Alaska Mainline Meter Station (at the GTP) and a set of launchers and receivers will be located at four of the compressor station sites.

Intermediate Gas Delivery Points

APP will install provisions for a minimum of five future intermediate sale gas delivery points along the Alaska Mainline (refer to Table 1.3.2-1). These points will provide the potential to deliver gas within Alaska. At each intermediate gas delivery point, a tee with an isolation valve and blind flange or pipe stub to accommodate a future hot tap may be installed. Section 1.4.2.2 describes the land requirements associated with the intermediate delivery point sites. The facilities to condition and distribute gas will be constructed and operated by others. At this time, there are no contractual agreements in place with others to receive gas. The initial four potential locations are identified in the In-State Gas Demand Study included as Appendix B of APP's April 29, 2010 Open Season filing.

Cathodic Protection Facilities

APP will install and maintain a cathodic protection system for the Pipeline Facilities in accordance with applicable codes and regulations. The cathodic protection system test stations (aboveground posts) will be located at approximately 2-mile intervals. All cathodic protection system facilities (i.e., groundbeds and rectifiers) associated with the PT Pipeline and Alaska Mainline will be located at selected compressor stations, meter stations, and MLBV sites (refer

[9] APP is currently planning to locate one receiver at a compressor station along the Canadian Section of the Project.

to Table 1.3.2-1). Section 1.4.2.2 describes the land requirements associated with the cathodic protection facility sites.

All compressor stations, meter stations, intermediate MLBVs, and aboveground piping at intermediate gas delivery points are planned to be fenced. Launchers and receivers will be inside the compressor station or meter station fence.

1.3.3 ASSOCIATED INFRASTRUCTURE

1.3.3.1 Gas Treatment Plant

Module Staging Area

APP plans to construct a laydown or staging area for GTP modules near West Dock, the location at PBU where sea-lift docking and staging facilities are concentrated for use by PBU user groups. This area will be needed because the existing PBU staging area near West Dock is heavily used and will not be sufficient to meet APP's module staging area needs. The laydown area will be located immediately southeast of the existing PBU staging area. Section 1.4.3.1 summarizes the land requirements associated with the module staging area and the location is depicted in the GTP facility location maps in Appendix 1B.

Access Roads

There are five ice roads planned for the construction of the GTP and associated facilities, referred to as ice road (IR) 1 through 5. IR 1 and IR 2 will be constructed for gravel hauling during initial site development activities between the GTP and the Putuligayuk-23 (Put-23) mine and between the GTP and the dedicated water reservoir site, respectively. IR 3 will be constructed between the water reservoir site and the Putuligayuk River for use during construction of the Putuligayuk River transfer line to the reservoir. IR 4 and IR 5 will be used during construction of the water transfer line from the reservoir to the GTP and the feed line(s) from the CGF to the GTP. IR5 will also be used during construction of the CO_2, propane, and fuel gas transfer lines which are all in the same right-of-way as the CGF feed line(s). The locations of these access roads are depicted in Appendix 1B.

In addition to the ice roads, APP plans to use two existing gravel roads that will be upgraded to support construction traffic, and two new gravel roads will be constructed to access the GTP site from West Dock. Modifications to the two existing access roads will be necessary to accommodate the transport of GTP modules from the dock to the GTP site. One of the new roads will be constructed from the main haul road to transport the modules and other heavy equipment to the GTP site. This road will branch off the main road north of the CGF and will be called the North Access Road. A second, new, light-duty road will also be constructed to permanently access the GTP from the main road from the south side of the CGF. This road will be called the South Access Road.

To access the water reservoir from the GTP, the existing road south of the GTP will be used. No upgrades are currently planned in order to utilize this road, however, two new roads, the Reservoir Access Road and the Putuligayuk River Pump Access Road, will be constructed to access the reservoir from the main road and to access the Putuligayuk River Pump Pad from the reservoir, respectively.

APP will coordinate access road construction activities with affected landowners, including federal and state agencies, as applicable. All new and modified facilities and roads will become permanent features following construction. Section 1.4.3.1 summarizes the land requirements

associated with the GTP access roads and their locations are depicted in the GTP facility location maps provided in Appendix 1B.

Construction Camp

Because construction will occur in areas with limited infrastructure, APP intends to construct and use a temporary camp on the GTP site during construction. The GTP camp will be constructed to house up to 800 workers during construction of the GTP. Part of this camp will be removed sometime after GTP startup and some of the camp will remain to support GTP maintenance activities.

Section 1.4.3.1 summarizes the land requirements associated with the GTP, which includes the construction camp. The location of the construction camp is depicted on the GTP plot plan provided in Appendix 1B.

Borrow Sites

The sand and gravel required for construction of the GTP and related facilities (e.g., West Dock modifications discussed below) will be obtained from existing borrow sites. Gravel will be sourced from the Put-23 mine, an existing borrow site located approximately 1.6 miles south of the GTP site, the dedicated water reservoir site (described below), and/or other existing borrow sites, as available, such as MS-102.

Section 1.4.3.1 summarizes the land requirements associated with the borrow sites for the GTP and the Put-23 mine location is depicted in Appendix 1B.

West Dock Modifications

Dock Heads

Most of the modules and materials needed for the GTP will be transported to the ANS by marine cargo transports using ocean tugs and barges. The large modules used to construct the GTP will be up to 9,000 short tons in weight. These large modules require barges and tugs with a draft up to 12 feet and drive the need for dock modifications and dredging. Modules will be sourced on a worldwide basis. Upon arriving in Prudhoe Bay, APP will use existing Dock Head (DH) 2 at the West Dock to offload the modules and materials. APP will modify DH2 for the GTP module sealift[10] offloads. DH2 has been used previously to support existing oil production facilities.

Modifications at DH2 will allow for the simultaneous mooring of multiple barges. In particular, APP will expand the existing dock to the east using sheetpile construction with import fill. The modifications will add five new berths to offload barges within the estimated 45-day-long open-water work window. In addition, the causeway road from DH2 to the existing staging area will also need to be widened to address operational and safety issues. Power required for GTP construction on West Dock will be supplied by a temporary power generation unit.

Dock Dredging and Disposal

Initial dredging is expected to be required prior to the first sealift (Sealift 1). In subsequent construction years, maintenance dredging will be performed as required to maintain the channel to specification width and depth. The channel specifications include adequate bottom and side clearance to allow the tugs and barges to operate safely. APP has identified an offshore dredged material disposal site in Steffansson Sound that is approximately 4 miles northeast of

[10] Sealift refers to the delivery of construction and support materials by oceangoing barge.

DH2 in approximately 20 to 25 feet of water. Several dredging methods are feasible, including cutterhead suction, clamshell, barge-mounted excavator, elevated excavator, or a combination of these methods.

Section 1.4.3.1 summarizes the land requirements associated with the West Dock modifications. Figures of the dredging and disposal sites are provided in Appendix 1B. Dredging and disposal issues are also discussed in Section 2.4.3 of Resource Report 2 and in Section 10.6.1.4 and 10.6.1.5 of Resource Report 10.

Water Reservoir, Pump Facilities, and Transfer Line

APP is planning to construct a water reservoir to provide water for GTP construction and operation. This will include installation of pump pads and a water transfer line. The current design is based on locating the reservoir at the Putuligayuk River, which is located approximately 5 miles southwest of the GTP, and will be accessible via a combination of existing and new roads as described above. The reservoir facility will consist of a bermed reservoir, a reservoir pump house situated on a gravel pad, a river pump house situated on a gravel pad, a line to supply water from the river to the reservoir, and a water transfer line to supply water to the GTP from the reservoir.

The reservoir is designed to draw water from the Putuligayuk River using pumps installed at the edge of the river. These pumps will be sized to refill the reservoir over a 75-day window to meet the annual GTP water requirements; consequently, the reservoir will be sized to provide sufficient storage to supply one year's volume of water required at the GTP (i.e., 130 gallons per minute over a 1-year period). Water from the reservoir will then be strained and pumped through a 6-inch-diameter insulated water transfer line for supply to the GTP.

The material excavated from the reservoir site will be used at the GTP for constructing the gravel pad. The additional overburden retrieved from the reservoir site will be placed around the reservoir perimeter to create a berm.

Section 1.4.3.1 summarizes the land requirements associated with the water reservoir, pump pads, and water transfer line and figures depicting the locations are provided in the GTP facility location maps in Appendix 1B.

1.3.3.2 Pipeline Facilities

Additional Temporary Workspaces

In addition to the temporary workspace needed for construction of the pipelines, APP will use ATWS for staging areas; truck turnarounds; utility crossovers; road, waterbody, and wetland crossings; areas of rocky soils, steep slopes, and rugged terrain; and at other site-specific locations on a temporary basis during construction. Section 1.4.3.2 summarizes the land requirements associated with ATWS. Appendix 1D lists the approximate MP locations of ATWS associated with APP. Appendix 1E provides drawings showing where ATWS will typically be located in addition to the temporary construction right-of-way at these various feature crossings.

Access Roads

APP will require access roads during construction to transport equipment, material, pipe, and personnel to the right-of-way, compressor stations, borrow sites, and other locations. These access roads include existing public roadways, existing public and non-public roads, and newly-built access roads and shoo-flies[11].

Roadway improvements are not expected to be required for public roads that will be used during construction of the Project. Many of the existing non-public roads (e.g., in PBU or old TAPS access roads that may not currently be used) may require modifications to accommodate large and heavy construction equipment and material. Modifications may include adding gravel 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, and installing culverts or bridges. In locations where the soils are stable, driving directly on the frozen ground is planned.

If existing roads are not readily available, or do not provide adequate access, APP will build new temporary or permanent access roads using available in-situ material (such as native soils or timber), imported granular material, or temporary use of snow/ice depending on the intended traffic load, duration, and timing of use. The Prudhoe Bay and Alaska Mainline Meter Stations will be accessible via GTP access roads. Construction of new permanent roads to access compressor stations and some MLBVs may be needed. Permanent and temporary bridges will be constructed, if needed, to cross waterbodies on such roads. The material for building an access road will depend on a number of factors, including:

- Seasonality of required access;
- Durability or trafficability;
- Terrain contours; and
- Readily available native material.

The type of access road depends on its intended use. Following construction, temporary access roads will be left in place or reclaimed.

Helipads

APP will install a helipad at each compressor station site, at construction camps, and at MLBV sites where existing roads do not provide adequate access and where a stable landing surface is not available along the permanent right-of-way. Helipads will be located within the footprint of the facility, camp, or permanent right-of-way. The permanent right-of-way may be widened at certain MLBV locations so that a wider area can be kept clear of trees and brush to allow safe approach, landing, and takeoff. Table 1.3.3-1 lists the helipad locations. Section 1.4.3.2 summarizes the land requirements for the helipads.

[11] A temporary, short access route around a difficult construction area or other obstruction.

TABLE 1.3.3-1

Alaska Pipeline Project
Helipads Associated with the Pipeline

Pipeline/Borough or Census Area/Helipad Location	Approximate Milepost [a]	Permanent or Temporary [b]
POINT THOMSON GAS TRANSMISSION PIPELINE		
NORTH SLOPE BOROUGH		
PTU Meter Station	0.0	Permanent at PTU
BV-PT1 (PTU Meter Station and Launcher)	0.0	Permanent
Point Thomson East Storage Yard	1.3	Temporary
BV-PT2	18.9	Permanent
BV-PT3	38.8	Permanent
Point Thomson Central 1 Storage Yard	45.0	Temporary
Point Thomson Central 2 Storage Yard	45.5	Temporary
Point Thomson West Storage Yard	50.4	Temporary
BV-PT4 (at GTP Receiver)	58.4	Permanent
ALASKA MAINLINE		
NORTH SLOPE BOROUGH		
MLBV-AK1	0.0	Permanent
Prudhoe Bay Storage Yard	3.1	Temporary
Deadhorse Camp 1	12.8	Temporary
MLBV-AK2	13.5	Permanent
MLBV-AK3	29.0	Permanent
MLBV-AK4	40.4	Permanent
Franklin Bluff Camp 2	44.3	Temporary
MLBV-AK5	60.0	Permanent
MLBV-AK6	79.6	Permanent
Happy Valley Compressor Station (MLBV-AK6)	79.6	Permanent
Happy Valley Camp 3	87.0	Temporary
Happy Valley Storage Yard	88.1	Temporary
MLBV-AK7	97.4	Permanent
MLBV-AK8	116.0	Permanent
MLBV-AK9	131.5	Permanent
Galbraith Lake Storage Yard	144.3	Temporary
Galbraith Lake Camp 4	145.7	Temporary
MLBV-AK10	149.9	Permanent
Galbraith Lake Compressor Station (MLBV-AK10)	149.9	Permanent
Atigun River Camp 5	168.7	Temporary
Atigun River Storage Yard	169.0	Temporary
MLBV-AK11	169.6	Permanent
Chandalar Camp 6	177.8	Temporary
Chandalar Shelf Storage Yard	179.9	Temporary
MLBV-AK12	189.3	Permanent
YUKON-KOYUKUK CENSUS AREA		
MLBV-AK13	208.0	Permanent
Dietrich Camp 7	210.1	Temporary
Dietrich Storage Yard	210.2	Temporary
MLBV-AK14	225.1	Permanent

TABLE 1.3.3-1

Alaska Pipeline Project
Helipads Associated with the Pipeline

Pipeline/Borough or Census Area/Helipad Location	Approximate Milepost [a]	Permanent or Temporary [b]
MLBV-AK15	242.7	Permanent
Coldfoot Camp 8	244.3	Temporary
MLBV-AK16	256.0	Permanent
Chapman Creek Compressor Station (MLBV-AK16)	256.0	Permanent
MLBV-AK17	275.0	Permanent
Prospect Creek Storage Yard	281.7	Temporary
MLBV-AK18	294.7	Permanent
MLBV-AK19	306.3	Permanent
Kanuti River (Old Man) Camp 9	308.7	Temporary
MLBV-AK20	322.0	Permanent
Dall River Storage Yard	329.8	Temporary
MLBV-AK21	338.0	Permanent
Fort Hamlin Hills Compressor Station (MLBV-AK21)	338.0	Permanent
Five Mile Camp 10	355.6	Temporary
Five Mile Storage Yard	356.4	Temporary
MLBV-AK22	356.9	Permanent
MLBV-AK23	366.3	Permanent
MLBV-AK24	380.3	Permanent
Hess Creek Storage Yard	387.5	Temporary
MLBV-AK25	400.0	Permanent
Livengood Camp 11	404.4	Temporary
MLBV-AK26	419.1	Permanent
Tatalina River Compressor Station (MLBV-AK26)	419.1	Permanent
Tatalina River Storage Yard	419.4	Temporary
FAIRBANKS NORTH STAR BOROUGH		
MLBV-AK27	433.6	Permanent
Treasure Creek Storage Yard	448.7	Temporary
MLBV-AK28	452.1	Permanent
MLBV-AK29	466.0	Permanent
Little Chena Camp 12	469.0	Temporary
Fort Wainwright Storage Yard	470.4	Temporary
MLBV-AK30	481.2	Permanent
MLBV-AK31	494.0	Permanent
Johnson Road Compressor Station (MLBV-AK31)	494.0	Permanent
Johnson Road Camp 13	495.3	Temporary
Salcha River Storage Yard	503.7	Temporary
MLBV-AK32	513.7	Permanent
SOUTHEAST FAIRBANKS CENSUS AREA		
Rosa Creek Camp 14	521.5	Temporary
Quartz Lake Storage Yard	532.8	Temporary
MLBV-AK33	533.4	Permanent
MLBV-AK34	545.9	Permanent
Delta Junction Camp 15	549.1	Temporary
Arrow Creek Storage Yard	563.8	Temporary
MLBV-AK35	565.2	Permanent

TABLE 1.3.3-1

Alaska Pipeline Project
Helipads Associated with the Pipeline

Pipeline/Borough or Census Area/Helipad Location	Approximate Milepost [a]	Permanent or Temporary [b]
MLBV-AK36	579.1	Permanent
George Lake Compressor Station (MLBV-AK36)	579.1	Permanent
George Lake Camp 16	582.0	Temporary
MLBV-AK37	589.8	Permanent
Sears Creek Storage Yard	593.3	Temporary
MLBV-AK38	603.8	Permanent
MLBV-AK39	623.1	Permanent
Cathedral Bluffs Alternate Storage Yard	625.7	Temporary
Cathedral Bluffs Storage Yard	632.0	Temporary
MLBV-AK40	632.4	Permanent
Tok River Alternate Storage Yard	646.3	Temporary
Tok Alternate Camp 17	647.1	Temporary
MLBV-AK41	651.6	Permanent
Tok Camp 17	659.3	Temporary
Tok River Storage Yard	662.2	Temporary
MLBV-AK42	670.2	Permanent
Tetlin Junction Compressor Station (MLBV-AK42)	670.2	Permanent
MLBV-AK43	688.8	Permanent
Beaver Creek Camp 18	700.3	Temporary
Beaver Creek Camp and Storage Alternate Storage Yard	701.5	Temporary
Beaver Creek Alternate Camp 18	701.5	Temporary
Northway Junction Storage Yard	702.8	Temporary
MLBV-AK44	705.1	Permanent
MLBV-AK45	716.9	Permanent
Seaton Storage Yard	731.9	Temporary
MLBV-AK46	735.6	Permanent

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.
[b] Temporary indicates needed during construction; permanent indicates needed during construction and operation.

Airstrips

APP will use existing airports and airfields, collectively termed airstrips, to transport personnel and freight to and from the Project area[12]. Table 1.3.3-2 lists the name and locations of potential airstrips that will be used during construction. APP does not expect the need to upgrade any existing commercial airports for the Project, but may need to make minor upgrades to some existing non-commercial airstrips. Temporary upgrades may include installation of buildings, fuel storage, secondary containment structures, and powered traffic controls. Section 1.4.3.2 summarizes the land requirements for airstrips associated with APP.

[12] The terms “Project area” and “Project footprint” are defined to include the project facilities and land requirements for construction and operation. The term “Project vicinity” is used to mean the area or region near or surrounding the Project area, and is subject to the context in which the term is used.

TABLE 1.3.3-2

Alaska Pipeline Project
Airstrips Associated with the Pipeline

Pipeline/Borough or Census Area/Airstrip Name	Approximate Corresponding Milepost [a]	Distance (miles) and Direction from Pipeline [b]
POINT THOMSON GAS TRANSMISSION PIPELINE		
North Slope Borough		
Badami Airstrip	22.5	0.3 S
Deadhorse Airstrip	53.5	5.6 SW
ALASKA MAINLINE		
North Slope Borough		
Deadhorse Airstrip [c]	10.1	4.6 NE
Franklin Bluffs Airstrip	43.7	0.4 SE
Happy Valley Airstrip	86.8	0.4 E
Galbraith Lake Airport [c]	144.4	1.1 SW
Yukon-Koyukuk Census Area		
Chandalar Airstrip [c]	177.9	34.1 SE
Dietrich Airport	208.5	0.2 W
Coldfoot Airstrip [c]	245.5	1.1 NW
Old Man Camp Airstrip [c]	310.0	1.3 NE
Five Mile Airport	355.1	0.2 NE
Livengood Airstrip [c]	404.9	0.3 SW
Fairbanks North Star Borough		
Fairbanks International Airport [c]	452.2	13.3 SW
Southeast Fairbanks Census Area		
Delta Junction Airstrip	546.7	0.7 SW
Tanacross Airstrip [c]	643.9	0.2 NE
Tok Airport [c]	656.7	1.3 SW
Tetlin Airstrip [c]	675.3	8.5 SW
Northway Airport [c]	702.8	6.3 SW
Anchorage Municipality		
Ted Stevens Anchorage International Airport [c]	550.1	241.1 SW
Merrill Field	550.1	239.0 SW
Valdez-Cordova Census Area		
Whittier Airport [c]	588.7	241.2 SW
Valdez Airport [c]	629.8	174.6 SW
Kenai Peninsula Borough		
Seward Airport	628.8	291.3 SW
Skagway-Hoonah-Angoon Census Area		
Skagway Airport [c]	745.1	287.4 SE
Municipality of Haines Borough		
Haines Airport [c]	745.1	295.9 SE
Juneau City and Borough		
Juneau International Airport [c]	745.1	366.0 SE

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.
[b] N - North, E - East, S - South, W - West.
[c] Airport under controlling authority of Alaska Department of Transportation and Public Facilities (commercial airport).

Construction Camps, Pipe Storage Areas, and Contractor Yards

Because construction will occur in areas of limited existing infrastructure, APP will, to the extent practicable, use existing disturbed sites for use as temporary camps, pipe storage areas, and contractor yards.

Table 1.3.3-3 lists the construction camp, pipe storage area, and contractor yard sites currently under evaluation by APP, including the approximate MP, distance, and direction from the pipeline, and whether or not the site has been previously used. Route maps included in Appendix 1A show the locations of these areas, or the distance and direction of these areas from the pipeline (if the site is not located within the map view). Section 1.4.3.2 summarizes the land requirements for construction camps, pipe storage areas, and contractor yards associated with the construction of APP.

TABLE 1.3.3-3

Alaska Pipeline Project
Locations Associated with the Pipeline: Construction Camps, Pipe Storage Areas, and Contractor Yards

Pipeline/Borough or Census Area/Facility Name	Approximate Milepost[a]	Distance (miles) and Direction from Pipeline[b]	Camp	Pipe Storage Area	Contractor Yard	Previous Use?
POINT THOMSON GAS TRANSMISSION PIPELINE						
North Slope Borough						
PTU Meter Station	0.0	0.0		✓		No
Point Thomson East Storage Yard	1.3	0.1 mile SE	✓	✓	✓	No
Point Thomson Central 1 Storage Yard	45.0	0.1 mile SW		✓	✓	No
Point Thomson Central 2 Storage Yard	45.5	0.1 mile SW		✓	✓	No
Point Thomson West Storage Yard	50.4	2.5 miles SW	✓	✓	✓	No
ALASKA MAINLINE						
North Slope Borough						
Alaska Mainline Meter Station (MLBV-AK1)	0.0	0.0		✓		No
Point Thomson West Storage Yard	3.1	6.4 miles SE		✓		No
Deadhorse Camp 1	12.8	4.0 miles NE	✓	✓	✓	No
Franklin Bluff Camp 2	44.3	0.2 mile E	✓	✓	✓	Yes
Happy Valley Compressor Station (MLBV-AK6)	79.6	0.0	✓		✓	No
Happy Valley Camp 3	87.0	0.1 mile W	✓	✓	✓	No
Happy Valley Storage Yard	88.1	0.1 mile E		✓		No
Galbraith Lake Storage Yard	144.3	1.4 miles SW		✓		No
Galbraith Lake Camp 4	145.7	2.1 miles SW	✓	✓	✓	Yes
Galbraith Lake Compressor Station (MLBV-AK10)	149.9	0.0	✓		✓	No
Atigun River Camp 5	168.7	0.1 mile E	✓		✓	Yes
Atigun River Storage Yard	169.0	0.1 mile W		✓		Yes
Chandalar Camp 6	177.8	0.3 mile NW	✓	✓	✓	Yes
Chandalar Shelf Storage Yard	179.9	0.2 mile SE		✓		No
Yukon-Koyukuk Census Area						
Dietrich Camp 7	210.1	0.5 mile E	✓	✓	✓	No
Dietrich Storage Yard	210.2	0.2 mile E		✓		No
Coldfoot Camp 8	244.3	0.2 mile W	✓	✓	✓	Yes
Chapman Creek Compressor Station (MLBV-AK16)	256.0	0.0	✓		✓	No
Prospect Creek Storage Yard	281.7	1.2 miles W		✓	✓	Yes
Kanuti River (Old Man) Camp 9	308.7	0.2 mile E	✓	✓	✓	Yes

TABLE 1.3.3-3

Alaska Pipeline Project
Locations Associated with the Pipeline: Construction Camps, Pipe Storage Areas, and Contractor Yards

Pipeline/Borough or Census Area/Facility Name	Approximate Milepost[a]	Distance (miles) and Direction from Pipeline[b]	Camp	Pipe Storage Area	Contractor Yard	Previous Use?
Dall River Storage Yard	329.8	0.7 mile SW		✓		[TBD]
Fort Hamlin Hills Compressor Station (MLBV-AK21)	338.0	0.0	✓		✓	No
Five Mile Camp 10	355.6	0.2 mile NE	✓	✓	✓	Yes
Five Mile Storage Yard	356.4	0.2 mile NE		✓		No
Hess Creek Storage Yard	387.5	0.1 mile W	✓	✓	✓	Yes
Livengood Camp 11	404.4	0.4 mile SW	✓	✓	✓	Yes
Tatalina River Compressor Station (MLBV-AK26)	419.1	0.0	✓		✓	No
Tatalina River Storage Yard	419.4	1.2 miles NE		✓		Yes
Fairbanks North Star Borough						
Treasure Creek Storage Yard	448.7	0.7 mile NE		✓		No
Little Chena Camp 12	469.0	0.2 mile W	✓	✓	✓	No
Fort Wainwright Storage Yard	470.4	9.9 miles SW		✓	✓	No
Johnson Road Compressor Station (MLBV-AK31)	494.0	0.0	✓		✓	No
Johnson Road Camp 13	495.3	0.4 mile SW	✓	✓	✓	No
Salcha River Storage Yard	503.7	0.1 mile S		✓		No
Southeast Fairbanks Census Area						
Rosa Creek Camp 14	521.5	0.2 mile SW	✓	✓	✓	No
Quartz Lake Storage Yard	532.8	0.1 mile SW		✓		No
Delta Junction Camp 15	549.1	0.3 mile SW	✓	✓	✓	No
Arrow Creek Storage Yard	563.8	0.4 mile SW		✓		Yes
George Lake Compressor Station (MLBV-AK36)	579.1	0.0	✓		✓	No
George Lake Camp 16	582.0	0.1 mile SW	✓	✓	✓	Yes
Sears Creek Storage Yard	593.3	0.1 mile N		✓		Yes
Cathedral Bluffs Alternate Storage Yard	625.7	0.1 miles SW		✓		Yes
Cathedral Bluffs Storage Yard	632.0	0.4 mile N		✓		Yes
Tok River Alternate	646.3	0.1 mile SE		✓		Yes
Tok Alternate Camp 17	647.1	0.2 mile SE	✓	✓	✓	No
Tok Camp 17	659.3	0.2 mile SW	✓	✓	✓	No
Tok River Storage Yard	662.2	0.1 mile N		✓		Yes
Tetlin Junction Compressor Station (MLBV-AK42)	670.2	0.0	✓		✓	No
Beaver Creek Camp 18	700.3	0.1 mile NE	✓	✓	✓	No
Beaver Creek Alternate Camp 18	701.5	0.1 mile SW	✓	✓	✓	No
Beaver Creek Camp and Storage Alternate	701.5	0.1 mile SW	✓	✓	✓	No
Northway Junction Storage Yard	702.8	0.6 mile W		✓		Yes
Seaton Storage Yard	731.9	0.3 mile W		✓		Yes

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.
[b] N - North, E - East, S - South, W - West.
TBD - To be determined

Temporary construction camps will be required in order to house workers during construction. Some camps will be relocated as the construction work progresses. The temporary construction camps will be self-contained, and operated and maintained throughout the pipeline and facilities construction period. In addition to housing facilities, the camps will typically be equipped with appropriate emergency medical facilities, electrical power generation, fuel storage, and facilities for sewage gathering or treatment, and waste incineration and management facilities.

The camps will house work crews, supervisors, inspectors, field management, and support staff. APP anticipates that the following types of camps will be used:

- Pioneer camps (50 to 125 personnel) will be used to support development of Project infrastructure, clearing, and isolated construction operations (e.g., major river crossings and borrow site locations). Generally, these camps will be located at sites planned for other uses such as pipeline and facility camps, pipe storage areas, contractor yards, and the pipeline construction right-of-way;
- Facility camps (75 to 150 personnel) will be used to support meter station and compressor station construction. Generally, these camps will be located at facility construction sites. Camps established for construction of compressor stations will be situated as near as possible to the station that crews will be constructing. These camps will likely consist of approximately 20 to 50 portable modules that may be moved from location to location during the course of construction; and
- Pipeline camps (750 to 1,600 personnel) will be used to support pipeline construction. These larger camps will generally be collocated with contractor yards and some of the pipe storage areas. Main pipeline camps will be fully self-sustaining, with fuel storage, power generation, water treatment, food preparation, first aid, and waste treatment facilities. Each new camp will consist of approximately 250 to 500 portable modules and may be moved from spread to spread up to three times during the course of construction. Depending on availability, potable water for the camps will be piped or trucked in or water wells may be drilled at the camp location. Water requirements for the Project are detailed in Section 2.3 of Resource Report 2.

Pipe storage areas will temporarily house the pipe to be installed. Pipe storage areas will be either standalone or collocated with camps and contractor yards.

Contractor yards will be used for construction staging, storing materials, equipment rig-up, setting up temporary construction trailers, fabrication work, safety and environmental training, equipment repair, and contract administration.

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

Compressor station sites will include permanent housing facilities for intermittent occupation; no other permanent housing facilities will be required for operation of the pipeline.

Borrow Sites

APP will require the use of borrow material (e.g., sand, gravel, and stone) for several Project activities. This will include base material for compressor station sites, campsites, pipe storage

areas, contractor yards, access roads, select backfill and padding material, right-of-way preparation, some MLBVs, some airstrips, and some helicopter pads. The borrow material required for these facilities will be obtained from borrow sites that are either existing or will be developed by APP.

Borrow sites may also be used during construction for concrete production, temporary laydown, equipment staging, etc. Appendix 1G lists the locations of the borrow sites associated with APP. Section 1.4.3.2 summarizes the land requirements for borrow sites.

After construction, APP-controlled borrow sites will either be used for other projects such as for road construction administered by the Alaska Department of Transportation and Public Facilities, or abandoned in accordance with land use agreements.

1.4 LAND REQUIREMENTS

Table 1.4-1 summarizes the land requirements for APP including the pipeline construction and operation rights-of-way, Aboveground Facility sites including the GTP, ATWS, access roads, helipads, airstrips, construction camps, pipe storage and contractor yards, borrow sites, and dock modifications. A detailed description and breakdown of land requirements required for the Project and land uses is presented in Resource Report 8.

TABLE 1.4-1

Alaska Pipeline Project
Summary of Land Requirements and Impacts

Facility	Approximate Milepost(s) [a]	Land Affected During Construction (acres)	Land Affected During Operation (acres)
PIPELINE RIGHT-OF-WAY			
PT Pipeline [b]	0 to 58.4	1,395.9	707.9
PT Pipeline SUBTOTAL		1,395.9	707.9
Alaska Mainline [b]			
North Slope Borough	0 to 185.2	3,858.5	2,244.8
Yukon–Koyukuk Census Area	185.2 to 430.2	5,395.5	2,969.7
Fairbanks North Star Borough	430.2 to 518.2	1,898.1	1,066.7
Southeast Fairbanks Census Area	518.2 to 745.1	5,061.2	2,750.3
ALASKA MAINLINE SUBTOTAL		16,213.3	9,031.5
PIPELINE RIGHTS-OF-WAY SUBTOTAL		17,609.2	9,739.4
ABOVEGROUND FACILITIES			
GTP – Operations and Process Area [c]	AMP 0.0	170.0	170.0
GTP – Flare Area [d]	AMP 0.0	65.0	65.0
Pipeline Aboveground Facilities			
Compressor Stations	see Table 1.3.2-1	200	200
Meter Stations	see Table 1.3.2-1	0.0 [e]	0.0 [e]
Mainline Block Valves	see Table 1.3.2-1	0.0 [e]	0.0 [e]
Launchers/Receivers	see Table 1.3.2-1	0.0 [e]	0.0 [e]
Intermediate Gas Delivery Points	see Table 1.3.2-1	0.0 [e]	0.0 [e]
ABOVEGROUND FACILITIES SUBTOTAL		435.0	435.0
ASSOCIATED INFRASTRUCTURE			
GTP			

TABLE 1.4-1

Alaska Pipeline Project
Summary of Land Requirements and Impacts

Facility	Approximate Milepost(s) [a]	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Module Staging Area	N/A	25.0	25.0
Access Roads [f]	N/A	115.0	56.0
Construction Camp	N/A	0.0 [e]	0.0 [e]
Borrow Site	N/A	[TBD]	[TBD]
West Dock Modifications [g]	N/A	15.0	15.0
Channel Dredging and Dredge Disposal	N/A	465.0	0.0
Water Reservoir and Pump pads	N/A	112.0	112.0
GTP INFRASTRUCTURE SUBTOTAL		732.0	208.0
Pipeline Facilities			
Access Roads	Various (see Appendix 1F)	2,218.4	33.9
Helipads	Various	0.0 [e]	0.0 [e]
Airstrips	see Table 1.4.3-4	[TBD]	0.0
Construction Camps, Pipe Storage Areas, and Contractor Yards	see Table 1.4.3-5	1,797 [e]	0.0
Borrow Sites	Various (see Appendix 1G)	10,700	0.0
PIPELINE INFRASTRUCTURE SUBTOTAL		12,918.4	33.9
PROJECT TOTAL		**31,694.6** [h]	**10,450.2**

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.
[b] Construction acreage is based on an estimate of required level construction right-of-way width, plus additional amounts for cut and fill areas on slopes plus ATWS requirements at site-specific locations as identified in Appendix 1D. Operation acreage is based on a 100-foot-wide permanent pipeline right-of-way.
[c] GTP site only. Includes construction camp and operational housing.
[d] GTP flare area includes a 15-acre pad for the flare surrounded by a 50-acre exclusion area.
[e] Acreage used for the construction and operation of a facility is 0.0 when it occurs within the construction or operation footprint of another facility or the construction or permanent right-of-way for the pipeline. Additional acreage is noted if the facility is placed outside of these areas.
[f] Includes new roads (North Road and South Road), existing haul road widening, causeway road widening, water transfer and pump roads, and temporary ice roads.
[g] Dock modifications include dock expansion area only.
[h] Excludes GTP borrow site, channel dredging and disposal, and airstrip land requirements. [Note: This information will be updated in the final report.]

1.4.1 PIPELINE FACILITIES

Workspace associated with the construction and installation of pipelines requires careful planning to provide sufficient space and proper configuration to allow a safe work environment while satisfying regulatory obligations. APP is planning to use a nominal 145- to 175-foot-wide construction right-of-way for the majority of the pipeline route, as shown in Appendix 1E and Table 1.4.1-1, with 100 feet retained as permanent right-of-way during operation of the new facilities. Wider or narrower rights-of-way may be needed in certain circumstances as described

in these resource reports and as depicted on the Project alignment sheets (refer to Appendix 1O).

During construction, APP will adopt one of the nominal right-of-way configurations listed in Table 1.4.1-1. The nominal widths are based on level terrain. The rationale for right-of-way widths is provided in Appendix 1H and includes a detailed discussion of the construction right-of-way workspace breakdown (e.g., spoil storage, trench line area, and work area to accommodate equipment movement). In general, the construction right-of-way width will vary depending on the conditions along the pipeline route and construction season. Other factors influencing the construction workspace requirements include proximity to permanent access roads, cross and longitudinal slopes, bedrock, soils, ice, wetlands, and construction traffic volume on the right-of-way. Typical drawings in Appendix 1H illustrate APP's typical right-of-way cross sections along the route.

TABLE 1.4.1-1

Alaska Pipeline Project
Typical Construction Right-of-Way Configurations

Construction Area	Construction Season	Nominal Construction Right-of-Way Width (feet)	Right-of-Way Preparation
PT Pipeline	Winter	145	Ice pad
Alaska Mainline Pipeline			
North Slope[a]	Winter	145	Ice pad or built-up work pad
South of Brooks Range	Winter	160[b]	Conventional or cut and fill
South of Brooks Range	Summer	175	Conventional[c]

[a] North Slope refers to north of the Brooks Range.
[b] Width can vary depending on sloping terrain. Refer to Appendix 1I for further detail.
[c] Conventional with loose surface material/topsoil removal if required on agricultural lands.

Appendix 1I summarizes the construction right-of-way's widths by MP. For the portion of the PT Pipeline and Alaska Mainline paralleling existing utility rights-of-way, refer to Tables 1.3.1-2 and 1.3.1-3.

1.4.2 ABOVEGROUND FACILITIES

1.4.2.1 Gas Treatment Plant

Construction and operation of the GTP site will require approximately 170 acres of land. This will include the areas needed for the temporary construction camp and for operational housing. In addition, the GTP flare area will require 65 acres of land adjacent to the GTP site. The required aggregate fill for construction and operation of the GTP site is estimated to be 2,240,000 cubic yards, and is estimated to be 160,000 cubic yards for the GTP flare pad. Section 1.6.4.1 summarizes how construction of the GTP site will be completed.

1.4.2.2 Pipeline Aboveground Facilities

Compressor Stations

Construction of a typical compressor station will require clearing an area measuring approximately 1,025 feet by 1,050 feet, for a total of approximately 25 acres of land. A typical compressor station plot plan is included in Appendix 1B. Section 1.6.4.2 summarizes construction of a compressor station site.

Custody Transfer Meter Stations

Construction of the PTU Meter Station is expected to occur within the boundaries of the PTU, and construction of the Prudhoe Bay and Alaska Mainline Meter Stations will occur within the boundaries of the GTP. The PTU Meter Station site will consist of a 250-foot by 360-foot pad and the Prudhoe Bay and Alaska Mainline meter Stations will be part of the GTP pad. The land required for the construction and operation of these meter stations will be located within their respective larger facility sites. Therefore, no additional land use impacts will occur beyond those already associated with the larger facilities. A typical meter station plot plan is included in Appendix 1B. Section 1.6.4.3 summarizes construction of a meter station site.

Mainline Block Valves

Construction and operation of MLBVs will occur within the pipeline right-of-way or a compressor or meter station site. Therefore, no additional land use impacts will occur beyond those already associated with these facilities. A typical MLBV plot plan is included in Appendix 1B. Section 1.6.4.4 summarizes construction of a MLBV site.

Launchers and Receivers

Construction and operation of launchers and receivers will occur within an Aboveground Facility site (e.g., GTP). Therefore, no additional land use impacts will occur beyond those already associated with these facilities. A typical launcher/receiver is shown on the typical plot plan for the compressor stations and meter stations included in Appendix 1B. Section 1.6.4.4 summarizes construction of a launcher or receiver site.

Intermediate Gas Delivery Points

Construction of provisions for an intermediate sales gas delivery will occur within the pipeline right-of-way. Therefore, no additional land use impacts will occur beyond those already associated with these facilities.

Cathodic Protection Facilities

The land required for cathodic protection facilities (i.e., vertical groundbeds and rectifiers) will generally be included within the pipeline right-of-way or a compressor station, meter station, or MLBV site. In these cases, no additional land use impacts will occur beyond those already associated with these facilities. Test lead posts will also be located along the permanent right-of-way. In some cases because of soils considerations, horizontal ground beds may be required. [Note: The locations where horizontal ground beds may be required are undetermined and additional land needs will be updated in the final report or supplemental filings as necessary.]

1.4.3 ASSOCIATED INFRASTRUCTURE

1.4.3.1 Gas Treatment Plant

The Associated Infrastructure needed to construct and operate the GTP will include a module staging area, access roads, construction camp, borrow sites, West Dock modifications, water reservoir, pumping pad, and water transfer line. The land requirements and gravel fill requirements associated with these facilities are described below and are summarized in Table 1.4.3-1.

TABLE 1.4.3-1

Alaska Pipeline Project
Land Requirements for Gas Treatment Plant Associated Infrastructure

Item	Length (miles)	Estimated Gravel Fill (or Excavation) Volume (cubic yards)	Land Impact (acres)	
			Construction	Operation
Module Staging Area	N/A	300,000	25	25
Access Roads				
IR 1 (Put-23 Mine to GTP)	1.6	N/A	10	0
IR 2 (Water Reservoir to GTP)	3.0	N/A	18	0
IR 3 (Putuligayuk River Pump to Water Reservoir)	0.3	N/A	2	0
IR 4 (Water transfer line construction)	4.0	N/A	24	0
IR 5 (CGF feed line construction)	0.9	N/A	5	0
Existing Causeway Road Widening	0.8	53,000	2	2
Existing Road Widening	4.1	183,000	15	15
New North Road	1.8	265,000	21	21
New South Road	1.7	246,000	12	12
New Putuligayuk River Pump Access Road	0.3	24,000	2	2
New Water Reservoir Road	0.5	42,000	4	4
Access Roads Subtotal		813,000	115	56
Construction Camp	N/A	N/A	0 [a]	0 [a]
West Dock Modifications				
DH-2 Expansion	N/A	375,000	15	15
Channel Dredging	N/A	(2,500,000)	180[b]	0
Dredge Disposal	N/A	2,500,000	285[b]	0
West Dock Modifications Subtotal		375,000	325	15
Water Reservoir	N/A	(406,000)	110	110
Reservoir Pump Pad	N/A	3,000	1	1
Putuligayuk River Pump Pad	N/A	2,600	1	1
Borrow site (Put-23 Mine)	N/A	3,894,000	[TBD]	[TBD]
TOTAL		**2,400,000** [c]	**732**	**208**

[a] Facility is located within the footprint for the GTP site.
[b] Assumes dredging/maintenance dredging, as needed to maintain 14-foot depth during construction.
[c] The remaining excavated material will be utilized to construct the GTP and flare pads (refer to Section 1.4.2-1).
N/A - Not Applicable

Module Staging Area

The module staging area will require fill for the site to be developed and it will be maintained throughout operation of the GTP facility. The land requirements for the module staging area are summarized in Table 1.4.3-1 and the location is depicted in figures provided in Appendix 1B.

Access Roads

As described in Section 1.3.3.1, APP plans to install five ice roads; use two existing, to-be-modified, roads; and construct four new roads to access the GTP site from West Dock and to develop and operate other GTP facilities. The ice roads will typically be 50 feet wide and will be used during construction of the GTP facilities.

The existing causeway road from DH2 to the existing staging area will be widened by approximately 20 feet (to 100 feet wide) to address operational and safety issues. In addition, the existing haul road between the new module staging area and the GTP will be widened by approximately 25 feet (to a total width of at least 70 feet) to accommodate the width of the GTP modules. The road curves will also be widened to accommodate the length of the transport trailers during sweeping turns and the existing road grade will be reduced so that the trailers can safely move the large loads over flat grades.

The new North Access Road will be at least 70 feet wide to facilitate transport of the large modules to the GTP site. The new South Access Road, Putuligayuk River Pump Access Road, and Reservoir Access Road will each be approximately 35 feet wide.

The temporary and permanent land requirements for access roads are summarized in Table 1.4.3-1 and the road locations are depicted in figures provided in Appendix 1B.

Construction Camp

As described in Section 1.3.3.1, APP will construct temporary housing for workers involved in the construction of the GTP. The camp will be located within the area dedicated for the GTP site. Therefore, no additional land use impacts will occur beyond those already associated with this facility.

Borrow Sites

As described in Section 1.3.3.1, the sand and gravel required for construction of the GTP and Associated Infrastructure will be obtained from within the 349-acre Alaska Department of Natural Resources-managed Put-23 mine site, the 110-acre water reservoir site, and other existing borrow sites, as available.

West Dock Modifications

The modifications to the dock facilities described in Section 1.3.3.1 will require gravel fill to increase the dock footprint, dredging to establish and maintain a barge channel, and dredge material disposal. Land impacts for the dock modifications, including the modifications to DH2, dredging, and dredge disposal areas are summarized in Table 1.4.3-1. Figures depicting the location for these planned modifications are provided in Appendix 1B.

Water Reservoir, Pump Pad, and Transfer Line

APP's water reservoir for operation of the GTP will require land for the reservoir and pump pads for construction and operation. Table 1.4.3-1 summarizes the land requirements associated with the water reservoir, pump pads, and water transfer line. Figures depicting the location of these facilities are provided in Appendix 1B.

1.4.3.2 Pipeline Facilities

Additional Temporary Workspaces

Table 1.4.3-2 lists the typical sizes of ATWS that will be used for APP. Each individual location requiring ATWS will be assessed and sized appropriately to account for terrain, soil conditions, site configuration, site-specific construction method, and construction seasonality. Therefore, the exact dimensions of each ATWS may vary from those presented in Table 1.4.3-2. Typical ATWS that will be required for feature crossings are shown on typical drawings provided in Appendix 1E.

TABLE 1.4.3-2

Alaska Pipeline Project
Typical Additional Temporary Workspace Dimensions Associated with the Pipeline

Segment/ Additional Temporary Workspace Location	Length (feet)	Width (feet)	Location	Number of Workspaces Needed at Each Location
POINT THOMSON GAS TRANSMISSION PIPELINE				
Waterbody Crossing				
1) Minor: Up to 20 feet wide (Winter)	160	35	Upstream/Workside	1
	160	35	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	110	40	Downstream/Spoilside	1
2) Intermediate: Up to 80 feet wide (Winter)	300	40	Upstream/Workside	1
	300	40	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	110	40	Downstream/Spoilside	1
3) Major: Up to 150 feet wide (Winter)	400	50	Upstream/Workside	1
	400	50	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	425	90	Downstream/Spoilside	1
Road Crossing				
Primary-Secondary Road (Winter)	290	50	Upstream/Workside	1
	290	50	Downstream/Workside	1
	100	50	Upstream/Spoilside	1
	100	50	Downstream/Spoilside	1
Winter Trails, Trails, Access Roads, Unknown (Winter)	80	35	Upstream/Workside	1
	360	35	Downstream/Workside	1
	80	35	Upstream/Spoilside	1
	80	35	Downstream/Spoilside	1
Existing Utility Crossings (Third-Party Pipeline)	160	20	Downstream/Workside	1
	80	35	Upstream/Spoilside	1
	80	35	Downstream/Spoilside	1
Stringing Truck Turnaround Site	200	80	Workside	1
Beginning or End of Construction Spreads	600	250	Workside	1
Horizontal Bends				

TABLE 1.4.3-2

Alaska Pipeline Project
Typical Additional Temporary Workspace Dimensions Associated with the Pipeline

Segment/ Additional Temporary Workspace Location	Length (feet)	Width (feet)	Location	Number of Workspaces Needed at Each Location
Left				
2° - 12°	320	35	Spoilside	1
12° - 20°	210	35	Spoilside	1
20° - 30°	200	35	Spoilside	1
30° - 40°	190	35	Spoilside	1
40° - 50°	180	35	Spoilside	1
50° - 60°	160	35	Spoilside	1
60° - 70°	150	35	Spoilside	1
70° - 80°	140	35	Spoilside	1
80° - 90°	120	35	Spoilside	1
Right				
2° - 12°	340	35	Spoilside	1
12° - 20°	240	35	Spoilside	1
20° - 30°	250	35	Spoilside	1
30° - 40°	260	35	Spoilside	1
40° - 50°	280	35	Spoilside	1
50° - 60°	290	35	Spoilside	1
60° - 70°	300	35	Spoilside	1
70° - 80°	320	35	Spoilside	1
80° - 90°	340	35	Spoilside	1
ALASKA MAINLINE				
Waterbody Crossings				
1) Minor: Up to 20 feet wide (Summer and Winter)	160	35	Upstream/Workside	1
	160	35	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	110	40	Downstream/Spoilside	1
2) Intermediate: Up to 80 feet wide				
a) Summer	300	50	Upstream/Workside	1
	300	50	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	110	40	Downstream/Spoilside	1
b) Winter	300	40	Upstream/Workside	1
	300	40	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	110	40	Downstream/Spoilside	1
3) Major: Up to 150 feet wide				
a) Summer	400	50	Upstream/Workside	1
	400	50	Downstream/Workside	1

TABLE 1.4.3-2

Alaska Pipeline Project
Typical Additional Temporary Workspace Dimensions Associated with the Pipeline

Segment/ Additional Temporary Workspace Location	Length (feet)	Width (feet)	Location	Number of Workspaces Needed at Each Location
	200	50	Upstream/Spoilside	1
	500	90	Downstream/Spoilside	1
b) Winter	400	50	Upstream/Workside	1
	400	50	Downstream/Workside	1
	110	40	Upstream/Spoilside	1
	425	90	Downstream/Spoilside	1
Horizontal Directional Drill (HDD) entry and exit points	200	200		5
HDD pipeline drag section false right-of-way	length of crossing [a]	100		
Road Crossing				
Highways (Summer and Winter)	180	50	Upstream/Workside	1
	500	50	Downstream/Workside	1
	180	50	Upstream/Spoilside	1
	350	50	Downstream/Spoilside	1
Primary-Secondary Road (Summer and Winter)	290	50	Upstream/Workside	1
	290	50	Downstream/Workside	1
	100	50	Upstream/Spoilside	1
	100	50	Downstream/Spoilside	1
Winter Trails, Trails, Access Roads, Unknown (Summer and Winter)	80	35	Upstream/Workside	1
	360	35	Downstream/Workside	1
	80	35	Upstream/Spoilside	1
	80	35	Downstream/Spoilside	1
TAPS Crossing				
a) State Land Buried	320	15	Downstream/Workside	1
a) State Land Aerial	160	10	Downstream/Workside	1
	160	10	Upstream/Spoilside	1
	160	10	Downstream/Spoilside	1
c) Federal Land Buried	160	15	Downstream/Workside	1
c) Federal Land Aerial	160	10	Downstream/Workside	1
	160	10	Upstream/Spoilside	1
	160	10	Downstream/Spoilside	1
Existing Utility Crossings (Third-party Pipeline)	160	20	Downstream/Workside	1
	80	35	Upstream/Spoilside	1
	80	35	Downstream/Spoilside	1
Stringing Truck Turnaround Site	200	80	Workside	1
Steep Side Slope	length of slope [a]	65		
Beginning or End of Construction Spread	600	250	Workside	1

TABLE 1.4.3-2

Alaska Pipeline Project
Typical Additional Temporary Workspace Dimensions Associated with the Pipeline

Segment/ Additional Temporary Workspace Location	Length (feet)	Width (feet)	Location	Number of Workspaces Needed at Each Location
Timber Decks	150	65	Workside	1
Horizontal Bends				
Left				
2° - 12°	320	35	Spoilside	1
12° - 20°	210	35	Spoilside	1
20° - 30°	200	35	Spoilside	1
30° - 40°	190	35	Spoilside	1
40° - 50°	180	35	Spoilside	1
50° - 60°	160	35	Spoilside	1
60° - 70°	150	35	Spoilside	1
70° - 80°	140	35	Spoilside	1
80° - 90°	120	35	Spoilside	1
Right				
2° - 12°	340	35	Spoilside	1
12° - 20°	240	35	Spoilside	1
20° - 30°	250	35	Spoilside	1
30° - 40°	260	35	Spoilside	1
40° - 50°	280	35	Spoilside	1
50° - 60°	290	35	Spoilside	1
60° - 70°	300	35	Spoilside	1
70° - 80°	320	35	Spoilside	1
80° - 90°	340	35	Spoilside	1

[a] Dependent on crossing length of feature.
Third-party pipeline - existing pipeline not operated by APP.

ATWS will be set back approximately 50 feet from the edges of waterbodies, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land or where topographic or other factors impose setback constraints. APP's actual breakdown of ATWS adjacent to the construction right-of-way (e.g., spoil storage areas, equipment travel lanes) will vary depending on site-specific conditions. The specific locations and acreages of ATWS needed for the Project are tabulated in Appendix 1D and depicted on the Project alignment sheets included as Appendix 1O to this filing.

Access Roads

Table 1.4-1 summarizes the construction and operational land impacts associated with modifying existing roads or construction and operation of new permanent access roads for the GTP and Pipeline Facilities. Table 1.4.3-3 summarizes the access road impacts for Pipeline Facilities by borough. Appendix 1F provides a detailed listing of pipeline access road and acreage impacts. Figures in Appendix 1E include typical access roads that will be used in association with APP.

TABLE 1.4.3-3

Alaska Pipeline Project
Summary of Land Requirements from Modified and New Access Roads Associated with Pipeline Facilities

Segment/Borough or Census Area/Road Name	Milepost [a] Begin	Milepost [a] End	Road Type/Status	Land Affected During Construction (acres)	Land Affected During Operation (acres)
POINT THOMSON GAS TRANSMISSION PIPELINE					
North Slope Borough	0	58.4	Various	331.4	0.0
ALASKA MAINLINE					
North Slope Borough	0	185.2	Various	467.3	1.3
Yukon–Koyukuk Census Area	185.2	430.2	Various	330.5	7.7
Fairbanks North Star Borough	430.2	518.2	Various	749.9	20.9
Southeast Fairbanks Census Area	518.2	745.1	Various	339.3	4.0
Alaska Mainline Subtotal				1,898.8	34.1
TOTAL				**2,218.4**	**33.9**

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.

Helipads

Each helipad will be constructed of borrow material with approximate dimensions of 100 feet long by 100 feet wide. All affected land will be within the permanent operations right-of-way of the pipeline or a compressor station or campsite. Some land use impacts will occur at the remote MLBV sites during operations, to the extent that brush control will occur to allow safe helicopter approaches, landings, and take-offs. Helipad locations are identified in Section 1.3.3.2. Appendix 1E includes a typical drawing of a helipad.

Airstrips

APP does not expect the need to upgrade any existing commercial airports for the Project, but may need to make minor upgrades to some existing non-commercial airstrips, as summarized in Table 1.4.3-4. [Note: APP is evaluating airstrip requirements and will provide an update of this information in the final report.]

TABLE 1.4.3-4

Alaska Pipeline Project
Land Requirements for Airstrips Used by the Alaska Pipeline Project

Pipeline/Borough or Census Area Location	Airstrip Name	Approximate Milepost [a]	Land Affected during Construction (acres) [b]	Land Affected during Operation (acres)
POINT THOMSON GAS TRANSMISSION PIPELINE				
North Slope Borough	Badami Airstrip	22.5	TBD	0
North Slope Borough	Deadhorse Airstrip	53.5	TBD	0
ALASKA MAINLINE				
North Slope Borough	Deadhorse Airstrip	10.1	TBD	0
North Slope Borough	Franklin Bluffs Airstrip	43.7	TBD	0
North Slope Borough	Happy Valley Airstrip	86.8	TBD	0
North Slope Borough	Galbraith Lake Airport	144.4	TBD	0
Yukon-Koyukuk Census Area	Chandalar Airstrip	177.9	TBD	0
Yukon-Koyukuk Census Area	Dietrich Airport	208.5	TBD	0
Yukon-Koyukuk Census Area	Coldfoot Airstrip	245.5	TBD	0
Yukon-Koyukuk Census Area	Old Man Camp Airstrip	310.0	TBD	0
Yukon-Koyukuk Census Area	Five Mile Airport	355.1	TBD	0
Yukon-Koyukuk Census Area	Livengood Airstrip	404.9	TBD	0
Fairbanks North Star Borough	Fairbanks International Airport	452.2	TBD	0
Southeast Fairbanks Census Area	Delta Junction Airstrip	546.7	TBD	0
Southeast Fairbanks Census Area	Tanacross Airstrip	643.9	TBD	0
Southeast Fairbanks Census Area	Tok Airport	656.7	TBD	0
Southeast Fairbanks Census Area	Tetlin Airstrip	675.3	TBD	0
Southeast Fairbanks Census Area	Northway Airport	702.8	TBD	0
Anchorage Municipality	Ted Stevens Anchorage International Airport	550.1	TBD	0
Anchorage Municipality	Merrill Field	550.1	TBD	0
Valdez-Cordova Census Area	Whittier Airport	588.7	TBD	0
Valdez-Cordova Census Area	Valdez Airport	629.8	TBD	0
Kenai Peninsula Borough	Seward Airport	628.8	TBD	0
Skagway-Hoonah-Angoon Census Area	Skagway Airport	745.1	TBD	0
Municipality of Haines Borough	Haines Airport	745.1	TBD	0
Juneau City and Borough	Juneau International Airport	745.1	TBD	0

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.

Construction Camps, Pipe Storage Areas, and Contractor Yards

As discussed in Section 1.3.3.2, APP will construct temporary camps, pipe storage areas, and contractor yards at various locations to support construction of APP. Table 1.4.3-5 lists the land requirements and impacts associated with temporary camps, pipe storage areas, and contractor yards required for APP. These will, to the extent practicable, be located at previously disturbed sites, and many of these sites will be used as temporary storage and staging areas during operations and maintenance activities. [Note: Appendix 1E of the final report will be updated as necessary with typical drawings of the construction camp, pipe storage area, and contractor yard layouts.]

TABLE 1.4.3-5

Alaska Pipeline Project
Land Requirements and Impacts at Construction Camps, Pipe Storage Areas, and Contractor Yards Associated with the Pipeline

Segment/Borough or Census Area/Facility Name	Milepost [a]	Distance (miles) and Direction from Pipeline	Land Affected During Construction (acres)	Land Affected During Operation (acres)
POINT THOMSON GAS TRANSMISSION PIPELINE				
North Slope Borough				
PTU Meter Station	0.0	0.0	0 [b]	TBD [b]
Point Thomson East Storage Yard	1.3	0.1 mile SE	70	TBD
Point Thomson Central 1 Storage Yard	45.0	0.1 mile SW	52	TBD
Point Thomson Central 2 Storage Yard	45.5	0.1 mile SW	72	TBD
Point Thomson West Storage Yard	50.4	2.5 miles SW	131	TBD
Subtotal PT Pipeline			325	
ALASKA MAINLINE				
North Slope Borough				
Alaska Mainline Meter Station (MLBV-AK1)	0.0	0.0	0 [b]	TBD [b]
Prudhoe Bay Storage Yard	3.1	6.4 miles SE	0 [b]	TBD
Deadhorse Camp 1	12.8	4.0 miles NE	49	TBD
Franklin Bluff Camp 2	44.3	0.2 mile E	49	TBD
Happy Valley Compressor Station (MLBV-AK6)	79.6	0.0	0 [b]	TBD
Happy Valley Camp 3	87.0	0.1 miles W	49	TBD
Happy Valley Storage Yard	88.0	0.1 miles E	29	TBD
Galbraith Lake Storage Yard	144.3	1.4 miles SW	49	TBD
Galbraith Lake Camp 4	145.7	2.1 miles SW	49	TBD
Galbraith Lake Compressor Station (MLBV-AK10)	149.9	0.0	0 [b]	TBD
Atigun River Camp 5	168.7	0.1 mile E	22	TBD
Atigun River Storage Yard	169.0	0.1 mile W	12	TBD
Chandalar Camp 6	177.8	0.3 mile NW	35	TBD
Chandalar Shelf Storage Yard	179.9	0.2 mile SE	19	TBD
Subtotal North Slope Borough			362	
Yukon-Koyukuk Census Area				
Dietrich Camp 7	210.1	0.5 mile E	49	TBD
Dietrich Storage Yard	210.2	0.2 mile E	19	TBD

TABLE 1.4.3-5

Alaska Pipeline Project
Land Requirements and Impacts at Construction Camps, Pipe Storage Areas, and Contractor Yards Associated with the Pipeline

Segment/Borough or Census Area/Facility Name	Milepost [a]	Distance (miles) and Direction from Pipeline	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Coldfoot Camp 8	244.3	0.2 mile W	49	TBD
Chapman Creek Compressor Station (MLBV-AK16)	256.0	0.0	0 [b]	TBD
Prospect Creek Storage Yard	281.7	1.2 mile W	36	TBD
Kanuti River (Old Man) Camp 9	308.7	0.2 mile E	49	TBD
Dall River Storage Yard	329.8	0.7 mile SW	19	TBD
Fort Hamlin Hills Compressor Station (MLBV-AK21)	338.0	0.0	0 [b]	TBD
Five Mile Camp 10	355.6	0.2 mile NE	39	TBD
Five Mile Storage Yard	356.4	0.2 mile NE	19	TBD
Hess Creek Storage Yard	387.5	0.1 mile W	38	TBD
Livengood Camp 11	404.4	0.4 mile SW	49	TBD
Tatalina River Compressor Station (MLBV-AK26)	419.1	0.0		TBD
Tatalina River Storage Yard	419.4	1.2 miles NE	19	TBD
Subtotal Yukon-Koyukuk Census Area			385	
Fairbanks North Star Borough				
Treasure Creek Storage Yard	448.7	0.7 mile NE	19	TBD
Little Chena Camp 12	469.0	0.2 mile W	49	TBD
Fort Wainwright Storage Yard	470.4	9.9 miles SW	89	TBD
Johnson Road Compressor Station (MLBV- AK31)	494.0	0.0	0 [b]	TBD
Johnson Road Camp 13	495.3	0.4 mile SW	49	TBD
Salcha River Storage Yard	503.7	0.1 mile S	19	TBD
Subtotal Fairbanks North Star Borough			225	
Southeast Fairbanks Census Area				
Rosa Creek Camp 14	521.5	0.2 mile SW	49	TBD
Quartz Lake Storage Yard	532.8	0.1 mile SW	19	TBD
Delta Junction Camp 15	549.1	0.3 mile SW	49	TBD
Arrow Creek Storage Yard	563.8	0.4 mile SW	19	TBD
George Lake Compressor Station (MLBV-AK36)	579.1	0.0	0 [b]	TBD
George Lake Camp 16	582.0	0.1 mile SW	49	TBD
Sears Creek Storage Yard	593.3	0.1 mile N	15	TBD
Cathedral Bluffs Alternate Storage Yard	625.7	0.1 mile SW	20	TBD
Cathedral Bluffs Storage Yard	632.0	0.4 mile N	19	TBD
Tok River Alternate Storage Yard	646.3	0.1 mile SE	20	TBD
Tok Alternate Camp 17	647.1	0.2 mile SE	49	TBD
Tok Camp 17	659.3	0.2 mile SW	49	TBD
Tok River Storage Yard	662.2	0.1 mile N	19	TBD
Tetlin Junction Compressor Station (MLBV-AK42)	670.2	0.0	0 [b]	TBD

TABLE 1.4.3-5

Alaska Pipeline Project
Land Requirements and Impacts at Construction Camps, Pipe Storage Areas, and Contractor Yards Associated with the Pipeline

Segment/Borough or Census Area/Facility Name	Milepost [a]	Distance (miles) and Direction from Pipeline	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Beaver Creek Camp 18	700.3	0.1 mile NE	49	TBD
Beaver Creek Alternate Camp 18	701.5	0.1 mile SW	37	TBD
Beaver Creek Camp and Storage Alternate	701.5	0.1 mile SW	0 [b]	TBD
Northway Junction Storage Yard	702.8	0.6 mile W	19	TBD
Seaton Storage Yard	731.9	0.3 mile W	19	TBD
Subtotal Southeast Fairbanks Census Area			500	TBD
Alaska Mainline Subtotal			1,472.0	TBD
Project Total			**1,797.0**	TBD

[a] PT Pipeline milepost 0.0 starts at the PTU; Alaska Mainline milepost 0.0 starts at the GTP.

[b] Acreage used for the construction and operation of Aboveground Facilities is 0.0 when it occurs within the construction or operation footprint of another facility or the construction or permanent right-of-way for the pipeline (e.g., acreage for camps, storage areas, or yards associated with compressor stations are tabulated as part of the compressor station acreage in Section 1.4.2.2). Additional acreage is noted if the Aboveground Facility is placed outside of these areas.

Borrow Sites

Table 1.4-1 summarizes the total land requirements associated with construction and operation of borrow sites, and Appendix 1G identifies the borrow site locations and approximate acreage for each individual site that may be used. After construction, borrow sites are planned to be reclaimed or left as is, per land use agreements.

1.5 CONSTRUCTION SCHEDULE

Figure 1.5-1 summarizes APP's preliminary construction schedule. The final Project schedule will be influenced by commercial, business, and other factors, and thus the timing for specific Project activities, including commencement of construction and operations (start-up), may extend beyond the dates shown in this preliminary Project schedule. Also, for clarification, the preliminary Project schedule shown in Figure 1.5-1 includes an allowance of one year for schedule contingency. This contingency reflects the current early state of Project definition and reflects inherent uncertainties (unknowns) that will likely impact the Project schedule.

1.5.1 GAS TREATMENT PLANT CONSTRUCTION

GTP site preparation will commence after property rights acquisition, completion of required studies (e.g., dredging sampling plan), receipt of the required permits and authorizations, and will generally proceed as follows:

- Materials/Equipment Procurement and Fabrication: Infrastructure construction activities, including establishing borrow sources, excavating the water reservoir, stockpiling granular material, and constructing contractor yards, material storage sites, dock modifications, and access roads, are currently planned to start in the winter of 2014/2015 (refer to Figure 1.5-1). The majority of this work will be associated with

preparation of granular material, site clearing, preparing rough grade, and constructing gravel pads, access, and ice roads to support the Aboveground Facility construction efforts;

- Sealift and Modules: Preparation of the GTP site is anticipated to start in 2014 with other infrastructure construction. Modules are planned for maximum completion at the fabrication sites in order to reduce the time required for facility installation on the North Slope. Three consecutive summer sealift seasons and corresponding construction periods are planned to stay within the proven capacity of the module fabrication yards. Sealifts 1, 2, and 3 will arrive on the ANS during 2017, 2018, and 2019, respectively. As installation of the modules is completed each year, the facilities are planned to be released to the facility operations team for commissioning and startup.
- Dock and Dredging: Initial dredging is anticipated to require approximately 45 days of nearshore open water at Prudhoe Bay and is planned to be performed during the summer or winter of 2016 prior to Sealift 1. Prior to all sealifts (or at first open water at Prudhoe Bay) in 2017, 2018, and 2019, maintenance dredging/screeding[13] will be performed as required to return the channel to specification width and depth.

[13] Screeding involves scraping the bottom of a channel and is a commonly used method to maintain channel depth.

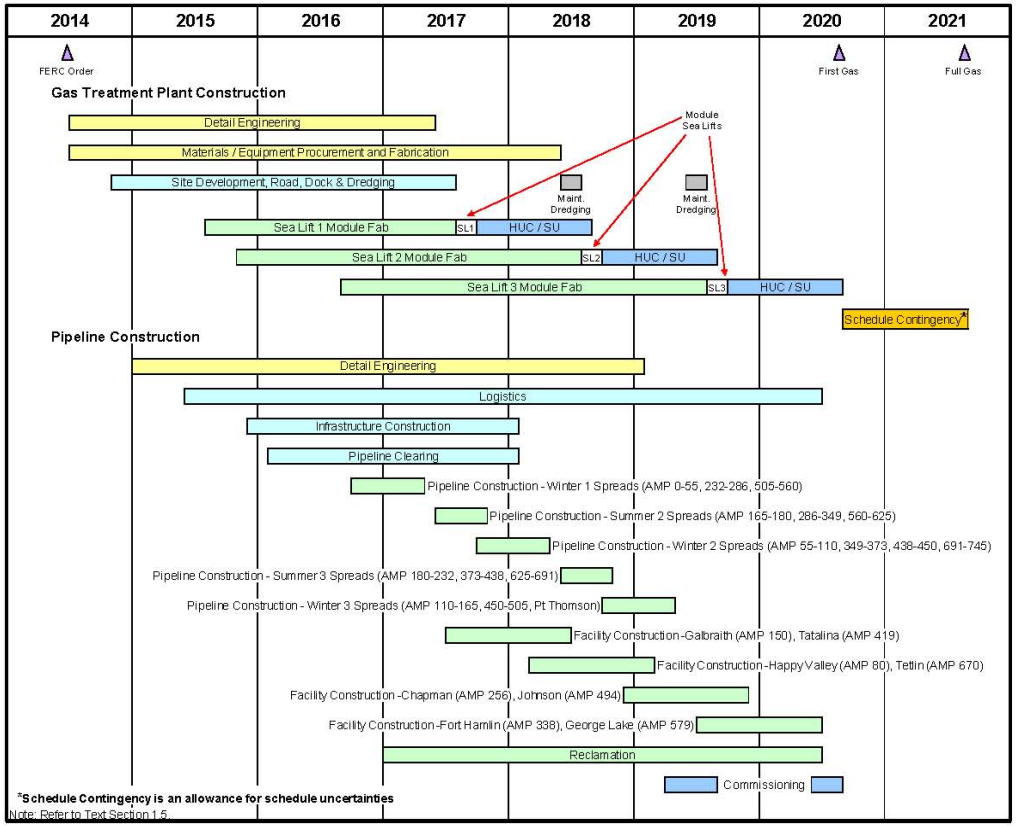

Figure 1.5-1
Alaska Pipeline Project
3 Year Alaska Construction Summary Schedule

1.5.2 PIPELINE CONSTRUCTION

Pipeline construction is planned to commence after property rights acquisition, receipt of the required permits and authorizations, and will generally proceed as follows:

- Pipeline Construction: Pipeline infrastructure construction and logistical support will start in 2015 (refer to Figure 1.5-1). The actual construction of Pipeline Facilities is currently planned to occur over 3 years using a total of 16 construction spreads in winter and summer seasons. However, APP is continuing to optimize this schedule.
- Facility (Compressor and Meter Station) Construction: Sufficient compressor and meter station construction is planned to be completed in the same timeframe as pipeline construction in support of initial first gas deliveries. The remaining compressor stations will be completed in the subsequent year to support full gas operations. Figure 1.5-1 depicts the timing of compressor station and meter station construction relative to the PT Pipeline and Alaska Mainline.

1.6 CONSTRUCTION ACTIVITIES

APP facilities will be designed, constructed, and operated in accordance with applicable laws and regulations.

APP recognizes Alaska-specific conditions and is proposing modified procedures where the measures contained in the FERC Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures are considered not applicable, technically infeasible, or unsuitable due to Alaska conditions. APP will prepare and implement its project-specific Erosion Control, Revegetation, and Maintenance Plan (APP Plan, refer to Appendix 1J) and Wetland and Waterbody Construction and Mitigation Procedures (APP Procedures, refer to Appendix 1K). The APP Plan and Procedures were developed using the 2003 versions of the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan) and the FERC's Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures). APPs Plan and Procedures will build upon the FERC Plan and Procedures and applicable permit conditions using a "toolbox" approach consistent with the FERC guidance. The toolbox will contain a set of best management practices available for selection and implementation based on site conditions during construction.

A comparison between the FERC and APP Plan and Procedures, and a justification for APP's changes, are tabulated at the end of the APP Plan and Procedures in Appendices 1J and 1K, respectively. Both the APP Plan and Procedures address development of a Stormwater Pollution Prevention Plan as part of pre-construction planning. An outline of the Stormwater Pollution Prevention Plan is provided in Appendix 2G of Resource Report 2.

The following subsections describe the logistical activities that will occur to facilitate construction, procedures that APP will use for pipeline construction, the Aboveground Facility and infrastructure construction procedures, and the anticipated construction workforce requirements.

1.6.1 CONSTRUCTION LOGISTICS

1.6.1.1 General Overview

Logistics activities for APP will include the transporting of personnel, equipment, construction materials, and supplies to construction sites via ocean, road, rail, or air. Site preparation and construction will be phased to lessen impacts to local infrastructure and communities. Logistics activities will likely begin prior to Project infrastructure development (e.g., right-of-way clearing may be completed a season/year prior to actual pipeline installation) and continue through construction, final cleanup, and demobilization. Additional discussion of local infrastructure is provided in Resource Report 5.

1.6.1.2 Logistics Timeline

Construction contractors are expected to mobilize and demobilize construction equipment to and from specific construction sites from 2014 through 2021. Stockpiling of pipe is anticipated approximately one year prior to mainline pipe construction. Staging of construction equipment will begin prior to commencement of construction (including infrastructure and clearing activities).

1.6.1.3 Logistics Plan

APP will develop a detailed logistics plan prior to construction. This logistics plan will address the following:

- Transportation of pipe, fittings, valves and equipment from the port-of-entry to the individual spread storage/laydown yards, including coordination through the various staging areas;
- Transportation of tracked construction equipment and rolling stock from point of entry premises and initial contractor storage;
- Transportation of facilities materials and equipment from port-of-entry to individual site locations;
- Transportation of MLBVs from port-of-entry to the individual spread storage/laydown yards, where the valves will be assembled and moved into position by the pipeline contractor;
- Ground and air transportation of pipeline and GTP facilities crews and supervisors;
- Transportation of restricted materials such as fuel, fuel storage tanks, hydro-test fluids, and freeze depressant storage tanks to the pipeline construction camps and/or storage/laydown yard site locations within each spread and the GTP site;
- Transportation and coordination of camps and associated camp material and equipment provided by the camp suppliers to monitor compatibility with the final logistics plan and schedules;
- Transportation of GTP modules from modular fabrication sites to Prudhoe Bay;
- Return of construction equipment, rolling stock, storage tanks, camp modules, surplus materials, and equipment for salvage at the completion of the Project;
- Customs clearance procedures;

- Execution of the approved APP Waste Management Plan; and
- Transportation of supplies and consumables during construction.

1.6.1.4 Infrastructure

Infrastructure needed for construction of the pipeline and GTP and related logistics is discussed in 1.3.3.1, 1.3.3.2, 1.5.1, and 1.5.2, including the early development of initial access roads, helipads, airstrips, camps, storage areas, contractor yards, and borrow sites needed to progress the Project.

1.6.1.5 Food

Food staples will be transported by air or ground to the construction sites where they will be stored at camp locations.

1.6.1.6 Crew

The field crews, including personnel local to Alaska, will be transported by air or ground to the various construction camps. It is expected that some Project personnel will be transported by commercial or charter flights from cities in the contiguous United States to Anchorage or Fairbanks.

1.6.1.7 Construction Equipment

The construction material and mechanical equipment that make up the pipeline, its related Aboveground Facilities, and the GTP includes line pipe, compressor units, piping, modular buildings, piles, etc. The equipment required for construction will most likely be transported by oceangoing barges to an Alaska port-of-entry and then railed or trucked to a marshaling yard near the start of each pipeline segment or Aboveground Facility site being constructed. At the end of construction, each contractor will transport their equipment to the next scheduled spread or Aboveground Facility to be constructed.

Table 1.6.1-1 summarizes material and equipment expected to be transported to construction sites of both the pipeline and Aboveground Facilities, and the associated number of truckloads to transport such items.

TABLE 1.6.1-1

Alaska Pipeline Project
Summary of Total Project Materials and Equipment to be Transported to Construction Sites

Item	Approximate Number of Loads	Approximate Weight or Bulked Volume of Material
POINT THOMSON GAS TRANSMISSION PIPELINE		
Plane loads of construction workforce [a]	9	800 round-trip tickets
Busloads of construction workforce [b]	40	1,300 round-trip tickets
Line pipe	900	21,000 tons
Aboveground Facility mechanical equipment	65	1,150 tons
Pipeline and facility construction equipment	600	12,000 tons
Camps	150	2,600 tons
Fuel and fuel tanks	300	4,000,000 U.S. gallons
Granular material	29,000	650,000 cubic yards
ALASKA MAINLINE		
Plane loads of construction workforce [a]	200	17,300 round-trip tickets
Busloads of construction workforce [b]	1,200	35,600 round-trip tickets
Line pipe	27,000	1,000,000 tons
Aboveground Facility mechanical equipment	1,200	20,000 tons
Pipeline and facility construction equipment	4,500	120,000 tons
Camps	5,100	25,000 tons
Fuel and fuel tanks	4,500	70,000,000 U.S. gallons
Granular material	900,000	21,000,000 cubic yards
GTP		
Plane loads of construction workforce	210	27,000 round-trip tickets
Busloads of construction workforce [c]	8,600 round trips	N/A
Modules shipped via ocean barges	114	317,000 tons
Pilings (loads / number of piles)	410 / 4,800	16,400 tons
Fuel and fuel tanks	1,750	15,700,000 U.S. gallons
Consumables and supplies	2,500	50,000 tons
Construction equipment	500	10,000
Granular material (gravel)	167,000	3,894,000 cubic yards

[a] A typical commercial plane can carry 175 people.
[b] A typical commercial bus can carry 45 people.
[c] Busloads represent trips between Deadhorse and the GTP work sites.

A storage yard and marshaling complex is planned to be located in the Fairbanks area and act as a central stockpile facility for pipe and construction equipment being transported from the Gulf of Alaska's marine ports. GTP materials and equipment (including construction materials and equipment) will be transported to the site by barge and truck and the new staging area described in Section 1.3.3.1 of this report will be utilized as needed.

1.6.1.8 Fuel and Freeze Depressant

Fuel will be transported by truck to the camp and stockpile/laydown yards. Fuel and freeze depressant, in addition to any supplied locally, will be imported to Alaska by ship or barge. They will then be moved by rail tankers and/or truck to the various camps and stockpile locations.

As practical, pipe and fuel storage sites will be combined to reduce the footprint and centralize supply points. Sites will be constructed to provide secure and safe storage and vehicle access.

1.6.1.9 Borrow Material

Borrow materials such as gravel, sand and other stable mineral material may be required to build pads for camps, pipe storage sites, Aboveground Facilities, and surfacing material for airstrips and access roads. Potential borrow sites are located along the pipeline route.

Development of borrow sites is anticipated to start in 2014 with GTP construction. Borrow material will be mined, processed, and stockpiled to be ready for start of construction of pads and access roads.

1.6.1.10 Pipe Delivery

The pipe is currently expected to arrive by ship at ports in Alaska and will be offloaded at docks and initially stockpiled in areas close by. Pipe will then be transported to pipe storage areas near the construction spreads prior to actual pipeline construction. Various entry ports are being considered. Pipe needed to construct the sections north of Atigun Pass to Prudhoe Bay and the Point Thomson Gas Pipeline may be transported by barge to the ANS.

1.6.1.11 Aboveground Facility Materials

The logistics support for Aboveground Facility materials will require the movement of large modules, truck-sized skids, pipe, equipment modules, pressure vessels, compressor skids, power generation equipment, fuel, and fuel tanks as well as construction camps.

Large modules (up to 9,000 short tons in size) for the construction of the GTP will arrive by barge or ship to Prudhoe Bay and be moved by Self-Propelled Modular Transporters (SPMTs) to the GTP site.

Equipment that is not sourced from within Alaska will most likely arrive by ship or barge and will be transported by train, truck, or SPMT to various locations.

1.6.1.12 Non-Hazardous and Hazardous Waste Management

Solid waste generated by the GTP will be transported to, and disposed of at existing approved and permitted waste management facilities located on the ANS. No new waste management facilities will be constructed for or by APP. There is no U.S. Environmental Protection Agency-identified Resource Conservation and Recovery Act-permitted Treatment Storage and Disposal Facility for restricted waste within the State of Alaska. Therefore, APP will likely ship any hazardous waste generated by construction or operation through use of a licensed waste transporter via road, barge, or air, to an approved Treatment Storage and Disposal Facility outside of Alaska. A Project-specific Waste Management Plan will be developed prior to construction to address handling, storage, transportation, reuse, recycle, disposal, training, and documenting Project non-hazardous and hazardous wastes.

1.6.1.13 Seasonal Ice-Window Open and Close Dates

The open-water transit window for sealift barges to Prudhoe Bay is on average, approximately 45 days. The open and close dates vary from year to year and are dependent on a variety of factors including offshore directional winds and ice cover. Barges will depart for Prudhoe Bay when safe and authorized by marine warranty surveyors.

1.6.1.14 Haul Road Truck Traffic

The Dalton Highway is the only highway providing ground access to Prudhoe Bay. Traffic control and scheduling on the Dalton may be required during periods of high traffic volume. APP will coordinate with the Alaska Department of Transportation and Public Facilities to address any traffic impacts on this highway. Additional discussions regarding potential impacts on other highways are underway with the Alaska Department of Transportation and Public Facilities.

Potential impacts on local traffic patterns will vary along the Project route, depending on the location, timing, and construction activity. These impacts will be temporary and activities will be conducted in accordance with local guidelines and as permitted by authorities or, in the case of private roads, landowners.

Potential impacts on road surfaces will vary along the Project route. Depending on the quality of the road surface, impacts could occur to paved, gravel, or dirt roads during the construction period. Roadways that typically have limited use could experience higher traffic volumes and heavy loads during the construction period, which could result in accelerating wear of the travel surface. Applicable permits will address impact to roadways.

1.6.2 TYPICAL CONSTRUCTION PROCEDURES

The following provides a description of typical construction procedures that will be implemented. These procedures will be modified as necessary to comply with site-specific environmental considerations. Where applicable, information distinguishing typical summer construction procedures from typical winter construction procedures are provided with construction procedures at features such as wetlands, waterbodies, and road crossings, as discussed in Section 1.6.3. Figures 1.6.2-1 and 1.6.2-2 depict typical summer and winter season construction sequences.

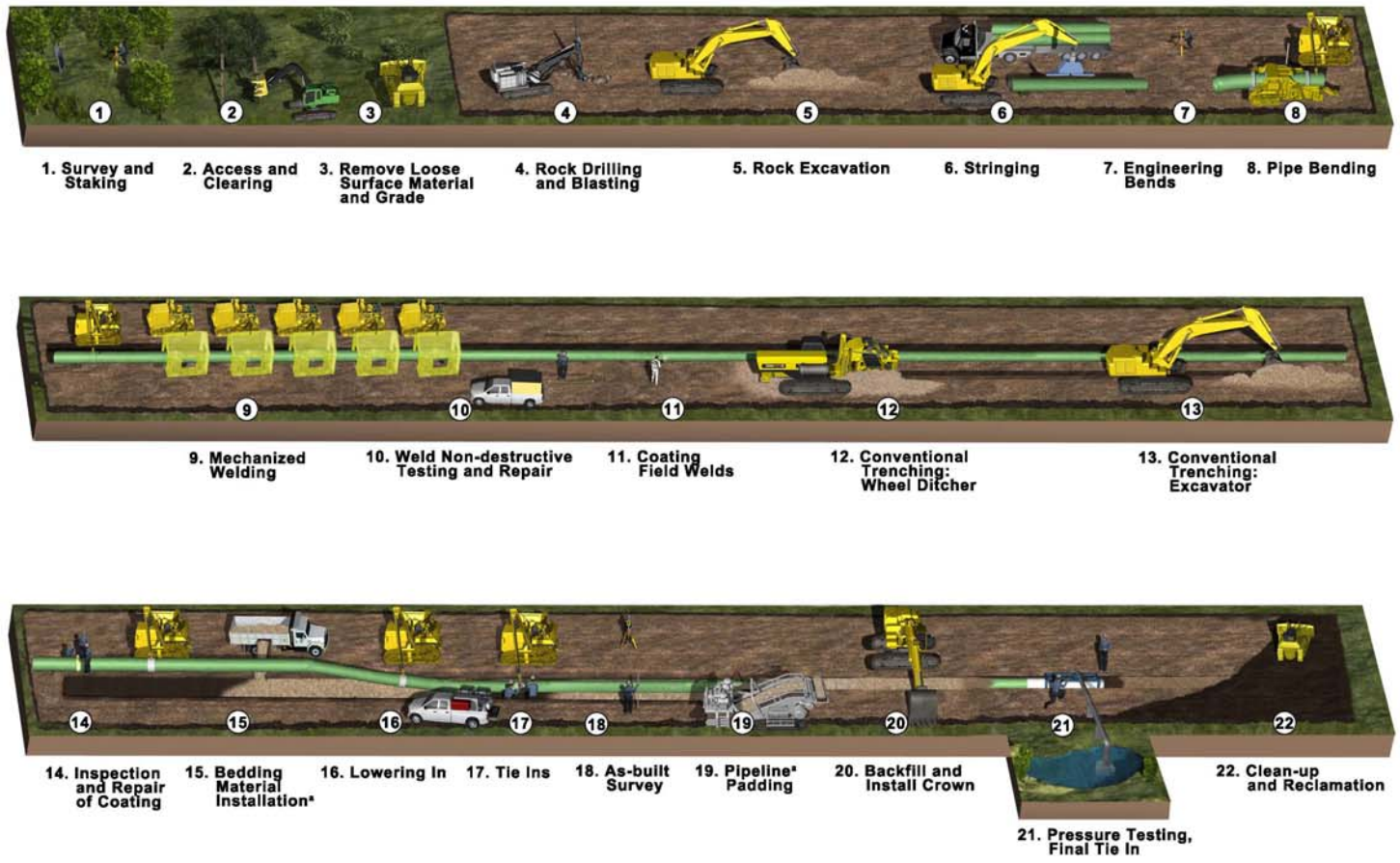

Figure 1.6.2-1
Alaska Pipeline Project
Typical Pipeline Construction Sequence (Summer)

* Only in rock excavation

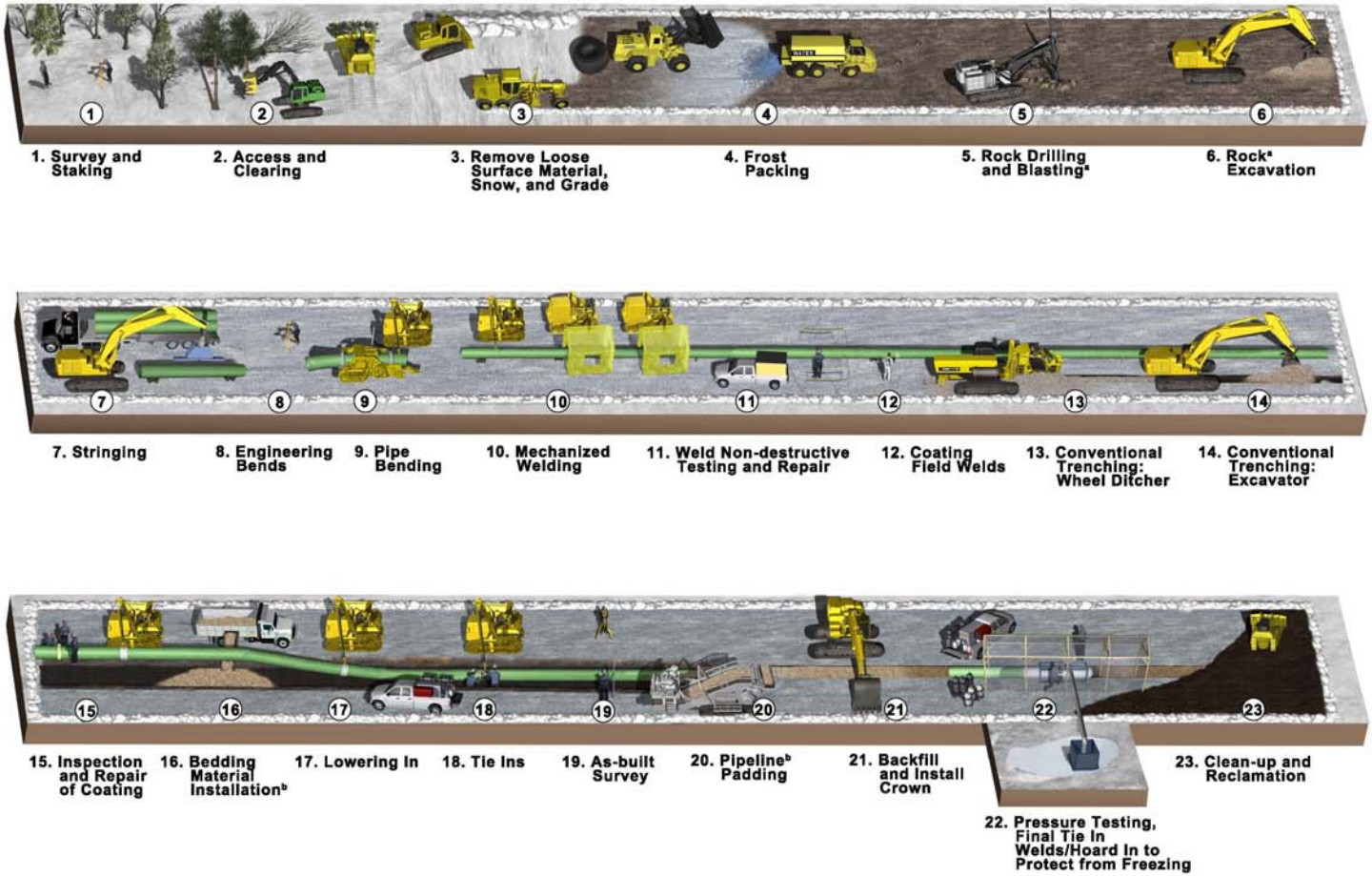

Figure 1.6.2-2
Alaska Pipeline Project
Typical Pipeline Construction Sequence (Winter)

[a] Rock excavation dependant on terrain
[b] Only in rock excavation

1.6.2.1 Surveying

Initially, the pipeline centerline, limits of right-of-way boundaries, and facilities will be staked, including construction and ATWS areas that will require the use of permitted access roads. This will also include the staking and/or exclusion fencing of known archaeological sites, select wetland areas, and water crossing boundaries, as well as other environmentally sensitive and other areas requiring protection during the construction process. Existing underground utilities will be located and flagged prior to construction.

Surveying and staking activities also will be required during pipeline construction to mark the locations of changes in pipe-wall thickness, pipeline crossings, utility crossings, test lead installation locations, buoyancy control (start and end locations), and borrow pit locations.

During construction, APP will conduct as-built surveys to document depth of cover, weld locations, and other as-built information.

1.6.2.2 Clearing

Clearing activities will occur in the winter season prior to the scheduled pipeline construction season, and will include removing trees and brush on the construction right-of-way and at ATWS areas. For the most part, vegetation will be removed using heavy equipment, as necessary. The specialized equipment that may be used includes feller-bunchers, mulchers, de-limbers, hydro-axes, and cable and grapple skidders. Some handwork with power saws will also be required.

The clearing activity for a winter pipe installation project is essentially the same as that of a summer installation project, though snow management will be required for winter construction. The right-of-way will normally be cleared during the winter prior to pipe installation activities. In addition, the right-of-way will generally not be grubbed; that is, root structures will not be removed from over the trench line until the season of pipeline installation.

Access to the right-of-way for personnel and equipment will be required for clearing. Winter access will include the installation of snow- and log-fill ramps, and bridges and culverts where required for crossing drainages and watercourses. Summer access may include use of mats, log corduroy, geotextile, or combinations of these, and may be overlain with imported borrow material on the work side and travel lane of the pipeline construction right-of-way to allow heavy construction equipment and support vehicles to cross.

Temporary environmental and erosion control mitigation measures will be installed in accordance with the APP Plan (refer to Appendix 1J). Fences that cross the right-of-way will be removed and replaced with temporary fences and gates to accommodate passage of personnel, pipeline construction equipment, and support vehicles along the right-of-way. Following construction, fences will be restored.

Merchantable timber may be stored on, or immediately adjacent to, the right-of-way in authorized storage areas. The burning or mulching of non-salvaged vegetation will be completed following clearing activities in accordance with agency criteria and timing constraints.

During winter construction, when little natural light is available for much of the day, artificial lighting, such as lighted equipment and portable light towers, will be used for clearing and subsequent activities.

1.6.2.3 Grading

Work surface grading is necessary to level the right-of-way for the safe use of heavy equipment during handling of pipe. Grading is also necessary to level side slopes across the work surface and to reduce the angle of longitudinal slopes along the work surface. In some cases shoo-flies will be required to provide less hazardous routes that bypass sections of extremely difficult topography.

The loose surface layer of native material will normally be bladed to one or both sides of the right-of-way and stored in windrows for later redistribution across the disturbed area during cleanup operations. This loose surface material aids reclamation efforts by enhancing regrowth of vegetation and assists in mitigating surface-erosion on the right-of-way. Additional temporary environmental and erosion-control mitigation measures will also be utilized as required in accordance with the APP Plan and Procedures (refer to Section 1.8 and Appendices 1J and 1K). For summer construction in actively cultivated or rotated crop lands, topsoil may be stripped from the entire width of the right-of-way using dozers, excavators, and/or graders, and moved to one or both sides of the right-of-way, stored in windrows, and segregated from stockpiled mineral soils and trench spoil. The depth of topsoil removal will depend upon site-specific soil conditions, land use requirements, and Project specifications. The width of area required for topsoil storage will depend on these variables.

In areas where rock at grade is encountered, the surface of the right-of-way will be ripped with ripper tractors. If it cannot be ripped, it will be drilled and blasted after removal of any loose surface material. Grading of rock areas may be undertaken a season or more in advance of pipe installation.

During winter seasons, wetlands or soils that are otherwise unstable due to high moisture content will be frost-packed by clearing snow cover and driving-over repeatedly to promote deeper frost penetration. Frost packing improves surface bearing capacity so that heavy equipment and vehicle loads can be safely supported. In some instances the use of construction mats, log corduroy, and/or geotextile products and fill might be required to bridge the wet or otherwise unstable areas to ensure that heavy construction equipment and support vehicles can pass.

During winter construction when there is little daylight, artificial lighting including lighting that is mounted on equipment and support vehicles augmented by lighting from stationary towers, will be required to support the grading activities.

Winter season grading activities are enhanced by taking advantage of frozen soil conditions to support construction equipment and vehicles. For thaw-stable soils[14] the right-of-way preparation activity will begin by driving frost into the ground so that heavy construction equipment will be supported. For thaw-sensitive soils initial preparation activities might include installation of a gravel or snow/ice working surface. Snow/ice working surfaces will be applied in thaw-sensitive tundra areas on the North Slope. Grade cuts will be required on steeper slopes. During winter construction, snow and loose surface material may be windrowed over the trench line to reduce seasonal or mechanical penetration of frost. This material is bladed away just prior to trenching activities.

[14] Thaw-stable permafrost soils are soils that, upon thawing, would not experience either substantial thaw-settlement or loss of strength.

During summer construction periods, crossing wetlands or unstable soils containing high moisture content may require the use of construction mats, log corduroy, geotextile products, or combinations thereof to condition the work surface to support heavy construction equipment and reduce rutting.

1.6.2.4 Ice and Snow Work Pads and Access Roads

In certain tundra areas and wetland areas a winter work pad will be required. Winter work pads and roads may be constructed of compacted snow, ice aggregate, mixtures of snow and water, manufactured snow, or ice created by flooding the tundra surface to achieve a design elevation. These methods are further described in Section 1.6.5.1 and in Resource Report 2.

Initial work activity will include surveying and marking the right-of-way limits and ATWS areas. Snow will be packed down, which will help hasten frost penetration through the active layer to create a frozen and stable winter work pad surface for equipment travel and pipeline construction activities. Dragging operations will be carried out to substantially level the surface by compacting the snow. Low pockets will be filled in. Water from approved water sources will then be added to the snow to create a frozen snow/ice surface.

Access roads will be developed to the approved water sources to obtain water for manufacturing snow, developing the winter work pad on the right-of-way, acquiring ice aggregate from the frozen surfaces of approved waterbodies to use to fill depressions on the right-of-way, and on more conventional winter access roads.

Ice aggregate will be harvested by using a scarifier to shave the ice cover on approved freshwater ponds and lakes. The chips can be used alone or mixed with water. Ice aggregates and manufactured snow will be hauled to the right-of-way and graded to level the right-of-way or access road, or used to build up lower areas. Water will then be added to the ice aggregates to create a solid frozen base to which more snow and water can be added to create a surface suitable for traffic.

Snow fencing may be temporarily installed along the side of the right-of-way to collect sufficient snow for the construction of a winter work pad. Snowmaking equipment similar to what is used to make snow on ski hills may also be utilized.

Ice bridges for crossing shallow waterbodies will be constructed by flooding the waterbody to the required design thickness. Ice bridge construction may require the addition of snow, ice aggregates, and water, to the surface of the existing ice at the crossing location. For ice bridges across fast-moving waterbodies, regular maintenance will include frequently checking the thickness of the ice to identify any under-ice scouring and unsafe conditions caused by the fast-flowing water.

Once in use, winter work pads and access roads will likely require maintenance to repair damage caused by the tracked equipment. Maintenance of a work pad includes adding snow and water, grading and, in some cases, adding ice aggregate as fill. Grading or snow blowing to remove standing snow drifts from the right-of-way will help prevent damage to the surface of the winter work pad and to monitor that good trafficable conditions are maintained.

During the late winter season, use of the access or right-of-way may have to be restricted to the nighttime to maintain stable road conditions.

APP will decommission winter snow and ice work pads and roads at the end of each winter season in accordance with land use permits.

1.6.2.5 Erosion Control During Construction

Work sites will be stabilized during construction to reduce surface erosion and siltation. This stabilization work will be done in accordance with APP's Plan using a "Tool Box" process, in which installation and maintenance of temporary and permanent environmental mitigation measures will depend on site-specific conditions and needs. For erosion control efforts, this may include installation of diversion berms, surface drainage ditches, French drains, silt fence, erosion-control matting, straw bales or straw pipes, and other means that have traditionally been used to mitigate and control surface erosion.

Regardless of whether construction activities are taking place during the summer or winter, erosion control measures will be left in place and supplemented as required through the end of construction to mitigate surface soil erosion that might occur as a result of the spring thaw and snow melt or summer precipitation events. Additional information regarding erosion and sediment control measures is provided in APP's Plan (refer to Appendix 1J.)

1.6.2.6 Stringing

Hauling and stringing of individual pipe segments (also referred to as "joints") will take place as access to, and grading of, the right-of-way progresses. In certain trench soil conditions, such as where drilling and blasting of the trench is required, stringing will take place after trenching. Individual pipe lengths are nominally 40, 60, or 80 feet in length. The weights of pipe loads will dictate the number of joints of pipe per load that can be transported to the right-of-way for stringing. Pipe will normally be transported for stringing by trucks with trailers. In some areas of challenging terrain, tracked pipe carriers may be utilized.

During winter and summer construction, end caps will be used to keep snow, dirt, and debris out of the pipe. Additionally, there may be a need for tow tractors to assist pipe stringing trucks to traverse steep grades during winter construction. In summer construction, tow tractors may also be required to assist stringing trucks on steep grades or when the right-of-way is wet from rainfall.

1.6.2.7 Bending

Pipe bending operations will follow pipe stringing. The bending crew will bend the pipe to fit the vertical profiles and horizontal alignments of the graded right-of-way. Typically, manufactured fittings will be used where field bends cannot be cold-bent in the field enough to accommodate the desired bend angle.

A hydraulic pipe bender will be pulled along the right-of-way by a tow tractor and positioned at intervals along the right-of-way. At each location, individual pipe joints will be carried to the bending machine by a pipe-layer, inserted into the pipe bender, and bent to the required angle as identified by the bending engineer. A mandrel will be placed inside the pipe for each bend to maintain the integrity of the pipe.

1.6.2.8 Production Welding

Pipe joints will be aligned and set up for field production welding. Generally, production welding will be done using a mechanized welding system, however, manual ("stick" welding) and semi-automatic welding may also be used. Multiple welding passes will be used to complete the weld as specified in the qualified welding procedures. Qualified and certified non-destructive examination inspectors will be engaged to perform non-destructive testing. Welds that do not

meet specification will be repaired or cut-out and replaced in accordance with specification and applicable code requirements.

1.6.2.9 Joint Coating

Following welding and non-destructive testing, the field girth welds will be sandblasted and heated as necessary to a specified temperature and coated. The field joint coating materials and application process will be appropriately matched to the pipe coating applied in coating mills. The coating process will be performed in compliance with a Project-specific coating procedure and specification.

Each section of welded pipe will be inspected with an electrical device called a holiday detector or "jeep." A holiday is a flaw in the external pipe coating. If a holiday is detected, an audible signal is heard to indicate a flaw to be repaired. This activity is also referred to as the "jeeping" operation. This non-destructive examination will identify coating flaws or defects requiring repair. Pipe coating damage identified will be repaired in accordance with an approved Project-specific procedure and specification.

1.6.2.10 Trenching

The trench will be excavated with bucket wheel or chain trenching machines, or track-mounted excavators. Track-mounted mechanical rippers, rock hammers, or rock trenchers will be used to fracture and excavate rock or frozen soil. Drilling and blasting techniques will be required where other means are not practical.

In summer and winter, pipe will typically be welded ahead of trenching, except where blasting is required. This sequence results in the trench remaining open for only a short time before the welded pipe sections are lowered in, thus making the trench less likely to fill with snow and the spoil material to freeze. If blasting is required, it will normally take place prior to stringing and welding.

In summer and winter, mechanical ripping of the trench line will not normally be necessary except in areas where rippable rock occurs. If appropriate, APP may choose to excavate the trench prior to stringing and bending of the pipe during summer construction.

In the absence of special requirements, APP will bury the pipe in permafrost areas similar to normal overland cover depths (e.g., 3-feet belowground) depending on bedding requirements, pillows, and bedrock.

For waterbodies, the typical crossing will have a minimum of 3 feet of cover. For major waterbody crossings, site-specific environmental crossing plans will be developed and greater depths of cover may be specified dependent on the results of the scour analysis completed during detailed design and consideration for potential frost heave of the pipe. For sections of the pipeline that are installed using HDD, the deepest portion of the drill arc will have greater cover depth.

Typical trench configurations are provided in Appendix 1E.

1.6.2.11 Lowering In, Tie-ins, and Backfilling

Before welded pipe sections are lowered in, the trench will be inspected to determine whether it is free of rocks and other debris that could damage the pipe or its protective coating. Dewatering or removal of snow might be necessary to allow for inspection of the trench bottom.

In rock trench conditions, or where soil conditions include the presence of frozen soil lumps, boulders, or cobbles, foam pillows or imported select fill bedding material (e.g., sand or soil fines) will be placed on the trench bottom before the pipe sections are lowered in. Suitable bedding and padding material will be placed around the pipe to protect the pipe and coating from damage. Padding material, typically gravel and other granular material, is planned to be obtained for the vast extent of construction from the excavated trench spoil. Padding machines and spoil pile processors, which screen-out or crush large cobbles and rocks, typically will be used to provide bedding and padding from on-site materials. Other pipe protection measures such as a rock-shield material might be installed before the lowering in of pipe strings. In some instances, select bedding and padding material will be sourced locally, or from outside Alaska.

After the pipe sections are lowered into the trench, tie-in welds will be performed to join together welded sections of pipe. Similar to production welding discussed above, tie-in welds will be performed in accordance with qualified weld procedures and non-destructively examined in accordance with qualified procedures.

1.6.2.12 Testing and Final Tie-Ins

After backfilling, the pipeline will be pressure-tested. If water is to be used, sections of pipeline to be tested as single segments will be determined by water availability and terrain contour conditions. Water for pressure-testing will be obtained from approved water sources and treated with an appropriate biocide.

During winter conditions, hydrostatic testing likely will be performed using heated water or with freeze-depressant additives mixed with hydrostatic-test water. If additives are used the hydrostatic-test water will be distilled or treated to separate the additives from the water, or disposed of using an approved disposal method after testing. There will be a requirement for sheltering and heating exposed pipe and test heads during winter conditions.

If the pipeline is installed in sections of permafrost during summer months, there is a potential that the hydrostatic-test water will need to be heated. Heating the water will allow the hydrostatic-test pressure to stabilize faster and complete the test in a shorter period of time.

After completion of the pressure test, the water will be discharged in accordance with applicable permits. Once the pipeline is dewatered, it will be cleaned and dried using tools referred to as cleaning and drying pigs that are propelled through the pipeline with pressurized air. Additives may also be used to remove water from inside the pipe, and will be stored and disposed of in accordance with applicable permits. Mechanical air drying methods may be used to dry the pipe where necessary. Test heads will then be removed and the final tie-ins completed. Refer to Appendix 1E for drawings depicting typical hydrostatic test points and a typical water-discharge layout.

1.6.2.13 Cleanup and Reclamation

Initial cleanup will begin after backfilling of the trench has been completed in both winter and summer construction efforts. Cleanup will continue as weather and site ground surface conditions allow in accordance with APP's Plan (refer to Appendix 1J) and continue until permit conditions are met.

Winter cleanup activities will start after the trench has been backfilled and final cleanup and restoration work will be completed during the subsequent winter seasons, as necessary, however, final cleanup may also occur during summer months if the access and the right-of-way are trafficable in these locations. Summer remedial work may be required following winter

construction to re-establish erosion control measures and address surface-water drainage or final grade issues.

For summer construction, final cleanup can usually be achieved in the subsequent summer season. Should remedial work be required, it will be done during the summer following pipeline construction.

Construction debris will be gathered and disposed of at approved off-right-of-way disposal sites. Surface drainage patterns will be re-established. In most areas, a crown of trench backfill material will be centered over the trench to compensate for settling of the backfill material as it consolidates. Surface cross-drainage patterns will be re-established where the trench line has been crowned.

Segregated, loose surface materials removed during winter construction before grading operations and stripped topsoil/loose surface material during summer pipeline construction will be spread over the surface of the right-of-way. Permanent erosion control devices appropriate for the application will be installed.

After permanent erosion control devices have been installed, disturbed and non-cultivated work areas will be seeded using approved seed mixes in accordance with Project-specific revegetation and reclamation plans. Reclamation will also address sites requiring special attention such as erosion-prone slopes, wetland/riparian areas, and those areas that will require reforestation.

Markers showing the location of the pipeline will be installed at fence and road crossings in order to identify the owner of the pipeline and convey emergency contact information in accordance with applicable governmental regulations, including U.S. Department of Transportation (DOT) safety requirements and Project-specific specifications. Special markers providing information and guidance to aerial patrol pilots will also be installed.

1.6.3 SPECIAL CONSTRUCTION PROCEDURES

The following provides a description of construction procedures typically conducted at special or unique locations (e.g., wetland, waterbody, and road crossings).

1.6.3.1 Wetland Crossings

Because of the large expanses of wetlands in Alaska, particularly north of Delta Junction it is not feasible for the Project to avoid crossing wetlands or to treat them as isolated features on a case-by-case basis. The construction techniques used in wetlands will therefore depend on site-specific conditions at the time of construction including season and weather conditions, the degree of soil saturation, presence and extent of permafrost, soil stability, and wetland type. In some cases, such as crossing certain wetlands in the winter, site-specific conditions may warrant utilizing conventional upland cross-country construction techniques. In other cases, site-specific conditions may warrant utilizing special wetland construction techniques. APP Procedures (refer to Appendix 1K) identify where conventional upland cross-country construction will occur and where modifications to the conventional techniques will be needed. The construction spread configuration for summer and winter work takes into account construction safety, soil characteristics and stability, topography, climatic conditions, and access. By constructing certain wetlands during the winter season and utilizing a work surface that is frozen and selectively padded, the Project will reduce wetland impacts.

Summer Conditions

Summer construction in wetlands where right-of-way grading (i.e., cuts and/or fills) is required, and where sub-soils can support construction equipment, will proceed as described in Section 1.6.2. The nominal right-of-way width will be 175 feet.

For low-strength soils that do not support construction equipment without adverse impacts such as soil mixing or deep rutting, alternative wetland crossing techniques will be considered such as reduced construction right-of-way width, shoo-flies, and mats/timber corduroy or other alternatives.

The APP Plan (refer to Appendix 1J) and Procedures (refer to Appendix 1K) provide further detail to the proposed summer construction and reclamation of wetlands as appropriate to site conditions. The Plan and Procedures will be further developed in the final report.

Winter Conditions

Winter construction in wetlands will proceed as described in Section 1.6.2, Typical Construction Procedures. The nominal right-of-way width will be 145 to 160 feet.

Even though sections of the pipeline will be constructed during winter months, it is expected that under certain conditions the subsoil or work surface will not be frozen or trafficable. If the subsoil cannot support construction equipment without adverse impacts such as soil mixing or deep rutting, an alternate crossing method will be considered.

The APP Plan (refer to Appendix 1J) and Procedures (refer to Appendix 1K) provide further detail to the proposed summer construction and reclamation of wetlands as appropriate to site conditions. The Plan and Procedures will be further developed in the final report.

1.6.3.2 Waterbody Crossings

APP will cross perennial waterbodies, seasonally intermittent watercourses, and other permanent waterbodies such as ponds. Section 2.3 of Resource Report 2 describes the waterbody crossings that have currently been identified. Appendix 1E provides typical waterbody crossing drawings.

APP will cross waterbodies using one of several crossing methods described below, and as specified in APP's Procedures (refer to Appendix 1K). Crossing installations will be performed in accordance with construction specifications and all terms and conditions associated with each crossing permit. Major waterbodies (those greater than 100 feet in wetted width at time of construction) and other waterbody crossings are listed in Appendix 2B of Resource Report 2. For those waterbodies that are dry or frozen to the bottom when crossed, APP proposes to use conventional upland cross-country construction techniques and procedures.

APP will identify a proposed crossing method subject to consideration of the waterbody characteristics and site-specific conditions as follows:

- If the waterbody is dry or frozen to the bed, APP will proceed with an open-cut crossing method;
- If the waterbody is flowing, assess the type of fish and fish habitat present within the affected reach and determine whether an open-cut timing window is available;

- If the potential fisheries impact is rated as negligible or low, and if an open-cut timing window is available and the in-stream work can be completed within the timing window, APP will proceed with the installation using the open-cut crossing method;
- If an open-cut timing window is not available or is too short to complete the in-stream work, then APP will consider the feasibility of using isolated (dry) crossing methods; and
- If the potential fisheries impact is not rated as negligible or low, and if isolated crossing methods are not feasible or appropriate, then consideration will be given to using a trenchless crossing method. This may include HDD, boring under the waterbody, or aerial crossings, noting that a minimum practical length of 1,900 to 2,100 feet is required on level terrain for using the HDD method with 48-inch-diameter pipe.

ATWS will typically be required on both sides of waterbodies to stage construction equipment and materials, and to fabricate the crossing section. The ATWS will typically be located at least 50 feet from the water's edge, except in those cases where the adjacent upland areas are actively cultivated or are used as rotated cropland, or other disturbed land.

Based on the results of the waterbody analysis completed to-date, the Project has identified a list of crossings by MP where topographic or other site-specific factors will preclude the standard 50-foot setback between the ATWS and the edges of waterbodies. Section 2.3.7 of Resource Report 2 summarizes the locations of ATWS that will require deviation from the standard 50-foot setback.

During clearing activities, temporary bridges will be installed, where necessary, across waterbodies to allow construction equipment and personnel to proceed. When clearing activities are performed during an out-of-sequence season relative to the pipe installation activities, any equipment/vehicle bridges installed to support the clearing activities will be removed from perennial waterbodies except if designed to the specified design flood return period. Temporary construction bridges will then be reinstalled across these waterbodies during a subsequent construction season prior to the start of the right-of-way grading or other right-of-way preparation activities. Temporary bridges will be removed when construction and reclamation activities are complete. Refer to Appendix 1E for typical drawings depicting typical equipment crossing methods.

A number of bridging methods could be used depending on season of use, and waterbody flow and width:

- Single-span bridges are rigid metal structures that span a waterbody from bank to bank without in-stream support. Multi-span bridges are rigid metal structures that span a waterbody from bank to bank with one or more in-stream supports;
- Portable sectional bridges are similar to single-span and multi-span bridges, however, they will be assembled in short sections to complete the span from bank to bank. Bailey and Flexifloat are examples of portable sectional bridges;
- Ice bridges require building up a sufficient thickness of ice on a waterbody to support the movement of construction equipment;
- Ramp and culvert bridging structures require filling the waterbody channel with earth or snow to provide a level surface for the construction equipment to cross. If there is flow in the waterbody, culverts can be incorporated into the fill to allow the flow to be maintained; or

- Synthetic or wooden mats may be used to cross waterbodies that are frozen to the bottom or have no flow. The mats provide support for construction equipment where the bed of the waterbody is soft.

Where the pipeline crosses waterbodies that do not contain permafrost, the use of insulation on the pipeline at those waterbodies will depend on a number of factors such as the annual pipe operating temperature profile, the flow characteristics of the waterbody, the fisheries present within the waterbody, and the depth of pipe burial. Individual waterbodies will be assessed during detailed design and insulation will be applied to the pipe at those waterbodies where the pipeline may have a local impact on fisheries or infrastructure. Thus, insulation will not necessarily be used at all waterbodies that do not contain permafrost.

Open-Cut Crossing Method

The standard open-cut or wet-trench crossing method will involve trenching through the waterbody while water continues to flow (unless dry or frozen) through the trench area. Before construction of the crossing begins, the crossing section of pipe will be fabricated, and any required pipeline concrete coating applied to the pipe section in an adjacent, approved extra workspace, located outside the riparian zone of the waterbody. Typically, for smaller waterbody crossings, in-water durations are shortest for an open-cut as compared to isolated crossing methods.

Depending on the width and depth of the excavation, tracked excavators or dragline buckets will then be used to excavate a trench in the flowing waterbody, working from one or both of the crossing banks. Where the waterbody is too wide to excavate the trench from the banks, excavation equipment might operate from within the waterbody with approval from appropriate regulatory agencies. Water flow will be maintained at the crossing location in accordance with approved site-specific requirements.

Trench spoil will be set back from the bank of the waterbody for temporary storage (refer to APP's Procedures in Appendix 1K). Sediment barriers will be installed where necessary to reduce the amount of sediment from excavated spoil entering the waterbody.

For wider waterbodies, trench spoil may be placed within the waterbody for temporary storage. Spoil will be stored away from the thalweg of the channel. In the case of winter installations, trench spoil may be temporarily stockpiled on the ice surface at the crossing location.

Short sections of the trench, known as hard plugs, will remain unexcavated in the adjacent upland/wetland section of the pipeline trench on both banks of the waterbody until after installation of the crossing section. This will separate the waterbody trench from the upland/wetland trench to prevent water from draining from the upland portions of the right-of-way. Once the trench has been excavated, the prefabricated crossing section will be installed in the trench. Pipe sections will be installed with required buoyancy control measures. The trench will then be backfilled, the bed contours re-established, and the banks replaced to a stable configuration. Any trench spoil not required for backfill will be spread across the construction right-of-way or hauled away for disposal. When crossing streams using this method, construction will be planned to occur during agency-approved in-water environmental work windows.

Refer to Appendix 1E for typical drawings depicting typical open-cut water-crossing construction.

Isolated Crossing Methods

Flume Crossing Method

The flume crossing method consists of isolating and temporarily diverting the flow of water across the trench area through one or more steel flume pipes or box channel selection placed in the waterbody. This method allows trenching activities to occur within the isolated stream or riverbed that temporarily has no flow (that is, beneath the flume pipes), thereby reducing the introduction of sediment and turbidity into the waterbody downstream of the crossing location during trench excavation and backfill operations. The flume method will typically be used to cross small to intermediate flowing waterbodies that support fishery habitat of value.

A sufficient number of adequately sized flume pipes will be installed in the waterbody to accommodate the highest anticipated flow during the scheduled crossing installation period. The flumes will be inspected to ensure that they are free of dirt, grease, oil, or other potential pollutants. After placing the flume(s) in the watercourse, sand or pea gravel-filled bags, water bladders, or metal wing deflectors will be placed in the watercourse around the flume(s) upstream and downstream of the proposed trench area. Where pea gravel-filled bags are used, the bags will be used in combination with an upstream facing of polyethylene or another approved impermeable barrier if required to restrict flow across the dam. The bags can also be composed of polyethylene or another approved impermeable barrier to restrict the flow through individual bags. These devices will serve to dam the stream and divert the water flow through the flume(s), thereby effectively isolating the water flow from the construction work area between the dam structures. In winter pipeline construction conditions, ice build-up at the mouth of the flume(s) may occur. Ice will have to be removed in order to keep the flow of water continuous through the flume(s) during excavation and installation of the pipeline section.

Any remaining standing water between the dams may be completely pumped out of the isolated streambed segment. Likewise, leakage from the dams or subsurface flow may require additional periodic pumping. Pumped water will be discharged into energy dissipation/sediment filtration devices such as a geotextile filter bag or straw bale structure, into well-vegetated areas away from the water's edge, into snow filled areas, or into settling ponds to prevent sediment-laden water from entering the watercourse.

Tracked excavators will trench across the dewatered streambed. For minor waterbodies, spoil excavated from the watercourse trench will be placed on the adjacent upland right-of-way and stored a minimum of 10 feet from the edge of the watercourse. Once the trench is excavated, a prefabricated segment of pipe will be installed beneath the flume(s). The trench will then be backfilled with native spoil from the watercourse bed. The banks will be stabilized before removing the dams and flume(s) and returning flow to the watercourse channel.

Refer to Appendix 1E for drawings depicting typical isolated-open-cut dam-and-flume construction.

Dam and Pump Crossing Method

The dam-and-pump method will be similar to the flume method, except that water pumps and hoses will be used instead of flume pipes to transport the stream flow around the construction work area. Similar to the flume method, the first step in the dam-and-pump crossing method will be to isolate the crossing area with upstream and downstream dams.

Next, one or more pumps and hoses of sufficient size will be installed to transport anticipated flows around the isolated stream bottom section. Additional backup pumps will be on site at all

times in case of an operating pump failure. Pump intakes above the upstream dam will be appropriately screened to prevent entrainment or impingement of aquatic species. Energy-dissipation devices will be used to prevent scouring of the stream bed at the downstream discharge location. Once the pumps are operational and pumping continuously, the watercourse upstream and downstream of the construction area will be sealed with sandbags and/or gravel with plastic liner. Following the installation of the dams, the pumps will operate continuously until pipeline installation across the watercourse is complete and the dams are removed.

Tracked excavators working from one or both banks of the waterbody will excavate a trench across the dewatered streambed. For minor waterbodies, spoil excavated from the watercourse trench will be placed and stored on the adjacent upland right-of-way a minimum of 10 feet from the edge of the watercourse. The pipe crossing section will be installed in the isolated area between the dams. After backfilling, the banks will be stabilized and the dams and pumps will be removed.

Refer to Appendix 1E for drawing depicting typical isolated-open-cut dam-and-pump watercourse construction.

Channel Diversion Crossing Method

The pipeline crossing of certain streams, in particular wide braided streams, might be installed using a channel diversion method. A diversion structure will be installed to divert the surface water flow to another channel away from the area where the first section of pipe will be installed. The first section of pipeline trench will then be excavated, and the excavated trench spoil will be stored beside the dewatered channel trench. The first pipe section will then be installed in the trench, and that section will be backfilled.

When the first portion of the crossing section is installed, the surface water flow will be diverted back over the installed portion of the crossing. The second portion of the crossing section will then be installed. The two segments of the crossing section will then be tied together within a dewatered bell hole. After the tie-in is completed, the diversion dam structures will be removed.

With the completion of all in-stream work, the stream banks will then be reclaimed including the placement, as required, of scour and erosion protection.

Refer to Appendix 1E for drawing depicting typical isolated-open-cut dam-and-divert watercourse construction.

Horizontal Directional Drill Crossing Method

The HDD crossing method allows the crossing section to be installed in a trenchless manner. This method involves drilling under the waterbody and installing a prefabricated crossing section through the borehole, thereby avoiding disturbance to the ground surface at the approaches to the crossing and to the watercourse bed itself.

The use of an HDD crossing method is subject to suitable surface and subsurface conditions being present at the crossing location, as well as the size, weight, and structural characteristics of the pipe and the capacity of the HDD rig and drill stem. This will be confirmed by a site-specific geotechnical investigation prior to construction.

The initial steps involved in the use of a HDD are to prepare the drill pad and exit pad sites and to set up the drill rig and associated equipment. Pad set up includes excavating temporary pits near the entry and exit points to capture and temporarily store drilling mud and soil cuttings, and

also includes installation of a buried anchor on the HDD rig side. APP does not currently anticipate using antifreeze agents within the HDD drill fluid. The drilling fluid will be pumped into the drill hole throughout the drilling process. The pressure of the drilling fluid will transmit hydraulic power to turn the drill bit, stabilize the drill hole, transport cuttings to the surface, and lubricate the drill bit. The mud and cuttings will be stored temporarily and then pumped from the temporary storage pits to an on-site recycling unit where the drilling fluid will be processed for reuse. In winter conditions the drill may be set up within a covered structure to keep the drill entry pit and associated equipment from freezing. Pumps and fuel tanks will be set up at this time to withdraw water from an approved source for use as drilling fluid make-up water.

The first drilling operation involves the drilling of a small-diameter pilot hole from the entry side to the opposite side of the crossing, the exit side.

As the pilot hole drilling activity progresses, the drill bit path will be monitored and steered throughout the HDD process to maintain the design path of the pilot hole. To enlarge the pilot hole, a larger reaming tool will be attached to the end of the drill on the exit side of the hole. The reamer will then be drawn back through the pilot hole to the drill rig on the entry side. Drill rod sections will be added to the rear of the reamer as it progresses toward the rig, thereby allowing a string of drill rod to remain in the hole at all times. Several passes of consecutively larger reaming tools will be required before the hole will be of sufficient size to accept the carrier pipe. The final hole diameter will likely be no less than 12 inches larger than the carrier pipe diameter (44 inches in diameter for the 32-inch-diameter PT Pipeline, and 60 inches in diameter for a 48-inch-diameter carrier pipe).

The crossing section pipe string, also referred to as the “pull section,” will be fabricated on the right-of-way or ATWS normally on the exit side of the crossing while the pilot hole is being advanced and reamed to size. The pipe string will be thoroughly inspected and pressure tested prior to installation. A steel pull-head will be welded onto the front end of the pull section to pull the crossing section through the drilled and reamed hole. After the hole is completed, the crossing section will be attached to the drill string on the exit side of the hole and pulled back through the drill hole toward the drill rig.

As the crossing section is being pulled in, excess drilling fluid will be collected, reused, incorporated into the soil in an upland area, or disposed of at an approved off-site disposal location. If water is left over from the drilling activity, it will be discharged into a well-vegetated upland area or into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale dewatering structure near the crossing site.

Unconsolidated gravel, coarse sand, and fractured bedrock all present geologic circumstances that might result in a drilling fluid release. These weak areas present potential escape pathways for drilling fluid that might be oriented either laterally or vertically. If drilling fluid moves laterally, the release may not be evident on the surface. For a release to be evident there must be a preferential pathway extending vertically from the drill hole to the surface of the ground or the bed of the watercourse. The volume of a potential mud release will be dependent on a number of factors, including the size of the pathway, the permeability of the geologic material, the viscosity of the drilling fluid, and the operating pressure of the hydraulic drilling system. An observation protocol will be prepared and implemented for any HDD site. The protocol will include requirements for visual observations along the drill path. Any mud release will be addressed in the spill response plan developed for the site.

Releases to the ground generally occur above and near the drill path near to the entry and exit pads. In the event drilling fluid is released on land, including within a wetland, a small pit with perimeter containment measures will be excavated at the release site to contain the drill fluid, and a pump will be used to transfer the drilling fluid captured in the pit to a containment vessel.

In the event of a release to a waterbody, APP will attempt to plug the flow path by adding thickening agents to the drilling fluid. Plugging agents that may be used include: higher viscosity drill fluid, sawdust, fibers, nut shells, bentonite pellets, natural gums, or other commercially available non-toxic products.

In most cases, an HDD can still be completed in spite of a drilling fluid release, however, in some situations, the HDD might fail entirely, and the watercourse may not be able to be crossed using this method. The presence of outwash, interspersed with boulders and cobbles, fractured bedrock, or non-cohesive coarse sands and gravels increase the likelihood drilling might fail due to refusal of the drill bit, collapse of the borehole in non-cohesive, unstable substrate, or failure to control the alignment of the pilot-hole drill path along the design path. In cases where drilling fails, waterbody construction will be completed using one of the alternative crossing methods described in this section.

Refer to Appendix 1E for drawings depicting typical HDD watercourse construction.

An HDD Contingency and Inadvertent Release Plan will be developed for the Project prior to construction to describe the prevention, detection, monitoring, notification, and corrective action procedures in the event of an inadvertent release of drilling fluid for HDD crossings.

Aerial-Span Crossing Method

An aerial-span crossing will generally be considered when geologic, topographic, fisheries, or hydrologic issues, or other conditions make the use of other crossing methods impractical, or where an existing crossing structure is present. Aerial-span crossing methods involve suspending an aboveground pipeline over the geographic feature to be crossed. The pipeline could be attached to an existing structure, such as a road of railway bridge; attached to a new, specially built structure, such as a suspension or fixed-span bridge; or simply span the waterbody without an additional supporting structure.

One or more types of aerial-span crossing methods are currently under consideration for APP:

- A single-span bridge with no bridge supports in the waterbody. Supports for the bridge will be located on each bank at either end of the bridge. The pipeline could be supported on the bridge or by a steel-girder or steel-plate structure under or on the side of the bridge;
- A multi-span bridge with bridge supports on each bank and one or more supports within the waterbody. The pipeline could be supported on the bridge or by a steel-girder or steel-plate structure under or on the side of the bridge;
- A steel-girder or steel-plate support bridge with or without one or more bridge supports, or footings, in the waterbody, depending upon the need; and
- A cable suspension bridge with or without an in-stream support, depending upon the width of the crossing.

With the aerial-span crossing method, soil disturbance will typically be limited to areas bordering the waterbody. In general, narrow waterbodies will not be disturbed because the bridge supports will be located above the high-water mark.

Refer to Appendix 1E for drawings depicting typical aerial-span crossings.

1.6.3.3 Road and Highway Crossings

Construction across paved roads and highways, and critical unpaved roads will be in accordance with Project-specific specifications, and the requirements of road crossing permits and approvals. Some major paved roads and highways, and critical unpaved roads will be crossed by conventional horizontal boring techniques. Other paved roads, smaller unpaved roads, and driveways will likely be crossed using the open-cut method, where permitted by local authorities or private owners.

Boring requires the excavation of a pit on each side of the feature to be crossed, the placement of boring equipment in one of the pits, then boring a hole under the road at least equal in diameter to that of the carrier pipe. Once the hole is bored, a prefabricated pipe section will be pushed or pulled through the borehole. For long crossings, sections might be welded onto the pipe string just before being pushed or pulled through the borehole. There will be little or no disruption to traffic at road or highway crossings where boring takes place.

The open-cut method across roadways will require temporary closure of the road to traffic, and establishment of detours. If no reasonable detour is feasible while performing the pipeline crossing of all road and highway crossings, APP will maintain emergency access for all crossings. The roads will be reclaimed using the same type of sub-bed and surface material as the original construction, or as specified by applicable crossing permits. Measures such as traffic control or posting signs at open-cut road crossings will be taken to promote safety and reduce traffic disruptions.

The Project will work with authorities having jurisdiction over road, highway, and utilities to be crossed by the pipeline to determine acceptable crossing methods and to obtain crossing permits and develop traffic management plans as necessary. Table 1.6.3-1 lists major roads crossed by the Project. [Note: Information for road crossings is still being evaluated and will be updated in the final report.]

TABLE 1.6.3-1

Alaska Pipeline Project
Major Road Crossings

Segment/Road Name	Approximate Milepost [a]	Land Ownership	Crossing Method
POINT THOMSON GAS TRANSMISSION PIPELINE			
TBD	17.9	TBD	TBD
Endicott Road	46.7	TBD	TBD
TBD	50.6	TBD	TBD
TBD	50.7	TBD	TBD
TBD	54.7	TBD	TBD
TBD	55.4	TBD	TBD
TBD	55.4	TBD	TBD
TBD	56.6	TBD	TBD
TBD	57.3	State	TBD
TBD	58.3	State	TBD
ALASKA MAINLINE			
TBD	0.6	State	TBD
TBD	3.9	State	TBD
TBD	3.9	State	TBD
Kuparuk Pipeline Road	4.6	State	TBD
TBD	5.3	State	TBD
TBD	68.1	State TA	TBD
119A-APL-3	115.7	State TA	TBD
119-APL-1	120.2	State	TBD
118-APL-1	124.9	Federal	TBD
TBD	126.6	Federal	TBD
Dalton Highway	131.8	Federal	TBD
116-APL-6	132.0	Federal	TBD
116-APL-1	136.5	Federal	TBD
TBD	138.4	Federal	TBD
115-APL-3	139.2	Federal	TBD
Dalton Highway	139.3	Federal	TBD
TBD	144.0	Federal	TBD
Dalton Highway	147.5	Federal	TBD
TBD	155.7	Federal	TBD
TBD	158.2	Federal	TBD
TBD	158.9	Federal	TBD
TBD	165.6	State TA	TBD
Dalton Highway	165.9	State TA	TBD
Dalton Highway	171.7	Federal	TBD
110-APL-1B	172.1	Federal	TBD
Dalton Highway	179.7	Federal	TBD
Dalton Highway	181.5	Federal	TBD
107-APL-1	193.8	Federal	TBD
Dalton Highway	209.5	Federal	TBD
104-APL-1A	211.5	Federal	TBD
Dalton Highway	213.5	Federal	TBD
102-APL-3	221.7	State TA	TBD
Dalton Highway	227.9	Federal	TBD

TABLE 1.6.3-1

Alaska Pipeline Project
Major Road Crossings

Segment/Road Name	Approximate Milepost [a]	Land Ownership	Crossing Method
101-APL-2	228.0	Federal	TBD
TBD	228.1	Federal	TBD
TBD	228.2	Federal	TBD
TBD	228.3	Federal	TBD
101-APL-1	228.4	Federal	TBD
101-APL-1	228.9	Federal	TBD
TBD	230.2	Federal	TBD
Wiseman Road	230.7	Federal	TBD
100-APL-2	231.8	Federal	TBD
100-APL-2	232.4	Federal	TBD
Dalton Highway	234.0	Federal	TBD
Dalton Highway	236.3	State TA	TBD
99-APL-4	236.3	State TA	TBD
99-APL-3	237.9	State TA	TBD
TBD	238.9	State TA	TBD
98-APL-4A	241.4	State TA	TBD
Dalton Highway	242.4	State TA	TBD
TBD	246.9	Federal	TBD
TBD	254.3	State TA	TBD
Dalton Highway	255.4	State TA	TBD
96-APL-1	258.6	State TA	TBD
TBD	260.4	State TA	TBD
Dalton Highway	262.9	State TA	TBD
TBD	265.8	State TA	TBD
TBD	267.4	State TA	TBD
Dalton Highway	268.4	State TA	TBD
Dalton Highway	270.1	State TA	TBD
TBD	271.0	State TA	TBD
TBD	308.4	State TA	TBD
TBD	308.8	Federal	TBD
TBD	309.9	Federal	TBD
86-APL-4B	310.1	Federal	TBD
Dalton Highway	315.4	State TA	TBD
TBD	322.0	State TA	TBD
83-APL-2	329.7	State TA	TBD
Dalton Highway	345.3	State TA	TBD
Dalton Highway	350.7	State TA	TBD
79-APL-2	351.5	State TA	TBD
79-APL-1	354.2	State TA	TBD
Dalton Highway	361.2	State	TBD
Dalton Highway	362.9	State	TBD
77-APL-1	367.1	State	TBD
76-APL-1A	371.8	State	TBD
Dalton Highway	373.8	State	TBD
75-APL-3	375.4	State	TBD
75-APL-2	377.2	State	TBD

TABLE 1.6.3-1

Alaska Pipeline Project
Major Road Crossings

Segment/Road Name	Approximate Milepost [a]	Land Ownership	Crossing Method
Dalton Highway	379.9	State	TBD
TBD	381.4	State	TBD
74-APL-2	383.2	State	TBD
Dalton Highway	384.5	State	TBD
73-APL-1	385.8	State	TBD
71-APL-2	397.6	State	TBD
71-APL-1	398.9	State	TBD
Dalton Highway	401.7	State	TBD
Elliott Highway	404.3	State TA	TBD
Elliott Highway	419.5	State	TBD
TBD	420.3	State	TBD
Elliott Highway	420.7	State	TBD
TBD	421.3	Private	TBD
67-APL-1	423.2	State	TBD
TBD	426.2	State	TBD
66-APL-2	427.7	State	TBD
66-APL-1	429.7	State	TBD
65-APL-3	430.9	State	TBD
65-APL-1	433.5	State	TBD
64-APL-2	438.3	State	TBD
TBD	441.2	Borough	TBD
63-APL-3	442.8	Borough	TBD
63-APL-2	445.5	State	TBD
62-APL-1	448.8	Federal	TBD
Murphy Dome Road	451.9	Borough	TBD
Elliott Highway	453.1	TBD	TBD
TBD	455.4	State	TBD
Steese Expressway/Highway	455.6	Private	TBD
Chena Hot Springs Road	468.5	TBD	TBD
TBD	479.9	Military	TBD
TBD	481.3	Military	TBD
TBD	482.8	Military	TBD
TBD	485.8	Military	TBD
TBD	485.8	Military	TBD
TBD	485.9	Military	TBD
TBD	486.0	Military	TBD
TBD	495.4	Private	TBD
Johnson Road	495.5	State	TBD
54-APL-2	495.7	State TA	TBD
TBD	503.6	State	TBD
TBD	507.3	State	TBD
TBD	523.0	State	TBD
49-APL-2	526.3	State	TBD
TBD	531.9	State	TBD
Quartz Lake Road	534.6	State	TBD
TBD	538.4	Private	TBD

TABLE 1.6.3-1

Alaska Pipeline Project
Major Road Crossings

Segment/Road Name	Approximate Milepost [a]	Land Ownership	Crossing Method
Rika's Road	539.3	Private	TBD
Tanana Loop Road	540.5	State	TBD
TBD	545.2	State	TBD
Jack Warren Road	545.5	University	TBD
Nistler Road	547.7	Private	TBD
TBD	548.1	TBD	TBD
TBD	550.7	Private	TBD
Clearwater Road	554.0	Private	TBD
TBD	554.1	Federal	TBD
TBD	554.3	Federal	TBD
TBD	555.7	Private	TBD
TBD	556.3	Private	TBD
TBD	558.0	Private	TBD
Spruce Road/AG 1410	558.8	Private	TBD
Sawmill Road/1403	565.3	State TA	TBD
TBD	576.4	State	TBD
TBD	576.9	State	TBD
TBD	578.4	Private	TBD
Alaska Highway	580.3	State	TBD
TBD	585.3	State TA	TBD
TBD	586.6	State	TBD
TBD	589.9	State	TBD
TBD	598.7	State TA	TBD
TBD	607.0	Private	TBD
Alaska Highway	611.0	Private	TBD
Alaska Highway	618.8	State	TBD
TBD	619.2	State	TBD
TBD	629.3	State	TBD
Alaska Highway	637.7	Private	TBD
TBD	643.1	Private	TBD
Tanacross Road (Old)	644.4	Private	TBD
TBD	646.0	State	TBD
TBD	656.4	Private	TBD
TBD	661.1	Military	TBD
TBD	662.2	Private	TBD
TBD	663.1	Private	TBD
Taylor Highway	667.7	Private	TBD
TBD	688.5	Private	TBD
TBD	689.3	Private	TBD
TBD	728.3	State TA	TBD
Alaska Highway	742.0	State TA	TBD

[a] PTM 0 starts at the PTU; AMP 0 starts at PBU.
TA - Tentatively Assigned.

Refer to Appendix 1E for typical drawing depicting typical road and highway crossing construction.

1.6.3.4 Trans-Alaska Pipeline System, Utility, and Third-Party Pipeline Crossings

Buried and overhead pipelines and utilities will be crossed during construction of APP. As a safety precaution, prior to the start of right-of-way grading and access construction activities, all overhead crossings will be identified and a warning system referred to as "goal posts" will be installed on each side of the overhead utility crossing. This system is typically made up of two small-diameter non-conductive posts installed in the ground on each side of the right-of-way. A rope is installed between the vertical posts at a safe height. The goal posts will be installed to allow for equipment to safely pass under the overhead utility without a line strike.

Crossings of TAPS will be in accordance with procedures approved by TAPS operator. Buried utility crossings include communication, electrical, pipeline (water, sewer, or hydrocarbon transmission pipelines), or other types of buried utilities. APP will design crossings of existing facilities that have cathodic protection to ensure that the existing system and the APP cathodic protection system are compatible. These buried crossings will then be identified visually with the use of a hydro-vacuum system that removes the soil cover from the buried utility without the use of mechanical excavation equipment. The depth and exact location will then be marked in advance of construction. APP will work closely with the Alaska Joint Pipeline Office and Alyeska Pipeline Service Company to develop site-specific drawings for crossing the TAPS.

Refer to Appendix 1E for drawings depicting existing typical pipeline and utility line crossings.

Tables 1.3.1-2 and 1.3.1-3 summarize the proximity of the APP routes to highways, major roads, TAPS, other pipelines, and other parallel utilities within Alaska. Appendix 1C provides detailed information regarding the Alaska Mainline's and PT Pipeline's proximity to existing rights-of-way by milepost. Refer to Appendix 1E for typical drawing depicting existing pipeline and typical utility line crossings.

1.6.3.5 Longitudinal and Cross Slopes

Areas of steep terrain may require special construction techniques for pipeline installation. Such techniques might include constructing a shoo-fly access around the slope for use by pipeline equipment and rubber-tired traffic. The shoo-fly may reduce the construction right-of-way width for these slope areas in some locations.

Grading might be required in areas where the pipeline crosses steep slopes. Steep slopes may need to be graded to a shallower slope angle to accommodate pipe-bending limitations and to provide for safe operation of construction equipment and support vehicles. In such areas, the slopes will be graded. Longitudinal slopes are linear along the right-of-way, while cross slopes are generally perpendicular to the right-of-way. Grading of longitudinal and cross slopes in areas of thaw-sensitive permafrost will be limited and subject to special measures to address potential thermal degradation. Refer to Appendix 1E for drawings depicting typical construction on slopes.

In areas where the pipeline route crosses laterally along the side of a slope, a built-up work pad is required to create a safe, relatively flat terrace. Mitigation measures and techniques to reduce impacts when working on slopes will be applied according to APP's Plan (refer to Appendix 1J).

Different construction methods are required to address thaw-stable and thaw-sensitive soils while preparing the right-of-way work pad.

Temporary sediment barriers will typically be installed during clearing activities to prevent the movement of disturbed soil off the right-of-way. Temporary slope breakers consisting of mounded and compacted soil will typically be installed across the right-of-way as part of the grading activities. Permanent slope breakers will be installed during cleanup.

To reduce the volume of cut and fill material while constructing a flat work surface on cross slopes, measures may be taken to reduce the width of either the spoil area or the travel area, or both. On cross slopes greater than two percent, a safety buffer will be included as part of the construction right-of-way. On cross slopes greater than 10 percent, a bypass travel lane will be required. Specific right-of-way preparation and corresponding workspace requirements are identified in Appendix 1H.

Pipeline construction efficiency is reduced on side slopes when the width of the right-of-way is reduced. The width of the right-of-way physically limits the amount of equipment and number of people that can work safely in a common area. Because the right-of-way is congested due to the reduced width, the construction workforce responsible for stringing, bending, welding, trenching, and lowering-in the pipe will have to function at a slower production rate compared to the typical construction crews and their expected efficiency.

The safety buffer will increase the width of the travel area, but is required for safe travel along the construction right-of-way. The width of the safety buffer from the edge of the fill slope will depend on the properties of the fill material and angle of the cross slope.

Following pipe installation activities, reclamation will be completed in accordance with Project-specific reclamation and re-vegetation specifications.

1.6.3.6 Geologic Faults

Pipelines crossing potentially-active fault zones must be able to deform in a longitudinal and transverse direction to accommodate potential ground surface displacements at active faults without failing or resulting in a rupture or natural gas leak. The Alaska Mainline will traverse areas of seismic activity and known major potentially-active fault crossings along the pipeline as described in Resource Report 6. The PT Pipeline does not cross any known potentially-active fault areas.

APP facilities will be designed to accommodate any longitudinal strains associated with seismic faults and environmental loading to be encountered on the right-of-way. To allow the pipeline to move in event of seismic activity, APP is planning to install the pipeline at known active faults with an aboveground configuration similar to the existing TAPS design at the Denali Fault. An aboveground support system will be installed to mitigate potential stresses and strains in the pipe due to fault movement. A sliding support design concept will be used for fault crossings with sufficient sliding capacity to accommodate fault rupture. Grade beams laid on the ground surface will serve as sleeper supports. The aboveground crossing concept will be similar for all major fault crossings, but the crossing layout dimensions and orientation will vary depending on the type of fault slip, width of the fault zone, and the amount and direction of estimated displacement. Similarly, sleeper beam and pipe shoe dimensions will also vary.

Refer to Appendix 1E for drawings detailing typical major fault-crossing layouts which show single Zee and U-shaped layouts. In some cases a multiple Zee arrangement may be required. This will be determined during detailed design.

1.6.3.7 Agricultural Land

Section 8.2.2.3 of Resource Report 8 identifies locations that are actively used for agricultural purposes. Depth requirements will be made a part of the easements and grants of rights for agricultural properties. APP will consult with landowners where soil needs to be imported to determine the compatibility and placement of such imported soils. APP will consult with landowners regarding final cleanup activities. APP's Plan addresses relevant aspects of pipeline construction and reclamation as they relate to cultivated lands (e.g., topsoil segregation, depth of cover, compaction limits, rock removal, irrigation/drain structures, weed and pest control, and easement restrictions). The APP Plan also identifies a dispute resolution process to address potential issues associated with alleged lack of success of soil reclamation, the acceptable level of crop production on the construction area, repairs to agricultural-related features, or any other items addressed by the APP Plan.

As part of the land acquisition process, negotiations with affected landowners will be undertaken to obtain easement agreements for the pipeline right-of-way across actively cultivated areas. Financial impacts associated with crop damage or potential harvest productivity losses caused by construction activities will be addressed during those easement negotiations.

1.6.3.8 Residential, Commercial, and Industrial Areas

[Note: APP is still evaluating whether any residences will be located within 50 feet of construction work areas. Additional information will be provided in the final report. An updated list of the residences within 50 feet of the construction work areas by MP, approximate distance from the construction work area, and approximate distance and direction from the pipeline centerline will be provided with Resource Report 8 in the final report.]

In residential areas, construction activities will be completed in a manner that will reduce disturbance to the residents. While working in such areas, APP will maintain access to the residences for the duration of construction activities. When construction activities involve crossing of roadways necessary for access to private residences and no alternative entrance exists, APP will implement special accommodation measures, such as the installation of temporary bridging over the open portion of the trench, to maintain passage for landowners and emergency vehicles.

APP will either narrow down the construction right-of-way or adopt a centerline alignment adjustment to avoid occupied structures. APP will erect temporary safety fences on both limits of the right-of-way that will extend along the construction right-of-way for a minimum distance of 100 feet beyond any nearby residence. Homeowners will be notified in advance of any anticipated utility disruption, including expected outage durations.

During summer construction, topsoil may be segregated from subsoil in residential areas, where possible, unless specifically requested not to do so by a landowner, or the Project may elect to import topsoil during its cleanup and reclamation activities. Following construction, debris will be removed and residential areas will be reclaimed to near preconstruction conditions.

APP will develop construction mitigation plans for residences within 50 feet of the construction work area. These plans will identify the mitigation measures that will be implemented to promote safe and efficient pipeline installation with reduced impacts on nearby developments.

1.6.3.9 Construction in Permafrost

In some cases, the special construction techniques described below may need to be implemented in permafrost terrain. These will be primarily applied where thaw-sensitive permafrost is present. Where thaw-stable permafrost is present, conventional construction methods will generally be applied.

Prior to construction, a geotechnical verification program may be conducted where additional subsurface soils data is desired to refine construction techniques. This program may involve mobilizing drilling rigs to advance boreholes at selected locations.

Specific concerns/issues related to pipeline construction in permafrost terrain will be addressed as described in the following subsections.

1.6.3.10 Slopes

In some cases, right-of-way clearing on slopes may be restricted in width or may be deferred until just before pipeline construction in order to protect the thermal regime of the soils. In these cases, an access route, or shoo-fly, around the partially cleared or uncleared slopes will be required. Additionally, the root structure of established vegetation will generally be left in place to reduce disturbance of surface organics for thermal protection. In some cases, a narrowed construction right-of-way will be considered as part of the mitigation strategies. A best Management Practices (BMP) tool kit will be implemented to reduce the rate of permafrost thaw, or in site-specific cases, potential preservation of the permafrost, will be designed and applied at the time of construction.

1.6.3.11 Grading

Preparation of the right-of-way normally involves cutting and filling to build a level work surface in order to proceed with pipeline construction. In the presence of thaw-sensitive soils on slopes, the general rule will be to reduce cuts and to apply fill in order to provide a uniform work surface. In some cases, a level granular pad or winter pad (snow/ice) will be installed on the right-of-way.

1.6.3.12 Trenching

Excavation of the pipe trench in permafrost will be much like trenching in seasonally frozen soils with either trenchers or excavators. In some cases, however, depending on soil conditions, drilling and blasting will be required before trenching with excavators. Immediately following drilling and blasting, excavation will take place in order to prevent soils from re-bonding.

1.6.3.13 Backfilling

In locations of high-ice-content soils, an excavated trench typically will require supplemental imported backfill to offset volume loss due to thawing in subsequent summer seasons. This backfill will be of low-ice-content, thaw-stable materials sourced from nearby borrow sites.

1.6.3.14 Blasting

Drilling and blasting operations will be required at some locations where shallow or exposed bedrock is encountered during right-of-way preparation or during excavation of the pipeline trench. In addition, certain soil conditions with boulders, cobbles, or gravel/granular materials in permafrost may require blasting depending on the proportion of coarse granular materials and the nature of the permafrost. Some watercourse crossings may also require blasting depending on specific conditions and the proposed crossing method at these sites. Blasting may also be used at some borrow sites to loosen material that may be frozen or in a dense consolidated

state. Appendix 6C of Resource Report 6 identifies the areas along the pipeline route by MP where blasting may be required.

APP will provide adequate notice to adjacent landowners or tenants in advance of blasting. This will generally include notification to landowners and residents within approximately 2 miles of the blast area. In addition, APP will place notification in newspapers and post local radio notices for larger areas.

Blasting activities will be performed in accordance with manufacturers' prescribed safety procedures, industry practices, and comply with applicable regulations and permits, including Alaska Department of Fish and Game (ADFG) criteria for blasting within or near streams that support fish resources.

1.6.4 ABOVEGROUND FACILITY CONSTRUCTION PROCEDURES

1.6.4.1 Gas Treatment Plant

The GTP will be constructed in accordance with APP's construction standards and applicable regulatory requirements, and will follow industry-accepted practices and procedures.

The GTP will be constructed on a new gravel pad. GTP personnel will arrive on the North Slope via Deadhorse Airport and drive to the GTP site or be transported via shuttle service to the site. No other airstrips are planned to be used. Medical facilities will be provided on the GTP site. APP will evaluate the sharing of fire protection, medical, and area security services with other PBU users, but will have its own site security services.

Construction of the GTP will be completed in accordance with the APP Plan (refer to Appendix 1J) and Procedures (refer to Appendix 1K), as applicable, however, due to the prevalence of wetlands and waterbodies in the GTP work areas, construction on the tundra (i.e., installation of work pads and road construction) will primarily be completed in winter to reduce tundra degradation. Gravel will be mined utilizing ice roads and existing roads for gravel transport, and pilings for the DH2 expansion will be installed. Construction activity during summer months will mostly be located on roads or gravel pads to reduce tundra degradation.

APP is planning to construct transfer lines (i.e., for CGF gas supply, CO_2 return, propane transfer, fuel gas transfer, and water transfer) on Vertical Support Members. The transfer lines are planned to be pressure-tested. If water is used for the test, the water likely will be withdrawn from the Putuligayuk River or other available sources, mixed with additives, and stored in tanks on the GTP pad during the three winter construction periods. The water will be disposed of in the GTP Class I disposal wells at the end of construction.

GTP facilities will be constructed on a gravel pad designed to insulate the permafrost. After the site has been prepared, piles will be installed to support modules, buildings, equipment, and structures. The majority of the GTP will be modularized and transported to site via barge and SPMT. The remaining facilities will be constructed on site. Piping will generally be welded, except where it is connected to flanged components. Welders and welding procedures will be qualified in accordance with applicable codes. The facilities will be connected, tested, and commissioned prior to operation.

Construction activities and storage of construction materials and equipment will require the use of the Project area and other existing commercial storage areas on the ANS. Water for the site will initially be trucked in from the North Slope Borough or sourced from a nearby lake or river until the dedicated GTP reservoir is operational. Waste water and other select liquid wastes will

initially be disposed of at North Slope Borough facilities until the on-site Class I disposal wells are completed. Debris and wastes generated from construction will be disposed of at an approved disposal site.

Required construction support facilities at the GTP will include a construction camp sized for up to approximately 800 workers. During early construction, approximately 270 field personnel will be housed at available hotels and contractor-owned facilities in Deadhorse. Field personnel will commute daily to the GTP work locations by bus service and typical construction crew cab trucks. The following summarizes the general chain-of-events that will occur during GTP site construction:

- Ice road installation connecting the GTP to the Put-23 mine and the water reservoir site, construction of the GTP gravel pad and access roads, as well as main haul road modifications and the water reservoir;
- DH2 modification;
- Channel dredging and first-year maintenance dredging/screeding;
- Installation and start-up of the main construction camp;
- Installation of underground electrical lines;
- Installation of temporary facilities (including construction fabrication buildings) and temporary power, water supply, and waste disposal to support these facilities. Installation of piles for first sealift;
- Installation of modules from Sealift 1, followed by hook-up, commissioning, and start-up. Installation of piles for Sealift 2;
- Installation of modules from Sealift 2, followed by hook-up, commissioning, and start-up. Installation of piles for Sealift 3; and
- Installation of modules from Sealift 3, followed by hook-up, commissioning, and start-up.

1.6.4.2 Compressor Stations

The compressor stations will be constructed in accordance with APP's construction standards, will follow industry-accepted practices and procedures, and comply with and DOT pipeline safety regulations.

In permafrost areas, compressor station facilities will be constructed on a gravel pad. The pad thickness will vary and depend on soil and permafrost conditions at the site. Where required an air-space separation between the pad and the base of the facilities structure will be maintained. In non-permafrost terrain, the pad will be thinned and the airspace will not be required. After the site has been prepared, piles will be installed to support buildings, equipment, and structures. Compressor buildings will be constructed on site by erecting steel frame structures followed by the installation of the roofing and walls. Prefabricated utility building skids will be installed along with major vessels and equipment. Piping will generally be welded, except where it is connected to flanged components. Welders and welding procedures will be qualified in accordance with API Standards or the American Society of Mechanical Engineers Boiler and Pressure Vessel code. Welds in natural gas piping systems will be examined using radiographic, non-destructive, ultrasonic testing or other approved examination procedures. Station piping will be installed above-grade with the exception of some piping runs that will be installed below grade to allow vehicular access to equipment and buildings. Electrical and

instrument cabling will then be installed. Natural gas piping systems will be checked and pressure-tested. Finally, the compressor station will be tested and commissioned prior to operation.

Construction activities and storage of construction materials and equipment will require the use of the Project area and other existing commercial storage areas. Water for the station will be trucked in or sourced from an on-site well. Waste water and other station wastes will be stored on site and trucked to an approved disposal site. Small amounts of waste will be incinerated on site. Debris and wastes generated from construction will be disposed of at an approved disposal site.

1.6.4.3 Custody Transfer Meter Stations

Many of the procedures used in meter station construction will be similar to those used in compressor station construction described above.

Meter station facilities will be constructed on gravel pads developed as part of the GTP and PTU sites. Following the installation of piles, building skids will be installed along with the scrubber, meter runs, and aboveground piping. Piping will generally be welded, except where it is connected to flanged components. Piping segments will be prefabricated and transported to the site. Electrical and instrument cabling will then be installed. Finally, high-pressure natural gas piping systems will be checked and pressure-tested, and the meter station will be fully tested and commissioned prior to operation.

1.6.4.4 Mainline Block Valves and Launchers and Receivers

Launchers and receivers will be constructed concurrently with compressor stations and meter stations using similar construction methods.

MLBV and compressor station side valve assemblies will be prefabricated and tested prior to installation, and will generally be installed after construction and testing of the pipeline is complete. Upon completion, the site will be fenced. Gravel may be applied at sites, if necessary.

1.6.4.5 Intermediate Gas Delivery Points

APP will install provisions for a minimum of five future intermediate sales gas delivery points along the Alaska Mainline (refer to Table 1.3.2-1). At each intermediate gas delivery point, a tee with an isolation valve and blind flange, or pipe stub to accommodate a future hot tap will be installed.

1.6.5 INFRASTRUCTURE CONSTRUCTION

1.6.5.1 Access Roads

To construct all-season access roads, the area to be constructed will be surveyed, staked, cleared of any trees, and graded as necessary. Compacted granular material, soil, ice, and/or snow will then be placed to create a trafficable surface where needed. Trees and brush within the construction area will be cut and mulched or burned. If leveling is required, low areas will be filled with granular material or thaw-stable material and high areas will be graded to establish a level area. The access road will 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. Where bridging over waterbodies or culverts are required, APP will follow the APP Procedures (refer to

Appendix 1K). In addition, culverts will be removed and waterbody crossings and drainage patterns will be stabilized.

APP will provide regular maintenance of roads under the Project's control as needed to maintain a trafficable surface and to control water or seasonal runoff.

Constructing access roads will require water for compacting fill material, for other construction activities, and for use by personnel. Section 2.3.5.3 of Resource Report 2 provides additional discussion of water use for constructing access roads.

1.6.5.2 Helipads

Where helipad sites are established (refer to Section 1.3.3.2), the site will be stabilized and leveled. Where required, borrow material (i.e., for gravel pads) will be installed for stability. In some cases the right-of-way may be sufficiently stable to allow helicopter operations without the use of a gravel pad. Before construction begins, the limits of the construction area, including the area for the actual pad, will be surveyed and staked. The helipad sites will be cleared of vegetation, leveled, and stabilized using gravel hauled to the site on approved access routes. Upon completion of post-construction reclamation, the gravel pad for temporary helipad sites will be left in place along with access roads where needed for use during operations. If required the disturbed areas will be finish-graded and left in as close to preconstruction conditions as practicable. Any trash and debris will be reused or recycled as appropriate, or disposed of in compliance with federal, state, and local regulations. Areas requiring revegetation will be seeded as soon as practicable after final cleanup. Revegetation will be carried out in accordance with APP's Plan (refer to Appendix 1J).

1.6.5.3 Airstrips

Where non-commercial airstrips need to be upgraded (refer to Section 1.3.3.2), the limits of the construction areas will be surveyed and staked. The sites will then be cleared, leveled, and stabilized by hauling borrow material to the site on approved access routes, as necessary. Facilities needed for operation of the airstrips will then be installed to facilitate use of the site for Project construction support purposes. If required, upon completion of post-construction reclamation, the disturbed areas will be finish-graded. Trash and debris will be disposed of in compliance with federal, state, and local regulations. APP will remove all non-essential buildings, fuel storage, secondary containment structures, powered traffic controls, and any other materials specifically mobilized for the Project. APP will leave the airstrip surface in place along with access roads and non-powered traffic controls.

Existing airstrips currently in operation will be reclaimed in accordance with APP's plan and landowner requirements after removing Project-specific buildings, fuel storage, secondary containment structures, and any other materials specifically mobilized for the Project.

Areas requiring revegetation will be seeded as soon as practicable after final cleanup. Revegetation will be carried out in accordance with APP's Plan (refer to Appendix 1J).

1.6.5.4 Construction Camps, Storage Areas, and Contractor Yards

As stated in Section 1.3.3.2, camps, storage areas, and contractor yards will be established at previously disturbed sites to the extent possible. Where new sites are established or existing sites need to be expanded, the limits of the construction area and the area for the actual pad will be surveyed and staked. The sites will then be cleared of vegetation and the ground leveled and stabilized, as necessary (e.g., using gravel pads), prior to installation of the site facilities.

The sites will be reclaimed when no longer needed. Final grade will be accomplished using acceptable excess material stored on site during the initial site development. Care will be taken to limit erosion, establish stable contours, and reclaim surface drainage patterns as close to preconstruction conditions as practicable. After cleanup is completed, the disturbed areas will be protected by the implementation of erosion control measures, including site-specific contouring or permanent slope breakers. The erosion control measures used will be in accordance with APP's Plan (refer to Appendix 1J) and other measures approved by the local soil conservation districts and appropriate agencies. Areas requiring revegetation will be seeded as soon as practicable after final cleanup. Revegetation will be carried out in accordance with APP's Plan.

1.6.5.5 Borrow Sites

Borrow sites will be surveyed and staked, any trees and brush will be cleared, an access road from the road or highway will be constructed, and a portion of the total footprint will be graded level for equipment use. APP will comply with U.S. Bureau of Land Management and Alaska Department of Natural Resources permit requirements for site preparation prior to borrow material removal.

Once the borrow site has been prepared, the contractor will mobilize crushing and screening equipment, a mobile office, and fuel tanks. In some cases, a small camp to house personnel will be brought to the site.

Borrow material will be processed to meet the demands of its intended use:

- General fill: An unsorted mix of granular material. General fill is typically used as non-specific fill or to build up an embankment on a severely uneven surface and is used as sub-grade material for gravel pads.
- Graded granular: A granular material that has been crushed or screened to a certain granular size. Graded granular material is typically used for road surfacing, concrete aggregate, padding and bedding for the pipeline, or as a surface grade for gravel pads.

After being mined and processed, granular borrow typically will be stockpiled and transported to the construction site.

Where suitable material cannot be segregated from the trench spoil or right-of-way cuts, material will be imported from these borrow sources.

1.6.6 CONSTRUCTION WORKFORCE

The anticipated workforce associated with the APP is currently planned to include:

- Pipeline: For the current pipeline construction plan, a peak pipeline workforce of approximately 5,000 to 7,000 will be required during construction of APP, with individual pipeline spreads reaching up to 1,400 people;
- Compressor Stations and Meter Stations: For the current pipeline construction plan, it is anticipated that each compressor station will be constructed in approximately 350 days and require approximately 150 personnel to construct, inspect, and pre-commission the facility. It is anticipated that a meter station will be constructed in approximately 100 days. Each meter station will require approximately 100 personnel to construct, inspect, and pre-commission the facility; and

- GTP: For the current construction plan, construction of the GTP, including GTP infrastructure and dock modifications, will require approximately 800 workers.

[Note: Other infrastructure (e.g., borrow sites) workforce information will be updated in the final report.]

Resource Report 5 provides additional discussion about the Project's construction workforce and related socioeconomic impacts.

1.7 ENVIRONMENTAL COMPLIANCE, TRAINING, AND INSPECTION

1.7.1 ENVIRONMENTAL COMPLIANCE

APP will incorporate the environmental requirements and Project-specific environmental mitigation plans into specifications and construction drawings issued with construction bid documents for the Project. During pre-bid meetings, APP will notify prospective contractors of the environmental requirements that will apply to the Project. Where environmental permits are received after bidding, APP will work with the affected contractors to ensure compliance with the new permit requirements. During construction, if a contractor does not comply with environmental requirements, as soon as APP becomes aware of the issue, APP will direct the contractor to comply and, if necessary, issue a stop-work order for that crew until the non-compliance is corrected, and, where warranted, take other appropriate actions.

Before construction, APP will develop a third-party environmental compliance monitoring plan for the Project.

1.7.2 ENVIRONMENTAL TRAINING

APP will conduct environmental training for company and contractor supervisory personnel. The training program will focus on APP's environmental requirements, Project-specific permit conditions, and Project-specific mitigation plans. In addition, APP will provide training sessions before each crew commences construction with periodic follow-up training. Newly assigned personnel will be provided equivalent training by APP's environmental inspectors (EIs).

1.7.3 ENVIRONMENTAL INSPECTION

APP will assign at least one EI per construction spread to monitor environmental compliance. APP's EIs will be responsible for monitoring compliance with the requirements of permits, clearances, and other approvals of an environmental nature that are issued for the Project; evaluating the construction contractor's implementation of the environmental mitigation measures required by the CPCN, permits and other approvals; issuing stop-activity orders and corrective actions to maintain environmental compliance; documenting compliance with environmental requirements; and preparing required status reports for the FERC and other agencies. APP's EIs may also serve as APP's field representatives when environmental regulatory agencies (e.g., FERC) visit the Project during construction.

1.8 OPERATION AND MAINTENANCE PROCEDURES

The pipelines and pipeline-related Aboveground Facilities will be operated and maintained to meet the requirements of the U.S. Department of Transportation, Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards (49 C.F.R. Part [pt.] 192) and other applicable federal and state requirements.

1.8.1 PIPELINE AND ABOVEGROUND FACILITY OPERATIONS

1.8.1.1 Pipelines, Meter Stations, and Compressor Stations

The pipeline system, including meter stations and compressor stations, will be monitored and operated around-the-clock from a central Gas Control Center. Appropriate redundancies and backup facilities will be provided to monitor operational reliability. The Gas Control Center will monitor meter stations and monitor and control compressor stations via a SCADA system and telecommunications infrastructure. Compressors will be started up and shutdown automatically from this location. Compressors can also be operated locally if needed.

The stations are designed for unmanned operation, however, accommodation modules are planned to be provided for housing personnel during operation. In addition, equipment health will be monitored via SCADA.

Meter stations will be equipped with gas detection and alarm systems. Compressor stations will be equipped with gas detection and fire protection to comply with applicable regulations. Emergency shutdown systems will be designed to be initiated automatically or locally if an unsafe condition is detected. Overpressure protection monitoring will prevent over-pressuring of natural gas piping and equipment.

Line break low-pressure control devices will be installed on MLBVs. These include pressure-sensing devices that will automatically close a valve if the pipeline gas pressure drops below a pre-established value.

A regional operations and maintenance office located in the Fairbanks area is currently planned to maintain the pipeline and Aboveground Facilities.

1.8.1.2 Gas Treatment Plant

The GTP will be monitored and controlled from a control center located on the GTP site. Gas detection and alarm systems will be installed throughout the facility and emergency depressuring and/or shutdown systems will be designed to be initiated automatically, locally (at the equipment module), or remotely (in the control room). In addition, an equipment health monitoring system will be installed to collect and trend data, monitor critical rotating equipment, and manage data so that it can be accessed both locally and remotely to enable troubleshooting, optimization, and predictive maintenance planning.

1.8.1.3 Emergency Response

Emergency preparedness and response plans will be developed to address and mitigate occurrences involving public or personnel safety or environmental protection. Emergency response equipment will be located at the GTP, the operations and maintenance office, and possibly at other locations along the Alaska Mainline. APP will establish and maintain communication with local industry and government fire and emergency response officials regarding its response plans.

1.8.2 RIGHT-OF-WAY MONITORING AND MAINTENANCE

1.8.2.1 Integrated Public Awareness Program

APP will develop an integrated public awareness program to educate and inform excavators, contractors, emergency services, public officials, and landowners about pipeline safety associated with the pipeline and GTP. Information will be communicated through newspaper advertisements and Project-specific mailings to targeted audiences.

1.8.2.2 Pipeline Patrol and Leak Detection

Aerial and, where necessary, ground patrols will be performed periodically to survey the right-of-way for evidence of gas leaks, unauthorized encroachments, soil disturbances, or other conditions that might affect the integrity or operation of the pipeline. Any land development in the vicinity of the right-of-way will also be monitored for encroachments into APP's right-of-way.

The pipeline will be clearly marked at crossings of roads and other key points. Markers identifying the operator will indicate the presence of the pipeline and provide a contact number and address in the event of an emergency, or before any excavation in the area by a third-party should occur. APP will participate in Alaska's One-Call system also called "Digline."

1.8.2.3 Right-of-Way Maintenance

Large brush and trees along the pipeline operational right-of-way will periodically be cut or trimmed back in order to maintain visibility during pipeline patrols and to facilitate access during maintenance. The frequency of vegetation maintenance will depend upon the vegetation growth-rate and any applicable regulatory requirements. Normally, vegetation maintenance will not be undertaken in agricultural or rangeland pasture areas.

Pipeline integrity surveys and vegetation maintenance may identify areas on the right-of-way where erosion control devices require repair, or additional erosion control devices are required. In these cases the right-of-way will be repaired and erosion control devices will be fixed or new ones installed to prevent degradation of the right-of-way.

1.8.3 PIPELINE INTEGRITY MANAGEMENT

1.8.3.1 Integrity Management Program

APP will develop a pipeline integrity management program for use throughout the operating phase to monitor public and staff safety, reduce environmental impacts, and protect the installed pipelines and facilities. The APP Integrity Management Program is described in Resource Report 11.

1.8.4 ABOVEGROUND FACILITY MAINTENANCE

1.8.4.1 Meter Stations, Compressor Stations, and Mainline Block Valves

Planned maintenance activities at meter stations and compressor stations will include routine checks, calibration of equipment and instrumentation, inspection of critical components, and servicing and overhauls of equipment. Unplanned maintenance activities will include investigation of problems identified by the gas control center and station monitoring systems, and implementation of corrective actions.

A fire buffer zone is included for compressor stations. This zone is a cleared strip of land that extends outward approximately 130 feet from the compressor station fence on three sides of the compressor station to provide separation between station equipment and the surrounding vegetation. The fourth side of the station is the side that includes the pipeline right-of-way. For this side, the station fence is placed at the edge of the pipeline right-of-way, and the buffer zone is located within the station fence. The fire buffer zone will reduce the potential for forest fires to spread to station equipment. In the unlikely event of a fire occurrence within the compressor station, it will also reduce the potential for a fire within the station from spreading to the surrounding vegetation.

Vegetation outside the compressor station fenced area in the fire buffer zone will be controlled by cutting and removing large trees and brush. Vegetation outside meter stations will be controlled following the practices of the collocated facility, either the GTP or the PTU. Vegetation outside the MLBV fenced area and within the pipeline right-of-way will be maintained as described in Section 1.8.2.3.

These facilities will be inspected per the Project-specific integrity management system.

1.8.4.2 Gas Treatment Plant

APP will develop a Maintenance and Reliability program to address responsibilities, staffing and organization, and schedules. Planned maintenance shutdowns, or turnarounds, will be scheduled and coordinated to meet the maintenance required for major equipment. Safety equipment will be included in the design of the GTP in accordance with API, National Fire Protection Association, and company standards in order to facilitate the safe operation and maintenance of the GTP. Safety equipment will include fire and gas detection systems, fire water system, pressure-relief valves, blowdown valves, and emergency shutdown systems.

1.8.5 OPERATIONS WORKFORCE

APP will initially staff GTP operations with a core team of experienced workers from the Project sponsoring companies, coupled with experienced local hires and trained new hires. It is intended that local hires will progressively replace non-local workers over time as they achieve the required skill levels and gain sufficient experience. On-site operations staff will include approximately 200 workers. Another 200 workers will be on off-rotation, and approximately 100 workers will comprise off-site support.

APP anticipates that operation and maintenance of the pipelines, meter stations, and compressor stations will require approximately 35 to 50 full-time workers in Alaska, comprised of trades technicians, technical specialists, safety personnel, support staff, and management. Additional engineering, maintenance, and management support will be provided by the Project sponsoring companies.

Current information indicates the number of qualified local people may not be sufficient to fill operating and maintenance manpower requirements, and recruitment programs will be required in advance of Project start-up. APP will recruit local people in 2015 to start training in preparation for operations in 2020. The field trainees will be trained at existing Project sponsoring companies' sites for the first two years and then will support commissioning and start-up of the APP as required. The balance of experienced technicians required will be supplemented from Project sponsoring companies' operations teams and will likely be phased out over time as local people gain experience over 5-10 years during operations.

1.9 NON-JURISDICTIONAL FACILITIES

Facilities both upstream and downstream of the APP facilities will be constructed for the purposes of delivering, receiving, and using APP's gas volumes. Although these facilities will not be subject to the FERC's jurisdiction, the Commission, as part of its National Environmental Policy Act obligations, must nevertheless determine whether it should evaluate the environmental impacts of these non-jurisdictional facilities as part of its National Environmental Policy Act review of the Project. To help answer that question, the FERC has adopted a four-factor test to assess whether there is sufficient federal control and responsibility over a

jurisdictional project as a whole to warrant environmental analysis of the non-jurisdictional facilities. The four-factors are:

- Whether the regulated activity comprises "merely a link" in a corridor-type project (e.g., a transportation or utility transmission project);
- Whether there are aspects of the non-jurisdictional facility in the immediate vicinity of the regulated activity which uniquely determine the location and configuration of the regulated activity;
- The extent to which the entire Project will be within the FERC's jurisdiction; and
- The extent of cumulative federal control of, and responsibility for, the Project.

General descriptions of the non-jurisdictional facilities related to the Project that are anticipated to be constructed are provided in the sections below. However, given the current lack of more detailed information about these facilities, the four-factor test cannot be applied at this time.

1.9.1 FACILITIES FOR SALES GAS OFF-TAKES

Non-jurisdictional sales gas laterals, meter stations and gas distribution facilities will be required to receive sales gas from the Alaska Mainline at the Intermediate Gas Delivery points listed in Table 1.3.2-1 and distribute it for local use. The exact locations, the potential developers, and the required sales gas volumes will not be known until later in the Project development timeline. Therefore, it is not possible to provide any location maps or specifics about the scope of these facilities at this time. Development of such non-jurisdictional facilities will be subject to the permitting requirements of the various federal and state regulatory bodies having jurisdiction.

1.9.2 AUXILIARY FACILITIES (AS DEFINED AT 18 C.F.R. § 2.55[A])

Numerous auxiliary facilities – including valves, pig launchers/receivers, yard and station piping, cathodic protection equipment, gas cleaning/cooling/dehydration equipment, water pumping equipment, electrical and communications equipment, and buildings – will be constructed as appurtenances to the APP facilities, as discussed in previous sections of this resource report. Such facilities will be located within an Aboveground Facility site (e.g., the GTP), within the pipeline right-of-way, or within a compressor station, meter station or mainline block valve site. Therefore, these facilities' environmental impacts, if any, will be addressed in the Environmental Impact Statement in the course of addressing the environmental impacts of the facilities to which these facilities are appurtenant.

1.10 FUTURE PLANS

APP currently has no expansion plans for the pipeline system, however, the system could be modified to accommodate additional throughput capacity by adding gas treating facilities to the GTP and/or adding compressor stations along the Alaska Mainline. Market forces (e.g., natural gas supply and demand) are the main factors that will determine the need for expansion of the facilities. Additional custody transfer meter stations will also be required at the intermediate gas delivery points, however, APP has not included those meter stations as part of the Project at this time because there are no contractual agreements in place with others to receive the gas.

All expansions will be carried out in accordance with applicable law, statute, or regulation. If future expansion is necessary, APP will be required to seek appropriate regulatory approvals at that time, including any authorizations that might be required from the FERC or other agencies.

1.11 PERMITS AND APPROVALS

Table 1.11-1 lists the major federal, state, and local authorizations that may be required to complete the APP, along with the status of applications and preliminary plans. Preliminary plans are based on the project schedule basis provided in Section 1.5 of Resource Report 1.

TABLE 1.11-1

Alaska Pipeline Project
Major Authorizations

Administering Agency and Permit or Consultation/Authority	Status / Preliminary Plans[1]
U.S. Federal Energy Regulatory Commission (FERC)	
FERC - Certificate of Public Convenience and Necessity (CPCN) under Section 7 of Natural Gas Act (NGA) & ANGPA-designated Lead Agency for EIS under Section 102 of the National Environmental Policy Act (NEPA)	• Dec 2011 - APP to file Draft Resource Reports 1 through 11 • Oct 2012 - CPCN application scheduled to be filed • Oct 2013 - FERC issues Draft EIS • Apr 2014 - FERC issues Final EIS • Jun 2014 - FERC issues CPCN
FERC - Presidential Permit & International Boundary Commission under Section 3 of NGA	• Oct 2012 - Presidential Permit application/letter filed with CPCN application • Jul 2014 - FERC issues Presidential Permit & International Boundary Construction Permit
FERC - Section 106 of the National Historic Preservation Act (NHPA)	• Sep 2014 - Final report for GTP and related facilities for clearance (if not already completed in EIS) • Nov 2014 - Clearance received for GTP site and ancillary facilities • Feb 2015 - Clearance received for Pipelines and ancillary facilities
U.S. Army Corps of Engineers (USACE)	
USACE Individual Permits under Section 404 of the Clean Water Act (CWA) & Section 10 of Rivers and Harbors Act & Section 103 Marine Protection, Research and Sanctuaries Act (MPRSA) Cooperating agency in FERC-led EIS pursuant to NEPA	<u>GTP, west dock, dredging, dredge disposal and associated infrastructure</u> • Dec 2013 – APP files final Section 404/10/103 application • Oct 2014 – USACE issue Section 404/10/103 permits <u>Mainline Pipeline, Point Thomson Pipeline and Associated Infrastructure</u> • Jul 2014 – APP files final Section 404/10 application • Feb 2015 – USACE issue Section 404/10 permits

TABLE 1.11-1

Alaska Pipeline Project
Major Authorizations

Administering Agency and Permit or Consultation/Authority	Status / Preliminary Plans[1]
U.S. Department of the Interior - Bureau of Land Management (BLM)	
BLM Federal Right-of-Way (ROW) Grant & Temporary Use Permit (TUP) For federal land crossings permitted under the Mineral Leasing Act (MLA). (BLM, U.S. Air Force [USAF], USACE, and U.S. Army [USAR]) Cooperating agency in FERC-led EIS pursuant to NEPA	• Nov 2012 - APP files Draft Plan of Development (POD) and updated SF299 • Nov 2014 - APP issues Final POD / SF299 • Feb 2015 - BLM - ROW Grant/TUP and Mineral Materials Sales Site Approvals
BLM Mineral Materials Sales Contracts For federal land crossings permitted under the Mineral Leasing Act (MLA). (BLM, U.S. Air Force [USAF], USACE, and U.S. Army [USAR])	• 2014 through 2019 - BLM / APP - Annual Mineral Material Contracts
U.S. Coast Guard (USCG)	
USCG Bridge Permits under the General Bridge Act and Rivers and Harbors Appropriations Act Cooperating agency in FERC-led EIS pursuant to NEPA	<u>West Dock Improvements:</u> • May 2015 - APP submits application • Sep/Oct 2015 - USCG Issues approved permit <u>Construction 2016 - Pipeline / Other Areas:</u> • May 2015 - APP submits applications • Oct 2015 - USCG Issues approved permits <u>Construction for 2017 through 2021 - Pipeline / Other Areas:</u> Same timing & submittal cycle but for each subsequent year of construction
U.S. Fish & Wildlife Service (USFWS)	
USFWS National Environmental Protection Act (NEPA) process for Endangered Species Act Section 7 Biological Assessment (BA) / Biological Opinion (BO) and Incidental Take Statement Cooperating agency in FERC-led EIS pursuant to NEPA	• Oct 2012 - Applicant-prepared BA Issued in FERC CPCN application (refer to Appendix 3D of Resource Report 3) • Nov 2013 - FERC issues Final BA • Mar 2014 - FERC issues Final BO and Incidental Take Statement
USFWS Letter of Authorization (LOA) under Section 101 of the Marine Mammal Protection Act (MMPA)	• Oct 2013 - APP Applies for LOA for Polar Bears and Pacific Walrus • Oct 2014 - USFWS Approves LOA • Oct 2015 - USFWS renews LOA • Process repeated each year of construction until operations commences, thereafter a 5 year LOA applied for.
USFWS Bald and Golden Eagle Protection Act (BGEPA) Nest Removal Programmatic or Individual Permits	• Permit applications - filed in 2014. If individual permits required, then filed every year prior to construction.
USFWS Migratory Bird Treaty Act (MBTA)	• May 2014 - Migratory Bird Conservation Plan included in Final EIS

TABLE 1.11-1

Alaska Pipeline Project
Major Authorizations

Administering Agency and Permit or Consultation/Authority	Status / Preliminary Plans[1]
National Marine Fisheries Service (NMFS)	
NMFS Magnuson-Stevens Fishery Conservation and Management Act process for Essential Fish Habitat (EFH) Consultation Biological Assessment (BA) / Biological Opinion (BO) and Incidental Harassment Authorization	• Oct 2012 - APP Files EFH Assessment Report within FERC CPCN Application (refer to Appendix 3B of Resource Report 3) • Mar 2014 - FERC issues Final BO and Incidental Harassment Authorization
Endangered Species Act Section 7 Biological Assessment (BA) / Biological Opinion (BO) and Letter of Authorization (LOA) Cooperating agency in FERC-led EIS pursuant to NEPA	• Oct 2012 - Applicant-prepared BA Issued in FERC CPCN Application (refer to Appendix 3D of Resource Report 3) • Oct 2013 - FERC issues Final BA • Mar 2014 - FERC issues Final BO and Letter of Authorization
NMFS Letter of Authorization (LOA) under Section 101 of the Marine Mammal Protection Act	• Oct 2013 - APP Applies for LOA for Offshore Species • Oct 2014 - NMFS Approves LOA (Renewal in 5 years)
Pipeline and Hazardous Materials Safety Administration (PHMSA)	
PHMSA Special Permits under (49 C.F.R. pt. 192) Cooperating agency in FERC-led EIS pursuant to NEPA	• Dec 2011 - APP files Special Permit Application for Strain Based Design • June 2014 - APP requires Special Permit
Environmental Protection Agency (EPA)	
Underground Inspection Control Class I Well Permits (40 C.F.R. pt. 144) Cooperating agency in FERC-led EIS pursuant to NEPA	• Jan 2015 - APP submits draft applications • Jun 2015 - APP submits final applications • Dec 2015 - EPA issues approved permits
Federal Aviation Administration (FAA)	
FAA review of objects affecting navigable airspace or High Intensity Lights impact (49 C.F.R. pt. 77)	• Jun 2014 - FAA issues FONSI approval
Federal Aviation Administration (FAA) Form 7480-1, Notice of Landing Area Proposal (Heliports)	• Feb 2014 - APP submits applications • May 2014 - FAA Issues permits
Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration (Objects)	• Feb 2014 - APP submits applications • May 2014 - FAA Issues permits
Federal Communications Commission (FCC)	
FCC review for Excessive Radiofrequency Emission and possible Section 301 of the Communications Act permit(s)	Applications will be filed 4 months prior to construction start, on an annual basis through construction

TABLE 1.11-1

Alaska Pipeline Project
Major Authorizations

Administering Agency and Permit or Consultation/Authority	Status / Preliminary Plans[1]
State Pipeline Coordinator's Office (SPCO)	
SPCO State of Alaska Right-of-Way (ROW) leases as per AS 38.35.050 Cooperating agency in FERC-led EIS pursuant to NEPA	• Jan 2013 - APP files State Lands Lease application with SPCO • July 2014 - SPCO issues State Lands Lease
SPCO Water Use Permits as per 11 Alaska Administrative Code (AAC) 93.220	• Nov 2013 - APP files GTP and early pipeline site Water Use Permit applications with SPCO • Oct 2014 - SPCO issues GTP and early pipeline site Water Use Permits • First quarter of each year of construction thereafter, APP will file for year-specific Water Use Permits. SPCO will issue Water Use Permits in 4th quarter of each year applications filed.
SPCO Mineral Materials Sales Contracts for State of Alaska	• Nov 2013 - APP files GTP and early pipeline borrow sites Material Sales Permit applications with SPCO • Oct 2014 - SPCO issues GTP and early pipeline borrow sites Material Sales Permits • First quarter of each year of construction thereafter, APP will file for year-specific Material Sales Permit applications. SPCO will issue Material Sales Permits in 4th quarter of each year applications filed.

These schedules are subject to change, and will be aligned over time with evolving project development plan/schedule details.

1.12 PUBLIC, AGENCY, AND OTHER STAKEHOLDER COMMUNICATIONS

Since Project inception, APP has engaged in a comprehensive public outreach program with stakeholders to discuss the Project and seek input regarding construction methods and issues of concern. As part of this plan, APP has met with landowners; elected federal, state, borough, municipal, and tribal officials; Alaska Native Claims Settlement Act regional and village corporations; Alaska Native Organizations and Groups; community and tribal leaders; agricultural, business, and civic groups; and the general public. These meetings have enabled APP to engage in an ongoing dialog with stakeholder groups, facilitating stakeholder receipt of Project information and providing a forum for stakeholder input into Project plans for design, construction, and operation of the Project.

APP is in the process of contacting affected private landowners to obtain their permission for engineering, geotechnical, cultural, and environmental surveys on their properties. Additionally, APP has established a toll-free phone number (877.625.8679) for landowners and other stakeholders to call to obtain further information about the Project, and is working directly with landowners regarding specific pipeline routing activities impacting their land. The names and addresses of affected landowners are provided in Appendix 1M, which is filed under separate cover and marked "**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**".

In addition to in-person outreach meetings with landowners and interested stakeholders, APP plans to participate in a number of other outreach opportunities for stakeholders to learn more about the Project and provide input, including: Open houses; FERC meetings; interagency meetings; communication materials (e.g., brochures, fact sheets, Project web site); and communications portals (e.g., email and voicemail).

APP believes that public engagement provides the opportunity for valuable input throughout Project development. To that end, APP is committed to communicating with landowners and area stakeholders, and will continue to refine the pipeline route as well as Project-specific mitigation plans in response to input received from the general public, agencies (including the FERC), and other stakeholders. As specified in 18 C.F.R. § 157.6, a notice will be published in local newspapers once the FERC issues a Notice of Application. Additionally, copies of APP's final resource reports will be placed in public libraries throughout the state.

1.12.1 PUBLIC OPEN HOUSES AND COMMUNITY OUTREACH MEETINGS

Table 1.12.1-1 provides a summary of the leadership and community open house meetings that were held in 2010 and 2011 along the pipeline corridors. Documentation of the key issues identified at these meetings is provided in Appendix 1N. The leadership meetings involved small group discussions including a presentation, and a question and answer session. The community open house meetings included an open house, formal presentation, and a question and answer session. APP has considered information about issues and concerns raised in these meetings during planning efforts for the Project.

TABLE 1.12.1-1

Alaska Pipeline Project
Summary of Public Open Houses and Stakeholder Meeting Dates

Community/Location	Meeting Dates	
North Slope Communities		
Anaktuvuk Pass	April 15, 2010*	March 17, 2011*
Barrow	April 12, 2010*	March 16, 2011*
Kaktovik	April 13, 2010	March 14, 2011
Nuiqsut	April 14, 2010*	March 15, 2011*
Interior Communities		
Alatna/ Allakaket (Allakaket)	July 1, 2010	March 29, 2011
Delta Junction	April 20, 2010 (Leadership) June 10, 2010 (Public)	April 28, 2011*
Dot Lake	May 26, 2010	April 14, 2011
Evansville/Bettles (Evansville)	June 30, 2010	March 30, 2011
Fairbanks/North Pole (Fairbanks)	April 20, 2010 (Leadership) June 9, 2010 (Public)	April 26, 2011*
Minto	May 12, 2010	June 2, 2011
Nenana	May 20, 2010*	March 10, 2011*
Northway	May 25, 2010	April 13, 2011
Stevens Village	May 11, 2010	March 24, 2011
Tanacross	July 13, 2010	April 12, 2011
Tetlin	July 12, 2010	April 29, 2011*
Tok	July 14, 2010	April 11, 2011
Wiseman/Coldfoot (Wiseman)	July 20, 2010	March 31, 2011
Copper Basin Communities		
Chistochina	July 28, 2010	April 20, 2011
Glenallen/Tazlina/ Copper Center/ Gakona/ Gulkana (Tazlina)	July 27, 2010	April 20, 2011

TABLE 1.12.1-1

Alaska Pipeline Project
Summary of Public Open Houses and Stakeholder Meeting Dates

Community/Location	Meeting Dates	
Mentasta Lake		April 22, 2011
Coastal/Port Communities		
Haines	June 15, 2010*	May 11, 2011*
Seward	May 3, 2010	May 3, 2011
Skagway	June 16, 2010	May 13, 2011*
Valdez	June 24, 2010*	April 20, 2011*

Note: * Separate Leadership and Public meetings were held on the same day.
^ 2010 meeting was scheduled in Mentasta Lake, but was cancelled at the community's request.
For meetings with multiple communities represented, the actual meeting location is shown in parenthesis.

1.12.2 AGENCY MEETINGS

APP began consultation meetings in late 2008 with federal, state, and local agencies. These meetings were conducted to inform the various agencies about the Project, and to assist in identifying and resolving potential issues.

Appendix 1L provides a summary list of agency meetings conducted through October 31, 2011 and provides agency correspondence where environmental issues have been identified.