

Prepared for:



**US Army Corps
of Engineers**
Alaska District

Alaska Stand Alone Pipeline Project

Final Supplemental Environmental Impact Statement

Chapter 2: Alternatives

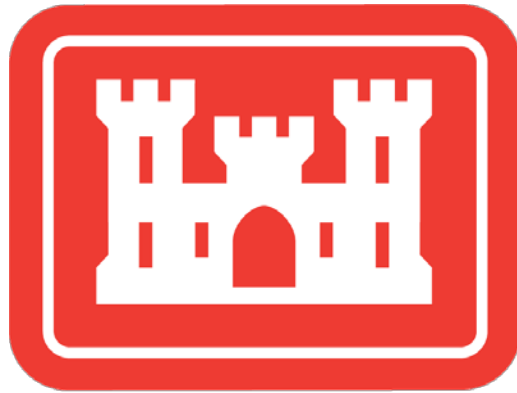
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Final Supplemental Environmental Impact Statement
Chapter 2: Alternatives

June 2018

United States Army Corps of Engineers, Alaska District



In Cooperation with:

U.S. Bureau of Land Management
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety
Administration
U.S. National Park Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Alaska Department of Natural Resources, State Pipeline Coordinator's Section

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS.....	v
2. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES	2-1
2.1. Alternatives Carried Forward for Analysis	2-2
2.2. Alternative 1: Alaska Stand Alone Pipeline Project (Proposed Action)	2-3
2.2.1. Overview of Key Revisions to the Proposed Project	2-5
2.2.2. Gas Composition.....	2-10
2.2.3. Use of West Dock at Prudhoe Bay.....	2-10
2.2.4. Gas Conditioning Facility and Connecting Lines	2-25
2.2.5. Pipe Characteristics	2-27
2.2.6. Segment-by-Segment Design to Address Issues Associated with Permafrost.....	2-30
2.2.7. Pipeline Right-of-Way.....	2-30
2.2.8. Route Alignment.....	2-31
2.2.9. Facilities.....	2-35
2.2.10. Project Footprint.....	2-63
2.2.11. Waterbody Crossings	2-64
2.2.12. Alternative 1 Construction Spread Plan (Schedule)	2-65
2.3. Connected Actions	2-69
2.4. Alternative 2: Denali NPP Route Variation including Dock Head 2, Ocean Disposal & Aboveground Pipeline Mode (Denali NPP Route Variation).....	2-69
2.4.1. Assessment of the Denali NPP Route Variation in the 2012 FEIS.....	2-70
2.4.2. 2016 Denali NPP Route Variation Analyzed in this SEIS	2-70
2.4.3. Aboveground Pipeline Mode, Dock Head 2, Ocean Disposal of Dredge Material and Aerial Crossing at Yukon River.....	2-72
2.5. Alternative 3: No Action.....	2-79
2.6. Alternatives Evaluated in the 2012 Final Environmental Impact Statement and Those Eliminated from Detailed Analysis.....	2-79
2.6.1. 2012 Alternatives Eliminated from Detailed Analysis in this SEIS	2-79
2.6.2. Upland Disposal of Dredge Material Eliminated.....	2-87
2.6.3. Aboveground Pipeline Alternatives Eliminated: Aboveground for Entire Project Length; Aboveground from Milepost 0 - 634; or Aboveground from Mile Post 0 - 168.....	2-87
2.6.4. Alternative Energy Sources Eliminated.....	2-90
2.6.5. West Dock Alternatives Eliminated	2-93
2.6.6. Summer Dredging	2-95
2.6.7. Gas Conditioning Facility Construction Options Eliminated	2-95
2.7. Identifying a Preferred Alternative.....	2-96
2.7.1. Environmentally Preferable Alternative	2-96
2.7.2. Least Environmentally Damaging Practicable Alternative	2-96
2.8. Final Supplemental Environmental Impact Statement	2-97

List of Tables

Table 2.2-1 Summary of Alaska Stand Alone Pipeline Design Changes & Refinements..... 2-5

Table 2.2-2 Chemical Composition of Gas to be Transported..... 2-10

Table 2.2-3 Location, Type, Quantity, Length of Sheetpile to be Installed..... 2-21

Table 2.2-4 Mainline Containment Pressure..... 2-28

Table 2.2-5 ASAP Material Sites and Locations 2-38

Table 2.2-6 Description of Use of Previously Disturbed Lands for Stationary Camps 2-53

Table 2.2-7 Alternative 1: ASAP Construction Spread Plan (Schedule) 2-67

Table 2.4-1 Acres and Percent of Total Wetlands Impacted through Areas of Continuous, Discontinuous & Sporadic Permafrost within the ASAP Pipeline ROW..... 2-75

Table 2.6-1 Alternatives Eliminated from Detailed Analysis 2-81

Table 2.6-2 Summary of Alternative Energy Sources Relative to the Proposed Project Purpose and Need Statement 2-92

List of Figures

Figure 2.2-1 Current ASAP Alignment 2-4

Figure 2.2-2 ASAP 2016 Fairbanks Lateral Alignment 2-5

Figure 2.2-3 West Dock Causeway Vicinity Map 2-11

Figure 2.2-4 Dredge Material Disposal Locations for Alternative 1 (Proposed Project) and Alternative 2 (see Section 2.4)..... 2-15

Figure 2.2-5 Limit of Dredging Proposed at DH3 2-17

Figure 2.2-6 Planned Use of Infrastructure at Dock Head 3 2-19

Figure 2.2-7 Temporary Bridge Installed for Module Offload at Dock Head 3 2-20

Figure 2.2-8 Tentative Construction Schedule for West Dock Modifications..... 2-23

Figure 2.2-9 West Dock Temporary Barge Bridge 2-24

Figure 2.2-10 Gas Conditioning Facility Layout 2-26

Figure 2.2-11 Location of New Material Source for GCF..... 2-26

Figure 2.2-12 Placement and Orientation of Connecting Lines between the Gas Conditioning Facility and the Existing Central Gas Facility 2-27

Figure 2.2-13 GCF Location 2-33

Figure 2.2-14	Materials Sites Segment 1 of 4	2-43
Figure 2.2-15	Materials Sites Segment 2 of 4	2-45
Figure 2.2-16	Materials Sites Segment 3 of 4	2-47
Figure 2.2-17	Materials Sites Segment 4 of 4	2-49
Figure 2.2-18	Construction Camps and Pipe Storage Yards	2-52
Figure 2.2-19	Depiction of Temporary Workspaces along Pipeline ROW	2-55
Figure 2.2-20	Seward Marshalling Yard	2-57
Figure 2.2-21	Fairbanks Marshalling Yard	2-58
Figure 2.2-22	Yukon River Crossing Horizontal Directional Drilling Option.....	2-66
Figure 2.4-1	Denali NPP Route Variation Alternative	2-71
Figure 2.4-2	MP Location Where VSMs End & Burial of the Pipeline Using Stress-Based Design Begins.....	2-73
Figure 2.4-3	Conceptual Suspension Bridge for Aerial Crossing at Yukon River	2-77
Figure 2.4-4	Graphic Depiction of Aerial Crossing at Yukon River.....	2-78

List of Appendices

- A: Part I: The ASAP Belowground Pipeline Mode: Selection, Construction, Operation, and Maintenance on Alaska's North Slope, and Part II: PHMSA Response Letter
- B: Draft Programmatic Agreement
- C: Application for Department of Army Permit - Attachment A: Clean Water Act 404 Permit Figures
- D: Identification and Evaluation of Time-Dependent Route Geohazards
- E: Part I: ASAP Revegetation Plan, Part II: Analysis of Potential Indirect Impacts to Wetlands Related to Buried Pipeline Construction, Part III: Segregation of the Surface Layer, and Part IV: Comparative Belowground Designs and Return of Wetlands
- F: Stream Crossings
- G: National Hydrologic Dataset - Waterbodies within 1 Mile of the Proposed Project and Supplemental Table: Waterbodies within ¼ Mile of the 2016 Route
- H: FEMA Floodplain Maps and Drinking Water Protection Areas
- I: Application for Department of the Army Permit - Wetlands Mapbook
- J: ASAP Fish Stream List
- K: Part I: Indirect Impact Area AHRS Sites and Place Name Tables, and Part II: ASAP Draft Cultural Resources Management Plan
- L: ASAP Air Quality Emission, Regulatory, and Support Documentation
- M: Part I: Applicant Proposed Design Features, Mitigation Measures, and Best Management Practices, Part II: Rationale ASAP Pipeline Route Refinement, and Part III: Regulatory Agency Recommended Mitigation Measures
- N: Part I: Corps Letter to NMFS Re-initiating Section 7 Consultation, Part II: ASAP Biological Assessment, and Part III: Biological Opinion
- O: Effect of Climate Warming on Expected Long-Term Thaw Depths on the ASAP Right-of-Way, Alaska Stand-Alone Pipeline Project
- P: Analysis of Subsistence Impacts
- Q: ASAP Comment Analysis Report
- R: ANILCA Section 810 Analysis of Subsistence Impacts
- S: Fugitive Dust Control Plan

ACRONYMS AND ABBREVIATIONS

%.....	percent
24/7.....	24-hours a day, 7 days a week
ADF&G	Alaska Department of Fish and Game
ADNR.....	Alaska Department of Natural Resources
AEA	Alaska Energy Authority
AGDC.....	Alaska Gasline Development Corporation
AIDEA.....	Alaska Industrial Development and Export Authority
API	American Petroleum Institute
ARRC.....	Alaska Railroad Corporation
AS.....	Alaska Statute
ASAP	Alaska Stand Alone Pipeline
ASME.....	American Society of Mechanical Engineer
BLM	Bureau of Land Management
BLMRB	Big Lake Maintenance and Response Base
BPXA	BP Exploration (Alaska) Inc.
CEQ.....	Council on Environmental Quality
CFR	Code of Federal Regulations
CGF	Central Gas Facility
CO ₂	Carbon Dioxide
NPP	National Park and Preserve
DA Application.....	Department of the Army Application for Permit
DH2.....	Dock Head 2
DH3.....	Dock Head 3
DOT&PF.....	Department of Transportation and Public Facilities
ENSTAR.....	ENSTAR Natural Gas Company
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
FEIS.....	Final Environmental Impact Statement
FMRB.....	Fairbanks Maintenance and Response Base
FTE.....	full-time equivalent
GCF	Gas Conditioning Facility
HDD	Horizontal Directional Drilling
LEDPA	Least Environmentally Damaging Practicable Alternative
LNG	liquefied natural gas
MAOP.....	Maximum Allowable Operating Pressure
Mat-Su.....	Matanuska-Susitna Borough
MCY.....	million cubic yards
MLBV	Mainline Block Valve
MM/Btu.....	million British thermal unit
MMscfd	million standard cubic feet per day

MP..... milepost
MRB Maintenance Response Base
NEPA..... National Environmental Policy Act
NGL Natural Gas Liquids
NRC Nuclear Regulatory Commission
O&M..... Operations and Maintenance
PBU Prudhoe Bay Unit
PHMSA Pipeline and Hazardous Materials Safety Administration
psig per square inch gauge
PSY..... Pipe Storage Yard
ROW Right-of-Way
SCADA..... Supervisory Control and Data Acquisition
SCC stationary construction camp
SEIS..... Supplemental Environmental Impact Statement
SPMT Self-propelled Modular Transporters
SOA..... State of Alaska
STP Seawater Treatment Plant
s/tons short tons
TAPS..... Trans-Alaska Pipeline System
TW Temporary Workspace
U.S..... United States
USACE United States Army Corps of Engineers
USDOT United States Department of Transportation
VSM vertical support member

2. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

This chapter describes a reasonable range of alternatives that meet the purpose and need of the proposed Action (Alaska Stand Alone Pipeline [ASAP] Project) to provide Alaskans with a stable, affordable, long-term supply of natural gas for heating and power (see Chapter 1, Purpose and Need, Section 1.2).

Evaluation of these proposed alternatives is presented in Chapter 4, Environmental Consequences. The United States (U.S.) Army Corps of Engineers (USACE) and the cooperating agencies have, in accordance with guidance from the Council on Environmental Quality (CEQ) on implementing the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] 1500) and USACE's NEPA guidance (Appendix B of 33 CFR 325), developed three alternatives for evaluation in this Final Supplemental Environmental Impact Statement (SEIS). In line with CEQ guidance (40 CFR 1501.7), USACE has considered comments received during the scoping period (Fall 2014) and public comment period (Summer 2017) (see Chapter 1, Section 1.10) in determining the substantive issues related to the proposed Action to be considered during development of the alternatives presented herein.

These alternatives include:

- Alternative 1: ASAP Project including use of Dock Head 3 (DH3) at West Dock, nearshore disposal of dredge material, buried pipeline (except at fault crossings, elevated bridge stream crossings, pigging facilities, and block valve locations), and Horizontal Directional Drilling (HDD) at the Yukon River.
- Alternative 2: Denali National Park and Preserve (NPP) Route Variation, use of Dock Head 2 (DH2) at West Dock, ocean disposal of dredge material, pipeline elevated on vertical support members (VSMs) from MP 0 to 62, and aerial crossing at Yukon River.
- Alternative 3: No Action Alternative.

Additionally, this chapter incorporates by reference the detailed analysis of alternatives and any alternatives eliminated from detailed analysis that were documented in the 2012 Final Environmental Impact Statement (FEIS) for this Project following NEPA guidance on supplemental analyses (40 CFR 1502.21). However, to ensure the alternatives analysis in this SEIS reflects recent, readily available information, alternatives that were eliminated from further analysis were subjected to another screening process to assess whether or not they were reasonable based on USACE's General Regulatory Policies for public interest review (33 CFR 320). Section 2.7.1 and Table 2.7-1 describe a list of alternatives that were screened again and either eliminated as not reasonable or carried forward for detailed assessment in Chapter 4.

Considering alternatives helps to ensure that ultimate decisions concerning the proposed Project are well founded and consistent with other national policy goals and objectives. The alternatives analyzed in detail were developed based on the purpose and need for the proposed Project, as discussed in Chapter 1, Section 1.3. The impacts of the alternatives have been evaluated based on information summarized in Chapter 3, Affected Environment, and according to the methods described in detail in Chapter 4. The findings in these chapters provide the basis for assessment of the relative merits of the alternatives and, ultimately, for USACE's supporting justification and determination of the Least Environmentally Damaging Practicable Alternative (LEDPA) (see Section 2.7.2 for more information on the LEDPA).

This chapter includes the following sections:

- Detailed description of the proposed ASAP Project (Section 2.2) including:
 - Overview of key project changes;
 - Gas composition;
 - Use of West Dock;
 - Gas Conditioning Facility (GCF) and connecting lines;
 - Pipe characteristics including diameter, pressure and operating capacity, wall thickness, burial, characteristics to address continuous and discontinuous permafrost, and anticipated operating temperature;
 - Route refinements;
 - Support facilities;
 - Stream crossings;
 - Material sites and volume;
 - Camps, marshalling yards, and pipe storage yards (PSYs);
 - Response bases;
 - Access roads, and ice roads and pads; and
 - Project footprint;
- Description of Alternatives (Sections 2.2 to 2.5);
- Alternatives eliminated from detailed analysis (Section 2.6); and
- Overview of USACE's description of the LEDPA (Section 2.7.2).

2.1. Alternatives Carried Forward for Analysis

The alternatives evaluated in this SEIS must achieve the objectives of the proposed Action as stated in the purpose and need (Section 1.2), without violating federal environmental statutes and regulations described in Section 1.11. Thus, comparing the

alternatives to the stated purpose and need, as well as technical and economic practicality and feasibility, serves as a means to filter alternatives that may be carried forward for detailed analysis. Any alternative that fails to meet the agency's purpose and need or federal environmental statutes and regulations, need not be carried forward for further consideration in the SEIS. Evaluation of the No Action Alternative is required in an SEIS (40 CFR 1502.14) and serves as a baseline for evaluation and comparison of the remaining alternatives. The three alternatives carried forward for detailed analysis in Chapter 4 vary by the proposed route, pipeline design, Yukon River crossing, disposal of dredge material, and dock head proposed at West Dock. These alternatives represent a reasonable range of options in accordance with the purpose and need described in Chapter 1 and fulfill the NEPA requirements for analyzing the No Action Alternative.

2.2. Alternative 1: Alaska Stand Alone Pipeline Project (Proposed Action)

The ASAP Project comprises a GCF near Prudhoe Bay, which is capable of producing an annual average of 500 million standard cubic feet per day (MMscfd) of natural gas; a buried 36-inch, 733-mile-long, 1,480-pound per square inch gauge (psig) buried pipeline connecting the GCF to the existing ENSTAR Natural Gas Company (ENSTAR) pipeline system in the Matanuska-Susitna (Mat-Su) Borough; and a buried, 12-inch, 30-mile-long, 1,480-psig, lateral line connecting the Mainline to Fairbanks; and associated facilities. The pipeline system would be designed to transport natural gas that would be accessible to and useable by communities and other public entities.

The proposed pipeline would typically be buried with a minimum cover of 30 inches and a bottom-of-ditch depth of 6 to 8 feet, except at fault crossings, elevated bridge stream crossings, pigging facilities, and block valve locations. The proposed ASAP route would generally parallel the Trans-Alaska Pipeline System (TAPS) and Dalton Highway corridor to near Livengood, northwest of Fairbanks. At Livengood, the route would continue south, to the west of Fairbanks and Nenana. The pipeline would bypass Denali NPP to the east and would then generally parallel the Parks Highway corridor to Willow, continuing south to its connection with ENSTAR's pipeline system at MP 39 of the Beluga Pipeline, southwest of Big Lake (Figure 2.2-1). The Fairbanks Lateral tie-in would be located approximately 2.5 miles south of the Mainline Chatanika River crossing at MP 440 of the Mainline. From the tie-in, the Fairbanks Lateral pipeline would traverse east, following the Murphy Dome and Old Murphy Dome Roads, and then extending southeast into Fairbanks (Figure 2.2-2).

Since the publication of the 2012 FEIS (USACE, 2012a), changes to the ASAP conceptual design have occurred as a result of refinements in engineering design and public comments received during the Draft SEIS scoping period between August 1 and October 14, 2014 as described in Section 1.10. These design refinements have been incorporated into the proposed Project and analyzed as Alternative 1 (AGDC, 2016e). A list of design changes and design refinements since 2012 are provided in Table 2.2-1.

Figure 2.2-1 Current ASAP Alignment

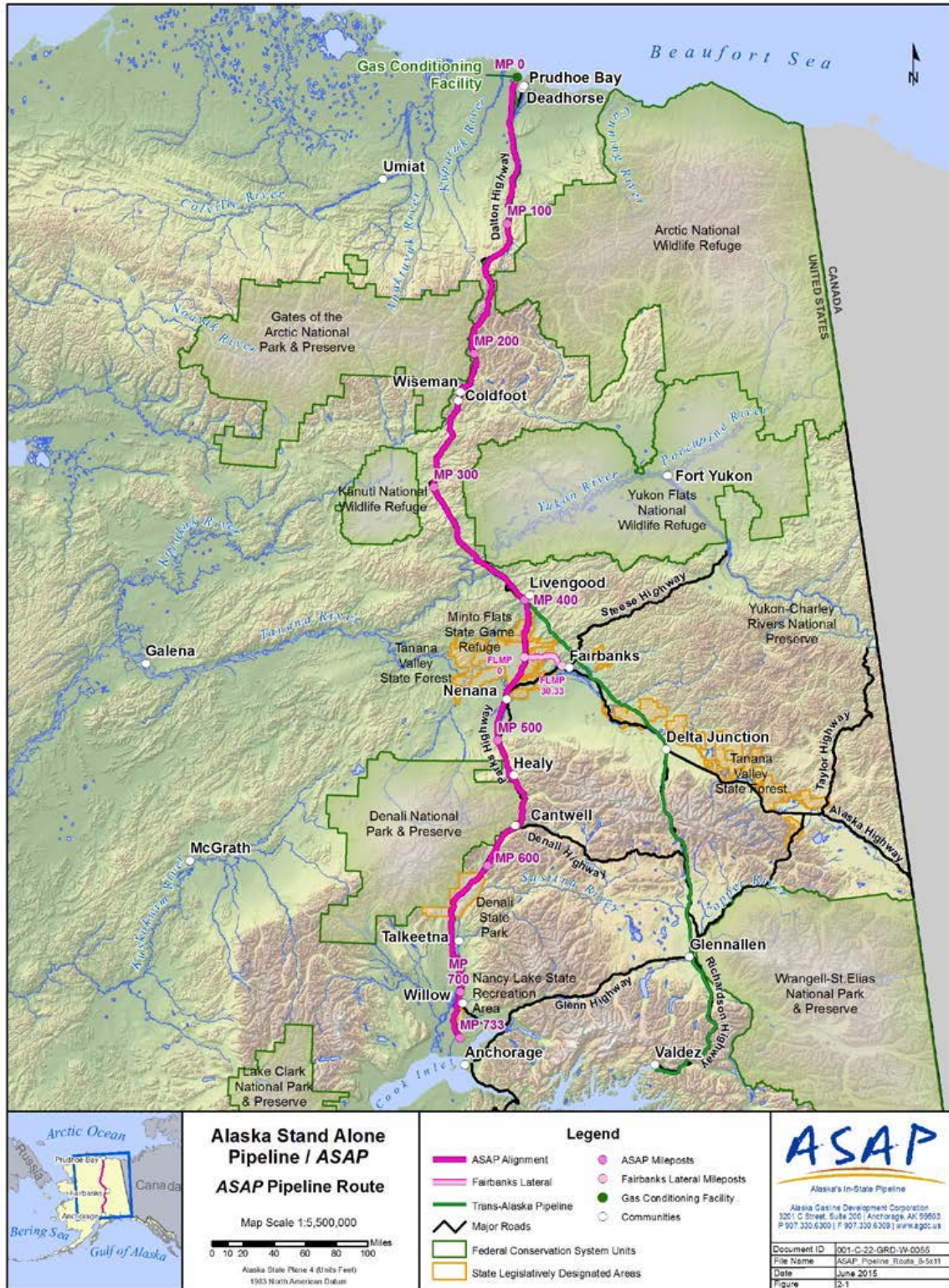
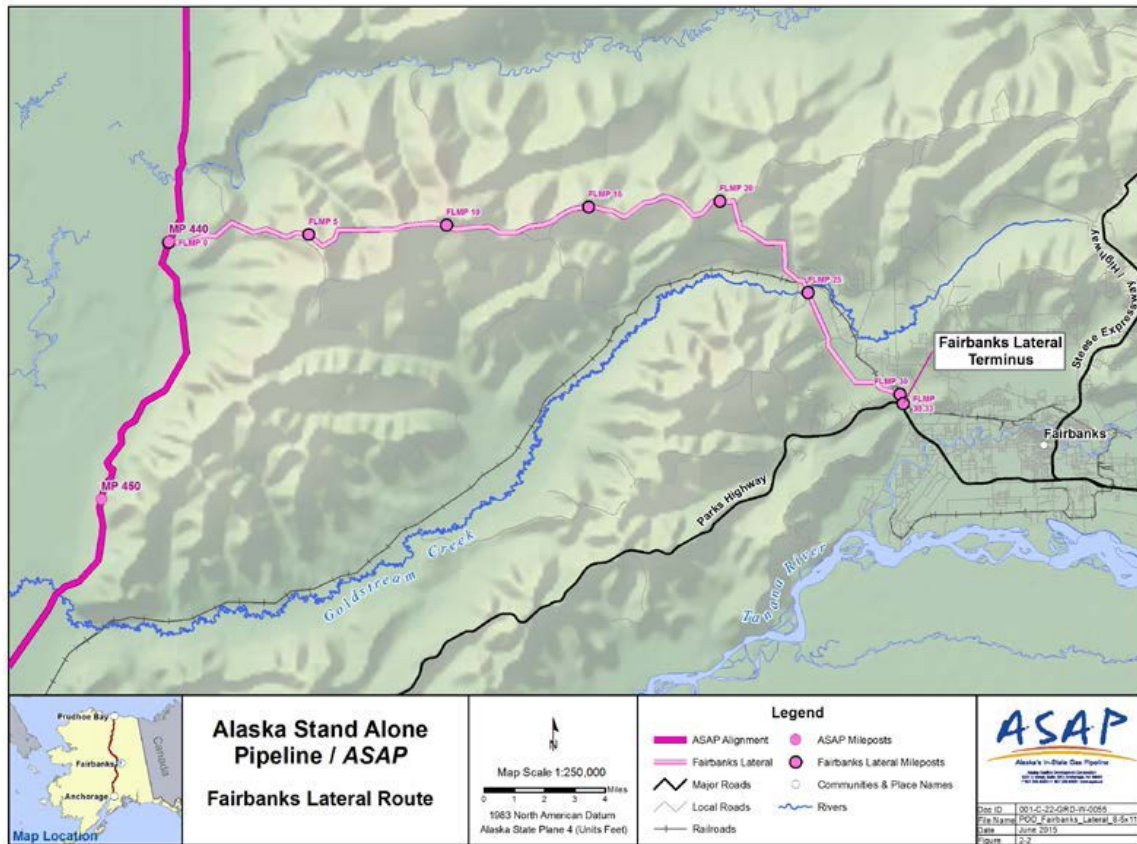


Figure 2.2-2 ASAP 2016 Fairbanks Lateral Alignment



2.2.1. Overview of Key Revisions to the Proposed Project

The conceptual design changes and refinements that occurred between the publication of the 2012 FEIS (USACE, 2012a) and the Application for a Department of the Army Permit Application (DA Application) (AGDC, 2016a) are described in Table 2.2-1.

Table 2.2-1 Summary of Alaska Stand Alone Pipeline Design Changes & Refinements

Item	2012 FEIS (USACE, 2012a) (Attachment 1)	DA Application (AGDC, 2016a)
Conceptual Design Changes		
Gas Composition	<ul style="list-style-type: none"> • Enriched Natural Gas: • Contains NGLs • Requires higher-pressure, dense-phase gas pipeline (2,500 psig maximum allowable operating pressure [MAOP]) • Requires multiple compressor stations • Requires NGL extraction facility to make gas accessible 	<ul style="list-style-type: none"> • Lean Natural Gas (non-enriched): • 89 mole % methane; No NGLs • Lower pressure pipeline (1,480 psig MAOP) • Transport of preconditioned gas for general use • Does not require additional facilities to make gas accessible

Item	2012 FEIS (USACE, 2012a) (Attachment 1)	DA Application (AGDC, 2016a)
West Dock at Prudhoe Bay	<ul style="list-style-type: none"> • Modification Undefined: The planning effort associated with construction, delivery, and offload of modules to Prudhoe Bay were not fully developed at this stage of the Project • 9-barge sealift importing GCF components and materials • Build facility from smaller modular components onsite • Use of West Dock without additional dredging (assumed BP Exploration (Alaska) Inc. [BPXA] would dredge under its permit) 	<ul style="list-style-type: none"> • Modification Defined: In 2014, the Project completed engineering to provide a Class 3 Cost Estimate for work associated with construction, delivery, and offload of modules to Prudhoe Bay • 23-barge sealift importing prefabricated modules • Winter dredging of a navigation channel and turn basin at West Dock • Nearshore disposal of dredge material on bottomfast sea ice in Prudhoe Bay, landward of Territorial Sea Boundary • Modification to DH3 berths and widening of the causeway road • Temporary bridge composed of two ballasted barges to facilitate offload and transport of large modules (bypass of weight-limited causeway bridge)
Design Refinements		
GCF- Central Gas Facility (CGF) Connection	<ul style="list-style-type: none"> • Two feeder lines (natural gas and NGL) and two return lines (undefined diameter) • Connecting lines were described as a Connected Action • Four lines supported on 17 VSMS spaced 60 feet apart; approximately 1,000 feet of line required 	<ul style="list-style-type: none"> • One natural gas feeder line, one 8-inch carbon dioxide (CO₂) return line, one 3-inch liquid return line, and an interface module • Design advanced to allow connecting lines to be assimilated into Project Description • Three lines supported on 171 VSMS, spaced 25 feet apart; approximately 4,200 feet of line required
Mainline Characteristics	<ul style="list-style-type: none"> • 737 miles • 24-inch diameter • 2,500 psig • Right-of-way (ROW) corridor, as follows: <ul style="list-style-type: none"> • Construction: A 100-foot-wide ROW, nominally, for the full length of the pipeline • Operation and Maintenance: 52-foot-wide ROW on federal lands, and 30-foot-wide ROW elsewhere for the full length of the pipeline • Coating and double-jointing in Fairbanks • First 6 miles aboveground within the Prudhoe Bay Unit (PBU); remainder belowground • 29 Mainline Block Valves (MLBVs) • Topsoil layer stripped and replaced when possible • Pipeline generally within existing transportation corridor ROWs 	<ul style="list-style-type: none"> • 733 miles (difference of about -4 miles) • 36-inch diameter • 1,480 psig • ROW corridor, as follows: <ul style="list-style-type: none"> • Construction: variable width, 120-foot-wide minimum temporary ROW, plus additional lands out to 350 feet to construct • Operation and Maintenance: A 53-foot-wide minimum permanent ROW, plus additional lands out to 350 feet to maintain ROW stability and integrity at steep bank or land cuts locations • Coating and double-jointing prior to arrival in Alaska • Buried along entire route, except at elevated bridge crossings, fault crossings, pigging facilities, and valves • 40 MLBVs (location changes) • Pipeline largely outside of existing ROWs; alignment shifts include North Slope, Minto Flats / Summer Ridge, Anderson / Clear, and Nancy Lake State Recreation Area

Item	2012 FEIS (USACE, 2012a) (Attachment 1)	DA Application (AGDC, 2016a)
Fairbanks Lateral Characteristics	<ul style="list-style-type: none"> • 34 miles • Routed through Goldstream Valley along the Alaska Railroad Corporation route • 2 Fairbanks Lateral block valves • ROW corridor as follows: • Construction: A 100-foot-wide ROW, nominally, for the full length of the pipeline (includes operational footprint) • Operation and Maintenance: A 52-foot-wide ROW on federal lands, and 30-foot-wide elsewhere for the full length of the pipeline 	<ul style="list-style-type: none"> • 30 miles (difference of about -4 miles) • Routed along Murphy Dome and Old Murphy Dome Roads • 1 Fairbanks Lateral block valve • ROW corridor, as follows: • Construction: variable width, 100-foot-wide minimum temporary ROW, plus additional lands out to 350 feet to construct • Operation and Maintenance: 30-foot-wide minimum permanent ROW, plus additional lands out to 350 feet to maintain ROW stability and integrity at steep bank or land cuts locations
Support Facilities	<ul style="list-style-type: none"> • GCF (69 acres for GCF pad; additional GCF facilities acreage undefined) • Multiple compressor stations • Straddle Plant at Fairbanks Lateral • NGL extraction facility at Pt. Mackenzie 	<ul style="list-style-type: none"> • GCF Facility Pad & Workspace: 90.6 acres • GCF Camp: 20.2 acres • Compression incorporated into GCF
Waterbodies ^a & Anadromous Waters	<ul style="list-style-type: none"> • Total Waterbody^a Locations Directly Impacted by Project Footprint: Undefined • Project Footprint not fully defined • Waterbodies not differentiated as streams or hydrologic points of interest^a (HPOIs); all were “streams” • Total Anadromous Waterbody Impacted by Footprint: Not Defined • Pipeline - 515 Waterbody Impact Locations <ul style="list-style-type: none"> ○ HDD (also called Trenchless Drilling): 41 ○ Open Cut / Isolated Open Cut: 470 ○ Bridge: 4 (included new suspension bridge as preferred alternative for Yukon River Crossing) • Anadromous Waterbodies Impacted: 75 • Access Roads - Undefined • Waterbody Crossing Impact Locations: Undefined • Anadromous Waterbodies Impacted: Undefined • Temporary and permanent impacts expected • In-River Material Extraction Sites - Undefined • Waterbody Impact Locations: Undefined 	<ul style="list-style-type: none"> • Total Waterbody^a Locations Directly Impacted by Project Footprint: 496 • Waterbodies differentiated as streams and HPOIs • Total Anadromous Waterbodies Impacted by Footprint: 71 • Pipeline - 430 Waterbody Impact Locations <ul style="list-style-type: none"> ○ Stream Crossing Impact Locations: 270 (All temporary) ○ Mainline: 263 <ul style="list-style-type: none"> • HDD: 7 • Open Cut: 95 • Isolated Open Cut: 155 • Bridge: 6 ○ Fairbanks Lateral: 7 <ul style="list-style-type: none"> • Open Cut: 3 • Isolated Open Cut: 4 ○ HPOI Impact Locations: 1 ○ Anadromous Waterbodies Impacted: 57 • Access Roads - 61 Waterbody Impact Locations <ul style="list-style-type: none"> ○ Stream Crossing Impact Locations: 40 <ul style="list-style-type: none"> • 17 Bridges • 23 Culverts ○ HPOI Locations: 21 ○ Anadromous Waterbodies Impacted: 13 • In-river Material Extraction Impact Locations: 5 Waterbody Impact Locations <ul style="list-style-type: none"> ○ Anadromous Waterbodies Impacted: 1 waterbody impacted at 5 locations

Item	2012 FEIS (USACE, 2012a) (Attachment 1)	DA Application (AGDC, 2016a)
	<ul style="list-style-type: none"> Anadromous Waterbodies Impacted: Undefined 	
Material Sites & Volume ^b	<ul style="list-style-type: none"> 546 existing potential sites 13.1 million cubic yards (MCY) required for preliminary features and facilities that were defined; expectation that this number would increase as features became defined / quantified 	<ul style="list-style-type: none"> 91 total material sites required (newly developed or expanded existing) Use of two existing commercial sites; near Willow and Fairbanks Total of 5,200 acres of lands used for material sites; primarily uplands Approximately 25 MCY of material needed from gravel sources, project-wide.
Pipe Storage Yards	<ul style="list-style-type: none"> 26 PSY locations 	<ul style="list-style-type: none"> 26 PSY locations
Construction Camps & Workforce ^b	<ul style="list-style-type: none"> 15 camp locations (camp capacities in parentheses, if available), including: <ul style="list-style-type: none"> Prudhoe Bay Franklin Bluffs (500) Happy Valley (500) Galbraith Lake (500) Atigun (250) Chandler (500) Coldfoot (500) Old Man (500) Seven Mile (500) Livengood (500) Nenana (500) Healy (500) Cantwell (500) Chulitna Butte (500) Sunshine (500) Total camp capacity: 6,750 + Prudhoe Bay (undetermined) Mainline Construction: 5,500 employees GCF Construction: 900 employees Operations: 50 to 75 employees 	<ul style="list-style-type: none"> 13 camp locations (camp capacities in parentheses): <ul style="list-style-type: none"> GCF/Prudhoe Bay (800) Franklin Bluffs (600) Happy Valley (1,000) Galbraith Lake (1,000) Dietrich (1,000) Prospect (600) Five Mile (1,000) Livengood (1,000) Dunbar (600) Healy (1,000) Cantwell (600) Swan Lake (1,000) Rustic Wilderness (1,000) Total camp capacity: 11,200 Mainline Construction: 6,000 employees or contractors at peak construction GCF Construction: 130+ employees and additional contractors Operations: 240 employees or contractors Most camps collocated with a PSY location
Access Roads ^b	<ul style="list-style-type: none"> 133 access roads; additional roads not yet defined or quantified in acreage 91 new roads; additional roads not yet defined or quantified in acreage 42 existing roads; additional roads not yet defined or quantified in acreage 	<ul style="list-style-type: none"> 293 new access roads totaling 169.9 miles Approximately 104 acres of ice roads Approximately 110 acres of ice pads
Additional Infrastructure & Facilities	<ul style="list-style-type: none"> Not yet determined 	<ul style="list-style-type: none"> 8 sets of HDD Entry Pads (1.4 acres), Exit Pads (0.5 acres), and False ROWs Pig Launchers and Receivers <ul style="list-style-type: none"> 36-inch Launcher at GCF 36-inch Launcher / Receiver at Coldfoot 36-inch Launcher / Receiver at Mainline / Lateral Tie-in 36-inch Receiver at Mainline/ENSTAR Tie-in at Big Lake 12-inch Launcher at Mainline/Lateral Tie-in 12-inch Receiver at Lateral Offtake

Item	2012 FEIS (USACE, 2012a) (Attachment 1)	DA Application (AGDC, 2016a)
		<ul style="list-style-type: none"> • 70 Temporary Workspaces (TWs) totaling 74.9 acres (size range of 0.3 to 1.5 acres; TW ROW width out to an 800-foot maximum width) <ul style="list-style-type: none"> ○ 29 TWs partially or fully outside permanent impact areas (57.8 acres) ○ 41 TWs inside permanent impact areas (17.1 acres) • 9 Rail Sidings • 2 metering stations with terminus facilities • Mainline tie-in at Big Lake • Fairbanks Lateral Terminus at Fairbanks • 2 Marshalling Yards <ul style="list-style-type: none"> ○ Seward ○ Fairbanks • 3 Operations & Maintenance Response Bases (MRBs) <ul style="list-style-type: none"> ○ GCF MRB ○ Fairbanks MRB ○ Big Lake MRB ○ AGDC Headquarters at Anchorage offices
Transportation & Equipment ^b	<ul style="list-style-type: none"> • 3,800 rail cars of pipe • 9,000 truckloads of pipe • Standard pipeline construction equipment list 	<ul style="list-style-type: none"> • 6,000 rail cars of pipe • 17,700 truckloads of pipe • Revised equipment list
Project Footprint ^b	<ul style="list-style-type: none"> • Project Footprint & Impacts Developing • Permanent Land Impacts For Facilities that were Defined and Quantified at that time: 4.1k acres • Additional Temporary Land Impacts for Facilities Defined and Quantified at that time: 10,900 acres^c • Note: Material Site Investigation Areas and other facilities not yet defined at that time 	<ul style="list-style-type: none"> • Wetlands & Waters of the U.S.: 9,704.8 acres • Freshwater Wetlands: 9,284.0 acres <ul style="list-style-type: none"> ○ Permanent Impact: 7,844.1 acres ○ Temporary Impact: 1,439.8 acres ○ Includes palustrine emergent wetland, palustrine shrub wetland, palustrine forested wetland, pond, lake, intermittent, perennial streams • Marine and Estuarine Wetlands: 420.9 acres <ul style="list-style-type: none"> ○ Permanent Impact: 170.7 acres ○ Temporary Impact: 250.2 acres • Upland Impacts: 11,788.2 acres • Total Project Footprint: 21,493.0 acres

a ASAP Project engineers and scientists have identified several drainage features or waterbodies that may exist within a jurisdictional wetland, but do not contain a “bed and bank” or other stream related morphological features to support identification as a jurisdictional stream. These drainage features do constitute a special engineering consideration and as such, AGDC has elected to call them “hydrologic points of interest” (HPOIs) in the EED for the purposes of determining a method of pipeline installation.

b The 2012 FEIS acknowledged that 2012 information related to these categories was preliminary as some specific components of the proposed Project were developing; current data estimates are more accurate due to project refinement. Area calculations were summarized from geospatial data from the 2012 FEIS Geodatabase developed by Cardno Entrix.

c The temporary impact defined in the 2012 FEIS (Attachment 1) includes some operational footprint acreage; therefore, some of the FEIS operational impact was also tallied as temporary impact.

2.2.2. Gas Composition

Table 2.2-2 describes the chemical composition of natural gas capable of being transported in the revised design. The natural gas would be a leaner composition than the enriched gas described in the 2012 FEIS in that it would not contain high concentrations of heavier hydrocarbons or natural gas liquids (NGLs). The lean gas would have a composition of 89 mole percent methane and would be compatible with the ENSTAR distribution network. It would be accessible to the public without additional processing facilities. This is in contrast to an enriched gas scenario with higher concentrations of hydrocarbons, requiring a much higher pressure for transport, and construction of additional processing facilities in order to make the gas available for use. The proposed ASAP Project would not include any local distribution infrastructure.

Table 2.2-2 Chemical Composition of Gas to be Transported

Gas Composition	Central Gas Facility Residue (Mole %)	Pipeline Gas After Conditioning (Mole %)
CO ₂	12.00	2.75
Nitrogen	0.60	0.67
Methane	80.13	88.78
Ethane	5.35	5.85
Propane	1.65	1.69
I-butane	0.08	0.08
N-butane	0.13	0.12
Pentanes +	0.06	0.06
Total	100.00	100.00

2.2.3. Use of West Dock at Prudhoe Bay

West Dock is a solid-fill gravel causeway structure located on the northwest shore of Prudhoe Bay, Alaska (Figure 2.2-3). West Dock lies within the Prudhoe Bay Unit (PBU) and is operated by BP Exploration (Alaska) Inc. (BPXA). The West Dock causeway was constructed in multiple phases between 1974 and 1981 and consists of two loading docks, commonly referred to as Dock Head 2 (DH2) and Dock Head 3 (DH3). At the waterward terminal end of the structure is the Seawater Treatment Plant (STP).

This multipurpose facility is commonly used to offload marine cargo to support Prudhoe Bay oilfield development. Due to concerns about causeway effects on coastal currents and nearshore fish movements (Fechhelm *et al.*, 1999), a 650-foot breach and a causeway bridge were installed between DH2 and DH3 during 1995 and 1996.

Figure 2.2-3 West Dock Causeway Vicinity Map



The GCF for the proposed ASAP Project would be constructed from 53 prefabricated modules that would be delivered from Asia to West Dock in Prudhoe Bay on 23 barges in a single-summer sealift. Two groups of barges would use established shipping lanes to deliver materials over a period of approximately 30 days, departing in mid-June/early July and arriving in early to mid-August. Vessels would port in Dutch Harbor, undergo customs clearance, and take on Protected Species Observers before continuing northward past the Pribilof Islands and through the Bering Strait using standard marine shipping routes. Barges would arrive during the Arctic summer when coastal waters are sufficiently free of sea ice cover to permit safe navigation of barge traffic to Prudhoe Bay. Sealift access to the coast depends on when sea ice retreats sufficiently to allow vessel and barge traffic around Point Barrow, about 200 miles west-northwest of Prudhoe Bay and West Dock. In this case, the open-water season is assumed to be generally between July and October, depending on sea ice.

Barges would be demobilized from West Dock and the Prudhoe Bay area as early as August 8, towed by ocean-going tugs using standard marine shipping routes. Demobilized barges would transit individually through the Beaufort and Chukchi seas rather than in groups, as occurred during their arrival into Prudhoe Bay. The final two barges that were used to construct the temporary causeway bridge would be demobilized from Prudhoe Bay on or about September 15, following deconstruction of the bridge.

The barges would arrive at a marine marshalling area 3 to 5 miles offshore from West Dock in two separate groups. Barges would be assisted by shallow-draft tugs into a navigational channel leading up to DH3, which would accommodate simultaneous offloading of up to three barges. Barges would vary in dimensions, deadweight capacity, and draft.

A 500-foot-wide by 5,400-foot-long channel would be scoured and excavated through ice to obtain a navigable depth of -9 feet for a planned barge approach at DH3 of the West Dock facility. Both ice pads and ice roads would be utilized to access the proposed dredge and disposal locations. Proposed dredge disposal requires excavated ice and sediments to be loaded into a truck and mobilized to the 100-acre disposal location (see Figure 2.2-4) within Prudhoe Bay.

The navigational channel would be dredged to -9 feet below mean lower low water the previous winter, as the barges would have a maximum payload of 5,500 short tons (s/tons) and a maximum draft of 7.6 feet. Dredging would occur just prior to the sealift, and because it would only be a 1-year sealift, no summer maintenance dredging would be expected. The sediment depth would be monitored regularly, and screeding of the navigational channel to level the seabed would be necessary in early summer prior to barge arrival to maintain the 9-foot channel depth during the ice-free season through the end of the sealift to ensure safe delivery of the modules. Screeding would be done by a shallow draft vessel that would pull a beam through parts of the navigational channel to level high spots where needed.

After the sealift, AGDC would allow the channel to infill as there would be no need for the Project to maintain it. The winter dredging period would occur when equipment could safely operate on the ice. Winter dredging would occur in stages, but it is likely the majority of dredging would occur in mid-winter. Dredging may not be complete until late winter before ice out. Figure 2.2-5 shows the limit of dredging for use of DH3.

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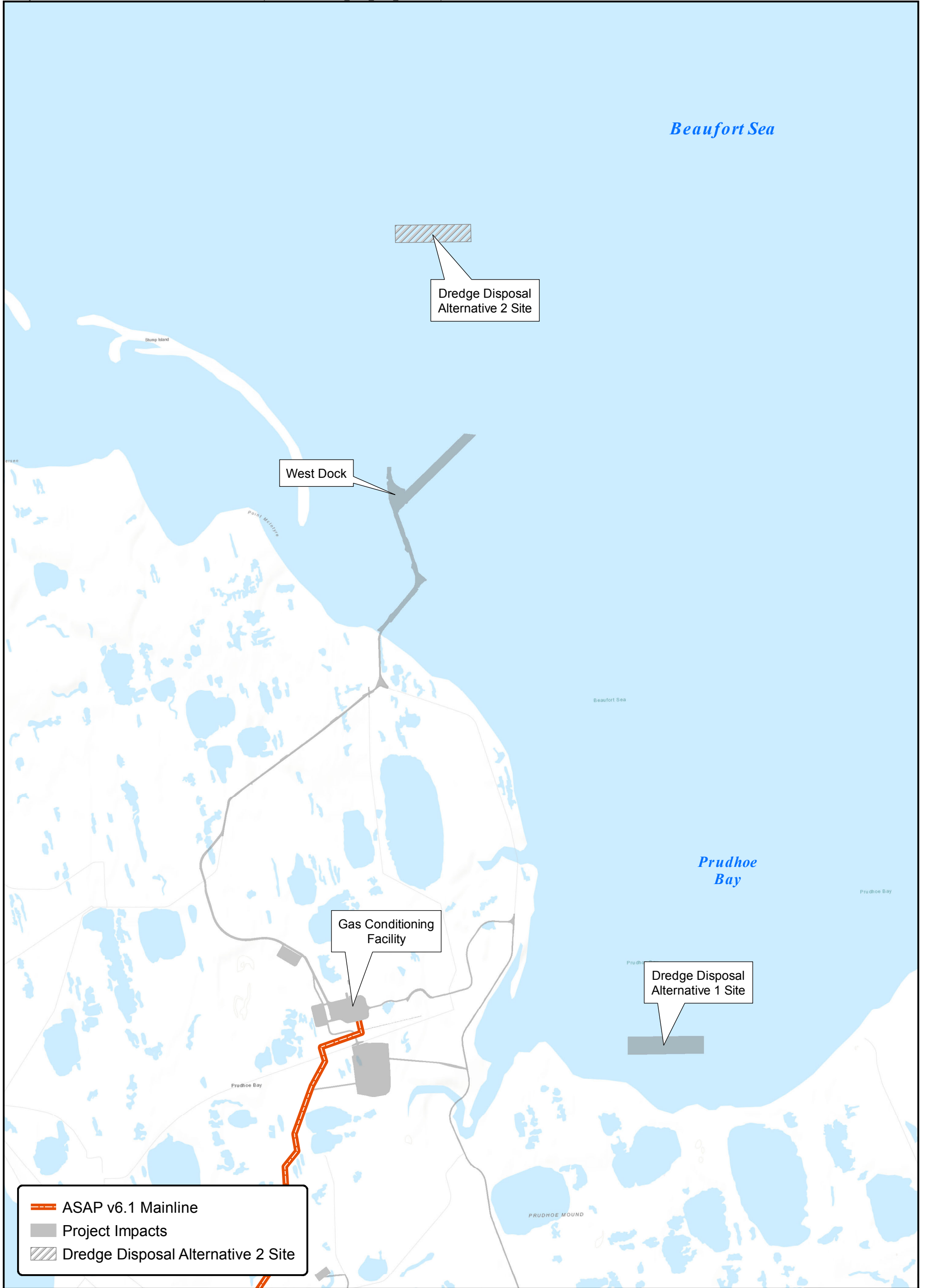
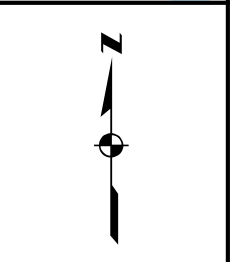


Figure 2.2-4: DREDGE MATERIAL DISPOSAL LOCATIONS FOR ALTERNATIVE 1 (PROPOSED PROJECT) AND ALTERNATIVE 2 (SEE SECTION 2.4) ALASKA STAND ALONE PIPELINE

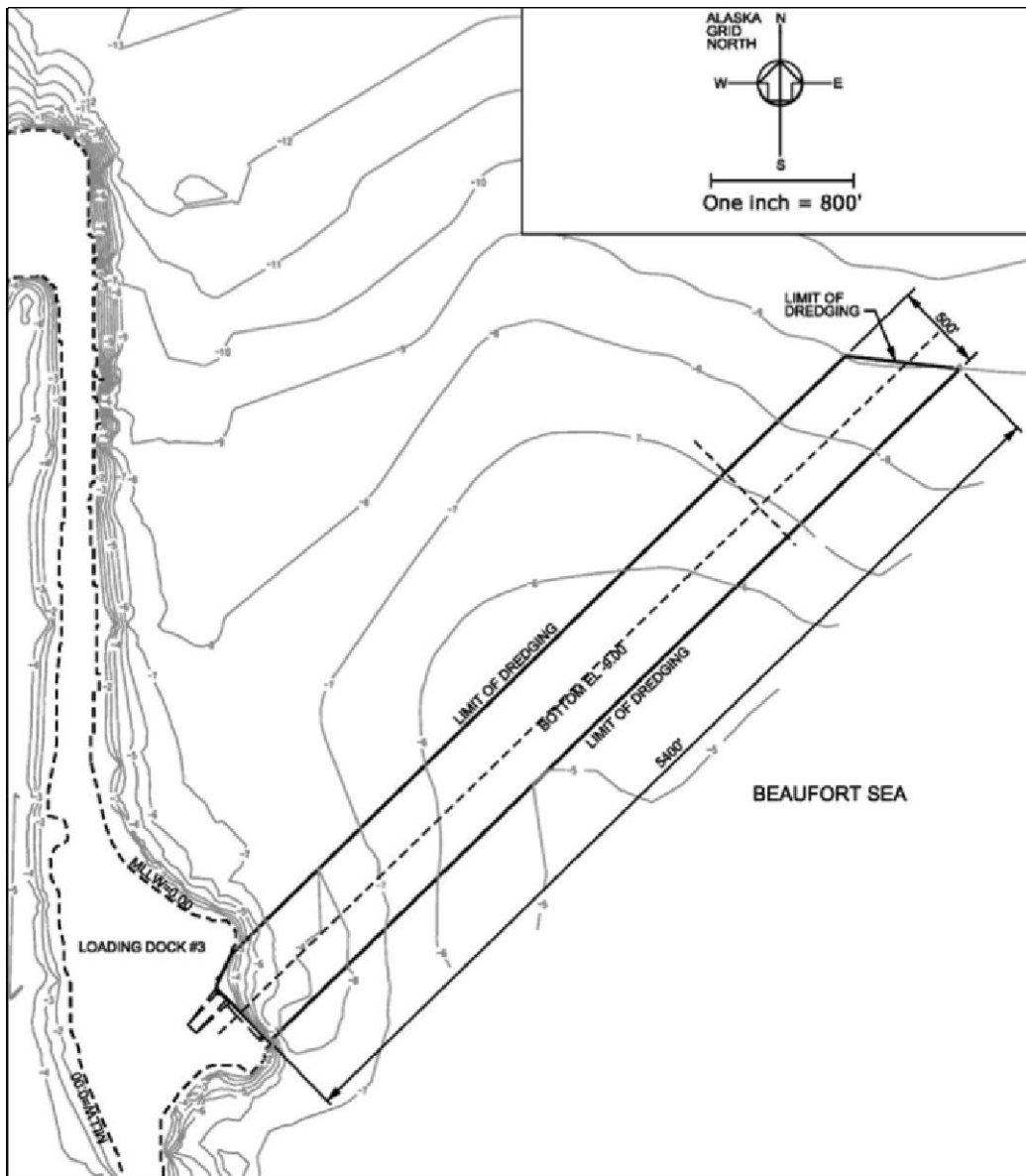


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Figure 2.2-5 Limit of Dredging Proposed at DH3



Disposal of dredge material the previous year would occur by placing it on bottomfast ice in the nearshore environment in southern Prudhoe Bay, as shown in Figure 2.2-4. A temporary bridge would be constructed using two barges in the fleet to allow self-propelled modular transporters (SPMTs) to bypass an existing weight-limited bridge spanning the 650-foot gap in the causeway.

Upgrades to dock and causeway infrastructure would be required. One of the existing dock ramps would be raised to 25 feet to accommodate a taller barge sideshell height, while the other two would remain at a height of 20 feet. Portions of the causeway road would be widened to 60 feet to accommodate module transport. Sheet piling and gravel would be used to develop abutments that would connect the temporary bridge to each side of the causeway breach.

Mooring dolphins would be installed during 2-year summer construction seasons prior to construction of the sealift to help stabilize the barge bridge (see Figure 2.2-6 and Figure 2.2-7). The four mooring dolphins would protect the current bridge from the barges and hold the ballasted barges in place. The mooring dolphins are 4-foot-diameter piles that would be driven to a minimum of 65 feet (19.8 meters) into the seabed. There are 1,837 individual pilings to be installed around West Dock; 4 of these are 48-inch dolphins (see Table 2.2-3). Most of the sheet pile is "Tail Wall" piling, which would be driven into dry ground above mean lower low water. Two types of hammers would be used for pile driving: mooring dolphins would be installed using impact pipe driving while vibratory pile driving would be used to install the sheet pile for the new bulkhead.

Figure 2.2-6 Planned Use of Infrastructure at Dock Head 3

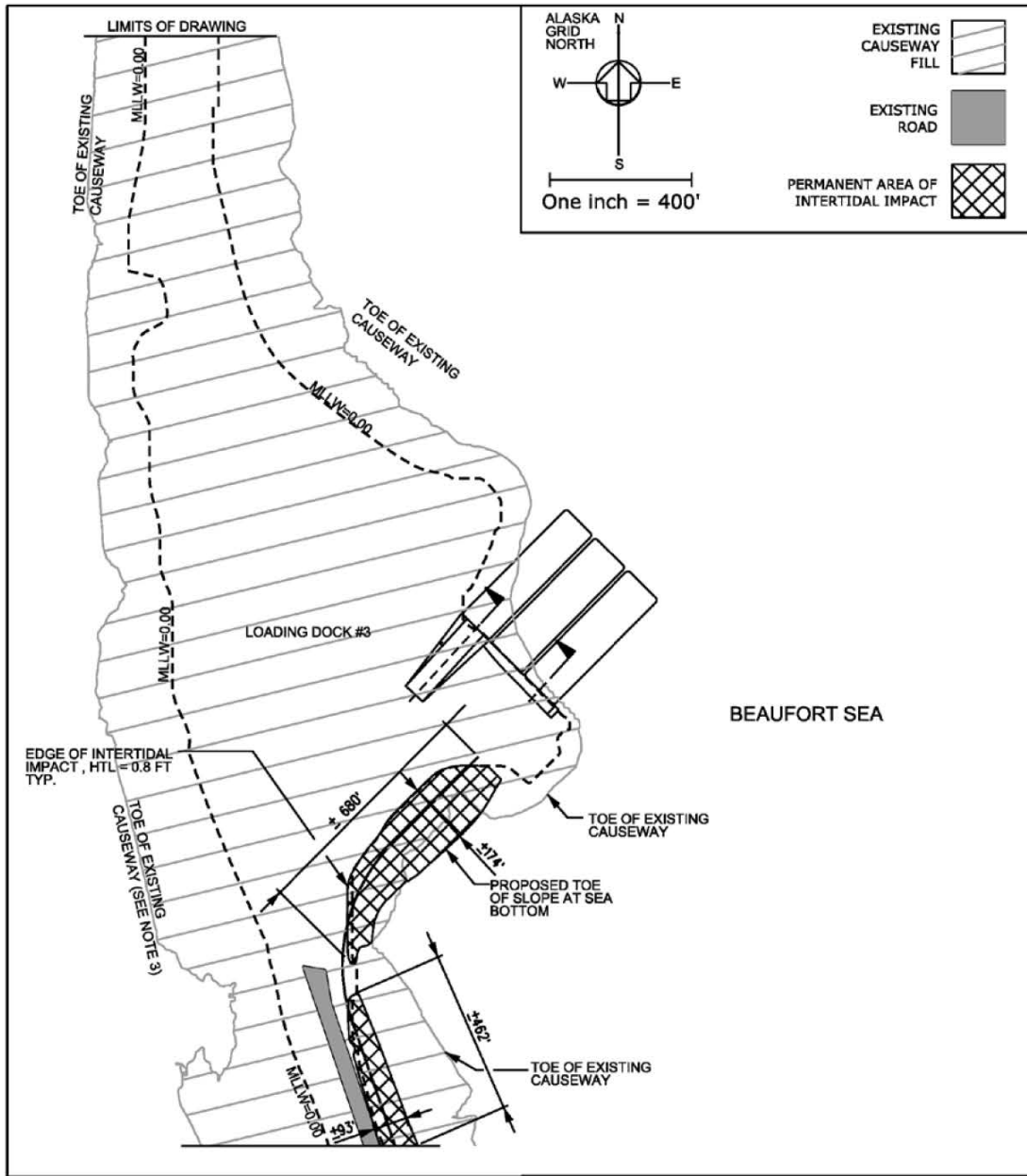


Table 2.2-3 Location, Type, Quantity, Length of Sheetpile to be Installed

Description	Total Quantity	Linear Feet of Installation (Horizontal Feet)
South Barge Bridge Abutment		
Sheetpile Arc - PS27.5 Type x 55' Long x 21 each	21	34
Sheetpile Arc - PS27.5 Type x 55' Long x 19 each	266	436
Sheetpile - PS27.5 Type x 55' Long Tailwall x 8 each	144	236
Sheetpile - PS27.5 Type x 45' Long Tailwall x 13 each	234	384
Sheetpile - PS27.5 Type x 40' Long Tailwall x 8 each	144	236
Sheetpile Arc Endwall - PS27.5 Type x 55' Long - End Wall 15	93	153
Sheetpile Arc Endwall - PS27.5 Type x 55' Long - End Wall 3	49	80
Anchor Pile HP 14 x 89 x 40' Long	18	21
1/2 Section Sheetpile at Anchor Pile x 40' Long	18	15
North Barge Bridge Abutment		
Sheetpile Arc - PS27.5 Type x 55' Long x 19 each	247	405
Sheetpile - PS27.5 Type x 55' Long Tailwall x 8 each	120	197
Sheetpile - PS27.5 Type x 45' Long Tailwall x 13 each	195	320
Sheetpile - PS27.5 Type x 40' Long Tailwall x 8 each	120	197
Sheetpile Arc Endwall - PS27.5 Type x 55' Long - End Wall 15	93	153
Sheetpile Arc Endwall - PS27.5 Type x 55' Long - End Wall 3	49	80
Anchor Pile HP 14 x 89 x 40' Long	13	15
1/2 Section Sheetpile at Anchor Pile x 40' Long	13	11
TOTALS (Installed)	1,837	2,973 feet

The mooring dolphins would be installed in open water in the first or second season. It takes approximately 3 hours of driving time (hammer in operation) to install one pile to the planned embedment, depending on weather and substrate. It is estimated that installing the four mooring dolphins would take approximately 8 days (*i.e.*, shifts) including splicing and move time between locations. Each day would require approximately 12 hours of pile hammer operation.

Vibratory pile driving would be required to install sheet pile, which would extend along the north side of the breach as well as the south side of the breach. Sheet piles would be installed from land, ice, or barges on open water during the first and/or second construction seasons (see the proposed West Dock Construction Schedule, Figure 2.2-8).

Pile driving crews can typically install an average of 25 lineal feet of sheet pile per shift, depending on weather, substrate, and equipment. Assuming continuous construction, the sheet piles could be completed in 64 shifts for the north side of the causeway and in 56 shifts for the south side of the causeway; however, the vibratory hammer is only operating intermittently during this time because of the need to set or move templates or sheets, or thread and stab the sheets. Therefore, vibratory pile driving is estimated to

require less than 120 days (*i.e.*, shifts), with actual pile driving only occurring for a portion of the shift (*i.e.*, approximately 25 percent).

The first two barges to offload modules at DH3 would be used in construction of the temporary bridge to facilitate transport of modules off the causeway. These barges would be moved into place against the mooring dolphins, where they would be ballasted and fastened to the causeway abutments and each other (see Figure 2.2-8). Prior to the temporary barges being placed, the seafloor would be prepped to make a stable surface upon which ballasted barges may rest. Screeding consists of a shallow-draft vessel slowly towing a beam across the ocean floor to level the area. Screeding would occur in the dredge area and at the 1.5-acre area of the temporary barge bridge. The temporary barge bridge area would be screeded twice: first in winter when the area is cut or ground free of ice and before gravel fill is placed; and second, just prior to placing the barges in summer. The areas would be leveled, and any high spots would be smoothed to create an area for the barges to be safely ballasted. Screeding at DH3 would take 7 days or less. Screeding at the barge bridge would take 14 days or less for each instance.

Up to 25,000 cubic yards of gravel would be placed in up to 1.5 acres of tidal waters, matching the footprint of the barge bridge, to create a level pad for the barge bridge. This would occur in the spring, using equipment working from an ice pad. The gravel would be imported from a North Slope material source, such as Put-23. Ideally this activity would occur in winter, working off the ice, and there would potentially be some smoothing (screeding) right before the barges are placed in summer in an effort to achieve a surface that is near flush with adjacent subsurface elevations. Screeding consists of a shallow-draft vessel slowly towing a beam across the ocean floor to level the area.

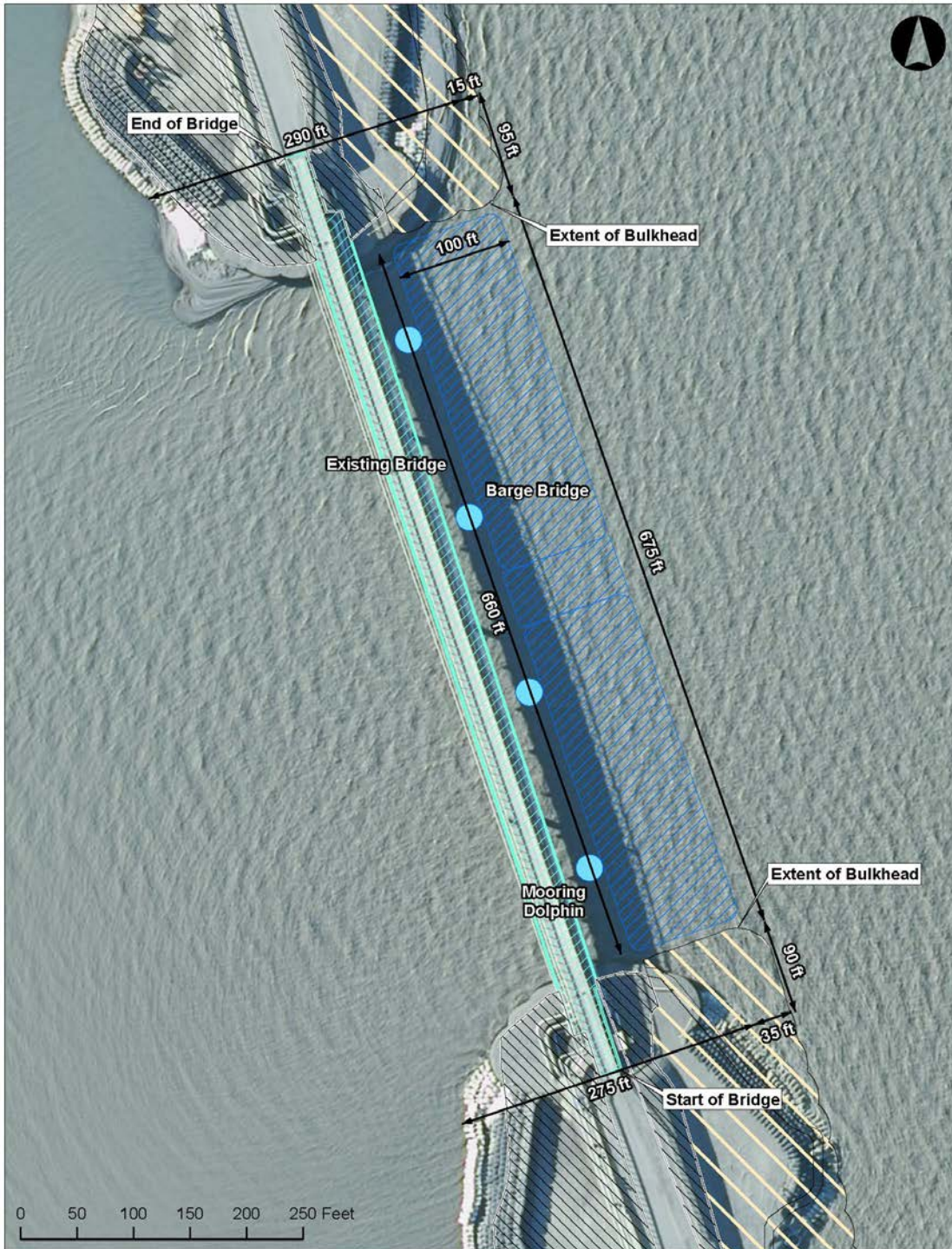
Ramps would be installed to accommodate smooth transport of the SPMTs over the bridge. Modules would be transported by SPMTs down the causeway and over the temporary bridge to a staging pad at the base of West Dock. From there, they would be moved south over approximately 6 miles of new and existing roads to the GCF construction area and permanent location.

When all modules have offloaded and rolled over the bridge and off the West Dock causeway, the barges comprising the barge bridge would be de-ballasted and depart. West Dock modifications would be left in place after modules are offloaded, as their removal would result in greater disturbance to the surrounding environment. The piling and infrastructure forming the offshoot and ramp to the temporary barge bridge would be left in place rather than pulling it out as this may result in erosion or weakening of the existing causeway. Mooring pilings would be cut below the sediment surface and removed, and then covered with surrounding sediment. The gravel layer placed under the temporary barge bridge would be left in place. Guidelines for dredge material evaluation are provided in the 2015 Dredged Material Evaluation and Disposal Procedures User Manual, prepared by the Dredged Material Management Office, USACE, Seattle District (USACE, 2015). Potential effects of this aspect of Alternative 1 are described in Chapter 4, Environmental Consequences.

Figure 2.2-8 Tentative Construction Schedule for West Dock Modifications

Year Month	Year 1												Year 2											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Barge Bridge Bulkheads																								
Order Long Lead Materials; by July 1 – previous year																								
NTP/Permits in Place; by January 1	x																							
Contractor Mobilized		x																						
Ice Roads & Pads																								
Initial Ice Roads & Pad Construction	x	x	x	x																				
Maintain Ice Roads			x	x	x	x	x																	
Barge Bridge Bulkheads																								
Haul 30,000 cy to South Side - 2 weeks duration				x																				
Haul 30,000 cy to South Side - 2 weeks duration				x																				
Thaw & Remove Existing sheet pile					x																			
Prepare Initial Site for Pile Driving					x																			
Thermally Modify Existing Ground (if needed)						x	x	x	x															
Drive South Side Face and Tailwall Sheet Pile (vibratory)						x	x																	
Move to North Side							x																	
Drive North Side Face and Tailwall Sheet Pile (vibratory)							x	x	x															
Complete Backfill of Sheet Pile - 2 weeks duration									x															
Install Erosion Protection									x	x														
Mooring Dolphins																								
Mobilize Construction Barge by August 1								x																
Install Mooring Dolphins (impact); August 1 – August 15								x																
Breach Sea Bottom Leveling																								
Thicken Ice																								
Cut Ice & Remove																								
Excavate to smooth the Sea Bottom																								
Haul, & Place 25,000 cy of Gravel to Fill low Areas																								
Screeding of Breach Area																								
Navigation Channel																								
Ice Roads & Pads																								
Initial Ice Roads & Pad Construction																								
Maintain Ice Roads																								
Cut Ice & Remove																								
Dredge Load, and Haul 250,000 cy to Disposal																								
Start Up = 7 days																								
Crew 1; Excavate at 250 cy/hr & 20 Hr per day = 25 days																								
Crew 2; Excavate at 250 cy/hr & 20 Hr per day = 25 days																								
Additional Work to Complete = 7 Days																								
Screed DH3 in Channel																								

Figure 2.2-9 West Dock Temporary Barge Bridge



2.2.4. Gas Conditioning Facility and Connecting Lines

The GCF and an associated workspace would be constructed from modules on a 90.6-acre gravel pad, approximately 1 mile west of the existing Central Gas Facility (CGF) and 5 miles south of West Dock (Figure 2.2-10). An additional 20.2-acre pad for the GCF camp and work space would be constructed near the GCF. Access roads would be used to connect the existing road to these facilities and provide access between the two facilities. The GCF would be located approximately 1 mile from the CGF. Approximately 4,200 feet of aboveground pipes supported on a single set of VSMs, 25 feet apart, would be used to transport gas from the existing CGF to the GCF and return waste products. This would result in an estimated 171 VSMs. Minimum height of the VSMs will be 7 feet. The DA Application includes a cross-section diagram/schematic of the VSM, the connection line placement and its height in relation to the tundra. An 8-inch CO₂ return line and a 3-inch liquid return line would be supported on the same set of VSMs to return wastes to the CGF. Figure 2.2-12 shows the orientation of the proposed GCF and connecting lines to the existing CGF.

The 2012 FEIS (USACE, 2012a) discussed the construction and operation of aboveground pipelines connecting the GCF and the module at the CGF, which included a natural gas supply line, an NGL supply line, and two return lines. In the current design, the NGL line is eliminated. The remaining connecting lines, which were previously listed as a Connected Action in the 2012 FEIS, along with an interface module, have now been assimilated into the Project Description and would be part of the ASAP proposal, rather than a Connected Action.

Each GCF module would have a structural steel base and would be mounted on piles driven through the gravel pad. Modules containing process and utility equipment would generally be enclosed and heated during the operations and maintenance (O&M) phase of the Project. Modules would be connected by an utilidor system that provides an enclosed, heated walkway for personnel, enclosure for small utility trailers, as well as, freeze and weather protection for interconnecting utilities and piping.

The Applicant has indicated that existing gravel material sources have been investigated and determined to be inadequate to meet the demands of the Project. A new gravel material source is proposed near the proposed location of the GCF (Figure 2.2-11). Freshwater needs for the GCF would be met by local surface water through a water use permit from the Alaska Department of Natural Resources (ADNR). The GCF would require a construction camp due to limited lodging facilities in the area. The temporary construction camp would be dismantled and removed following completion of GCF construction, commissioning, and startup; the pad would remain in place for use during operation, primarily for storing materials and equipment. A GCF Maintenance and Response Base (MRB) would remain at the site, through operation.

Figure 2.2-10 Gas Conditioning Facility Layout

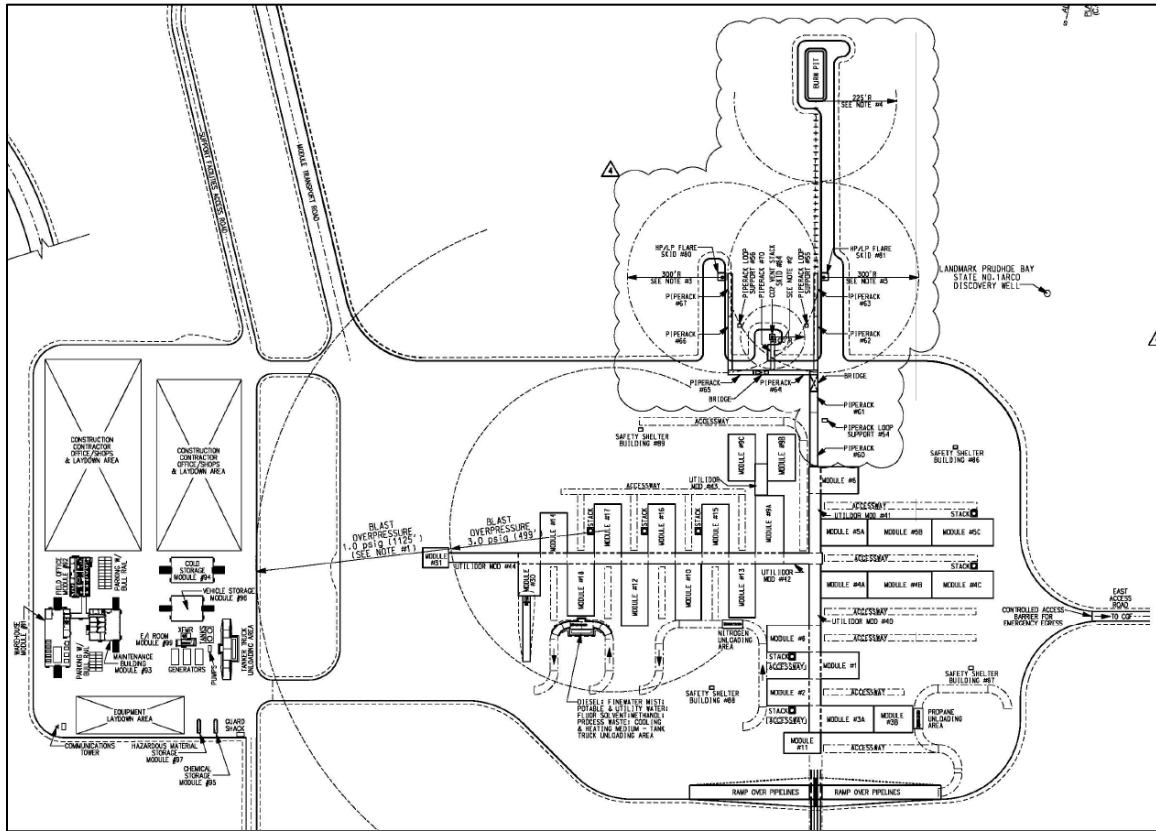


Figure 2.2-11 Location of New Material Source for GCF

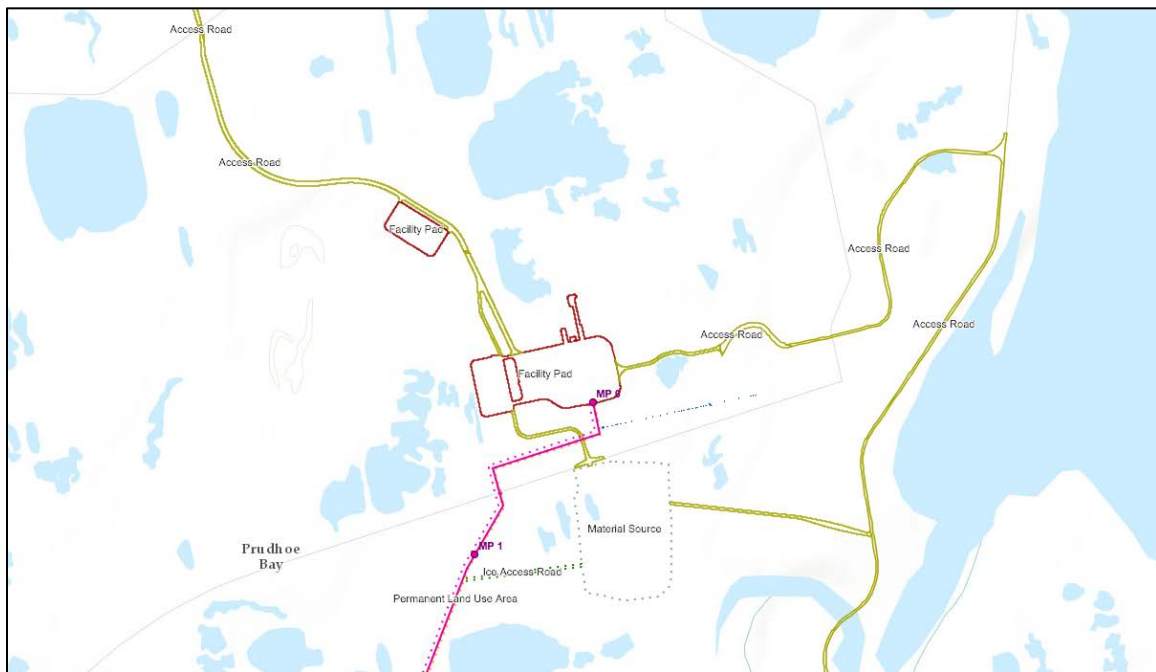
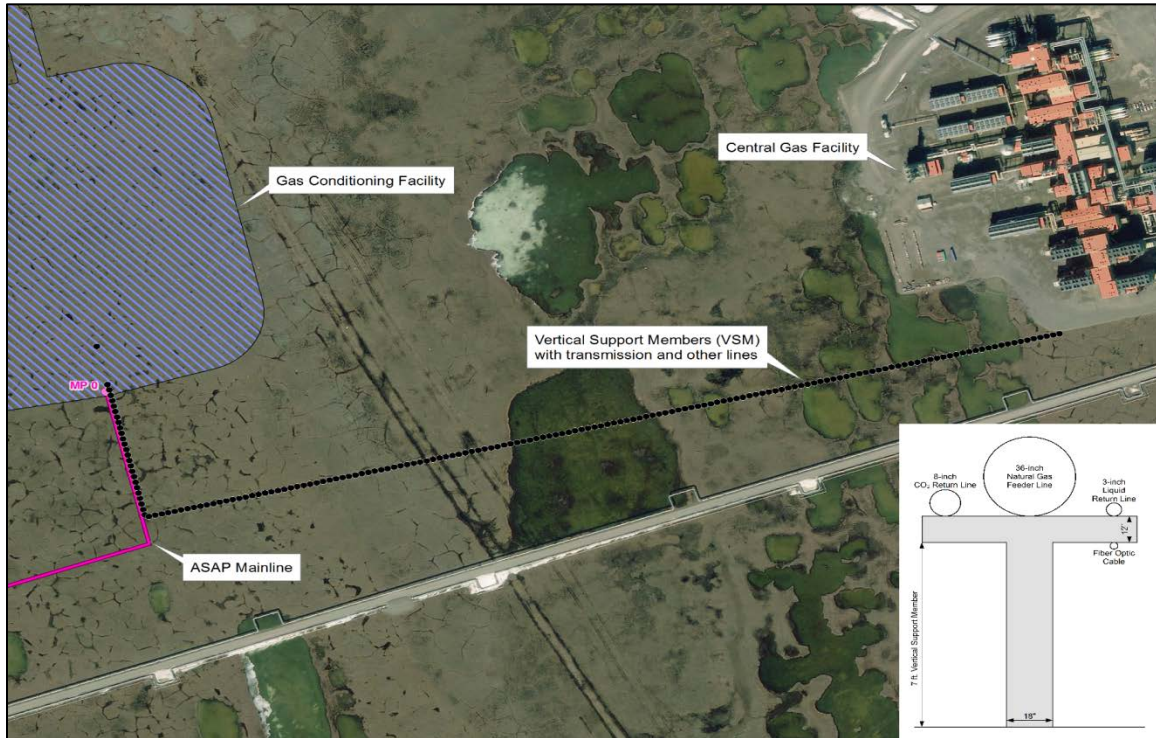


Figure 2.2-12 Placement and Orientation of Connecting Lines between the Gas Conditioning Facility and the Existing Central Gas Facility



2.2.5. Pipe Characteristics

2.2.5.1. Pipe Diameter, Pressure, and Operating Capacity

The 2012 FEIS described ASAP as a 24-inch high-pressure pipe with a maximum allowable operating pressure (MAOP) of 2,500 psig (USACE, 2012a). The revised ASAP Project would use a conventional pipe diameter of 36 inches for the Mainline operated at MAOP of 1,480 psig (AGDC, 2016e). Pipeline natural gas compression would be provided at the GCF; no additional compressor stations would be required. The Fairbanks Lateral would remain a 12-inch-diameter pipe with a pressure of 1,480 psig, the same as the Mainline.

The Mainline would be expected to operate near its MAOP and would transport approximately 500 MMscfd, up to the Fairbanks Lateral tie-in. The Fairbanks Lateral would transport up to 30 MMscfd. Differing weather conditions, seasons, maintenance needs, and other factors could cause daily fluctuations in the gas flow rate.

The changes in pipe diameter and pressure are largely driven by the change to gas composition. Since there is no need to maintain a single dense phase with both methane gas and NGL transported simultaneously, the 500 MMscfd volume of gas could be transported in a larger pipe with a lower pressure without intermediate compression.

2.2.5.2. Pipe Wall Thickness

Table 2.2-4 identifies the pipeline location classes, wall thickness, and MAOP for the Mainline. AGDC would use American Petroleum Institute (API) 5L X70 PSL2 for the Mainline pipe and API 5L X52 PSL2 for the Fairbanks Lateral¹. Applicable U.S. Department of Transportation (USDOT) integrity management (49 CFR 192, Subpart O) and corrosion control requirements (49 CFR 192, Subpart I) would be met.

Table 2.2-4 Mainline Containment Pressure

Location Classes ^a	Wall Thicknesses (Inches)	Maximum Allowable Operating Pressures for the Mainline 36-Inch Pipe (psig)
Location Class 1 (Division 2)	0.527	1,480
Location Class 2	0.632	1,480
Location Class 3	0.758	1,480
Location Class 4	0.948	1,480

Source: AGDC, 2016e

^a Location Class 1, Division 1 not used

2.2.5.3. Pipe Burial and Temperature

The pipeline would be installed belowground except at specified locations, such as pigging facilities, block valves, fault crossings, and aerial crossings. The ASAP buried line would vary in depth, meeting conditions of 49 CFR 192.327(a), "Cover." The bottom of the pipe ditch would usually be 6 to 8 feet deep, allowing for bedding, pipe installation, and trench spoils (a mixture of subsoil, topsoil, and vegetation) backfill. If material suitable for bedding and padding comes from the trench, it would be stored on the spoils side of the trench. Some examples of this are included in Appendix C (Application for Department of the Army Permit – Attachment A). If trench spoils are not suitable for bedding and padding, it would be imported from the closest material site. It is assumed that the construction contractor would stockpile bedding and padding material in large piles in the material site. Spoils not suitable for bedding and padding may be used as backfill and crowning over the ditch. Any additional spoils, which would exist in limited volume following these activities, would be spread flat and used in ROW cleanup such as for stabilizing impacted surfaces on either side of the crown.

To reduce potential impacts along the northern portion, the gas would be chilled to 30 degrees Fahrenheit (°F) before leaving the North Slope GCF. As the gas travels southward, the operating temperature would fluctuate based on several factors including time of year and the surrounding ambient ground temperature. The Joule-Thompson effect of the natural gas is muted for the relatively low volume throughput for this line. For this reason, the pipeline is referred to as an 'ambient' pipeline, indicating that the gas temperature would reflect the subsurface thermal conditions.

¹ API 5L Specification for Line Pipe is the starting basis for the Project line pipe specification. The X70 and X52 designators refer to the minimum yield strength of the pipe. PSL2 refers to the Product Specification Level 2, which is the highest level under API 5L.

With chilling of the gas on the North Slope, it is anticipated that the pipeline would operate below freezing for most or all of the year in the continuous permafrost regime. Thermal conditions of the proposed pipeline and ground have been predicted using a coupled hydraulics/geothermal model described in more detail in Appendix D, Identification and Evaluation of Time-Dependent Route Geohazards. Evaluation of the proposed Project (Alternative 1), including issues associated with pipeline temperature, are discussed in Section 4.6.

The gas would be conditioned to below-freezing temperature at the GCF to be compatible with ground temperatures expected in the northern portion of the proposed Project Area. The proposed pipeline would operate at below-freezing temperatures in predominantly permafrost terrains to protect the thermal stability of the surrounding soil. Similarly, the proposed pipeline would operate at above-freezing temperatures in predominantly thawed settings so as to not create frost-bulbs around the pipe, which could lead to frost-heave displacement or adverse hydraulic impacts on drainages. The pipeline operating temperature would be governed by the combined influence of Joule-Thompson cooling associated with gas pressure drop and pipe-wall heat transfer between the gas pipeline and surrounding soil.

As described in Appendix A, Part II, geotechnical data and associated analysis conducted by AGDC revealed that there are approximately 60 miles along the pipeline route where thaw settlement (*i.e.*, due to discontinuous permafrost) could result in longitudinal strain magnitudes (either tensile or compressive) on the pipeline and could be in excess of 0.5 percent. To address this, AGDC proposes to use heavier pipe which would reduce the strain to acceptable limits (less than 0.5 percent). In addition, a 0.3-mile segment would require free-standing thermosyphons or soil replacement as mitigation. Based on further geotechnical analysis and a decision by AGDC to use thicker wall pipe, AGDC has determined that there is no need for a SBD Special Permit. In a letter from PHMSA, dated January 16, 2018, PHMSA is no longer considering the request for a special permit understanding that the pipeline would comply with Part 192, which requires the pipeline be able to “maintain the structural integrity of the pipeline under temperature and other environmental conditions that may be anticipated” and “withstand anticipated external pressures and loads that will be imposed on the pipe after installation” to include strains imposed by permafrost and discontinuous permafrost soils.

In the 2012 FEIS Project design, the first 6 miles of pipe were supported on VSMs aboveground, while the remaining 730 miles of Mainline pipeline and 34 miles of Fairbanks Lateral were belowground, except at the specified locations described above (USACE, 2012a). The current proposed Project would involve burying the majority of the pipeline, including those first 6 miles starting at MP 0. The north-to-south configuration of the pipeline means that pipe buried beneath wetlands on the North Slope would run parallel to the direction of sheet water flow that is directed by the downward elevation gradient from the Brooks Range foothills north towards the Beaufort Sea.

2.2.6. Segment-by-Segment Design to Address Issues Associated with Permafrost

As described in detail in Appendix D, using route geotechnical data in conjunction with the results of the demand and capacity analyses, a segment-by-segment design would be completed to identify the thaw settlement and frost heave potential along the proposed alignment. The segment-by-segment design approach would follow the general steps described below.

- Areas of continuous permafrost, low water table, or where the pipeline operating temperature is greater than 32°F would not be susceptible to frost heave, and therefore, no rigorous frost heave analysis would be required.
- Areas of continuous permafrost where the pipeline operating temperature is less than 32°F would not be susceptible to thaw settlement; therefore, no rigorous thaw settlement analysis would be required.
- In areas predicted during design to have thaw settlement or frost heave in excess of 0.5 percent strain for standard wall thickness pipe, the Project would add heavier wall thickness pipe and/or utilize other means to stabilize the pipe and prevent ground movement (such as thermal siphons); these areas would be identified for curvature surveillance during operations utilizing digital pigging analysis.
- Areas where the predicted combined pipe stress due to frost heave for the critical span length remain below the allowable combined stress as per ASME B31.8 are classified as having low heave potential and no special mitigation measures would be implemented.
- During operations, areas where the predicted curvature (due to thaw settlement and frost heave for any span lengths remaining below the allowable curvature) are classified as being “movement susceptible” and would require ongoing monitoring. Should the measured curvature reach the intervention curvature limit over time, then mitigation measures would be implemented.
- During operations, areas where the predicted curvature (due to thaw settlement and frost heave for any span lengths exceeding the allowable curvature) are classified as having high heave potential and mitigation measures would be implemented.

AGDC has indicated that they plan to meet the standards of 49 CFR 192, Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards. Additionally, for pipeline construction outside of the highway right-of-way (ROW), AGDC expects to meet USDOT PHMSA regulations.

2.2.7. Pipeline Right-of-Way

The ASAP Project was designed with consideration of cross slope, terrain type, and avoidance and minimization of impacts to environmental resources where possible. The ASAP Project would propose a variable-width temporary construction ROW that

matches the project footprint. The mainline construction ROW would range from a 120-foot easement at its narrowest point to a 350-foot easement at its widest point, which includes Temporary Workspaces (TWs) and other lands needed for constructing the pipeline. The Fairbanks Lateral construction ROW would range from a 100-foot easement at its narrowest point to a 350-foot easement at its widest point. TWs and HDD False ROWs used during construction would need up to an 800-foot wide easement. TWs are described in more detail in Section 2.2.9.7.

The ASAP Project would propose a permanent operational ROW that would range from a 53-foot easement at its narrowest point to a 350-foot easement at its widest point. This maximum distance would be used during the O&M phase of the proposed Project to maintain certain side slope cuts and/or fills performed during the construction phase of the Project. The Fairbanks Lateral Operational ROW would range from a 30-foot easement at its narrowest point to a 350-foot easement at its widest point to access and maintain the land.

Security and surveillance along the ROW would require 10 full-time equivalent (FTE) management positions. After year 5 of operational activity, three FTE positions would be necessary for clearing and maintaining the ROW.

2.2.8. Route Alignment

Based on additional field data collected since 2012, as well as stakeholder input from the 2014 scoping period (see Chapter 1, Section 1.10), route refinements have been made to the Mainline and Fairbanks Lateral alignments to minimize environmental and social impacts. This section highlights the major differences between the 2012 route alignment and the alignment proposed in the 2016 DA Application submitted to USACE.

2.2.8.1. The 2016 ASAP Route

The proposed ASAP alignment is shown in Figure 2.2-1 above. Through optimization, the Mainline pipeline decreased in length from 737 miles to 733 miles (-4 miles) and the Fairbanks Lateral pipeline decreased in length from 34 to 30 miles (-4 miles). The result of this route refinement is a reduction of 8 miles, with a total length of 763 miles (AGDC, 2016e).

The proposed alignment would continue to generally parallel the TAPS and Dalton Highway corridor for most of the way to near Livengood, northwest of Fairbanks. The proposed alignment continues to be located within the established federal utility corridor managed by U.S. Bureau of Land Management (BLM) under Public Land Order 5150. At Livengood, the revised Mainline route would continue south, to the west of Fairbanks and Nenana. The pipeline would bypass Denali NPP to the east and then essentially parallel the Parks Highway corridor to Willow, continuing south to its connection into ENSTAR's distribution system at MP 39 of the Beluga Pipeline southwest of Big Lake (Figure 2.2-1).

The Fairbanks Lateral tie-in would be located approximately 2.5 miles south of the Chatanika River at MP 440 of the Mainline. From the Mainline tie-in point, the Fairbanks Lateral pipeline would traverse east over Murphy Dome, following the Murphy Dome and Old Murphy Dome Roads, and then shifting southeast to the western side of Fairbanks near the University of Alaska Fairbanks (Figure 2.2-2).

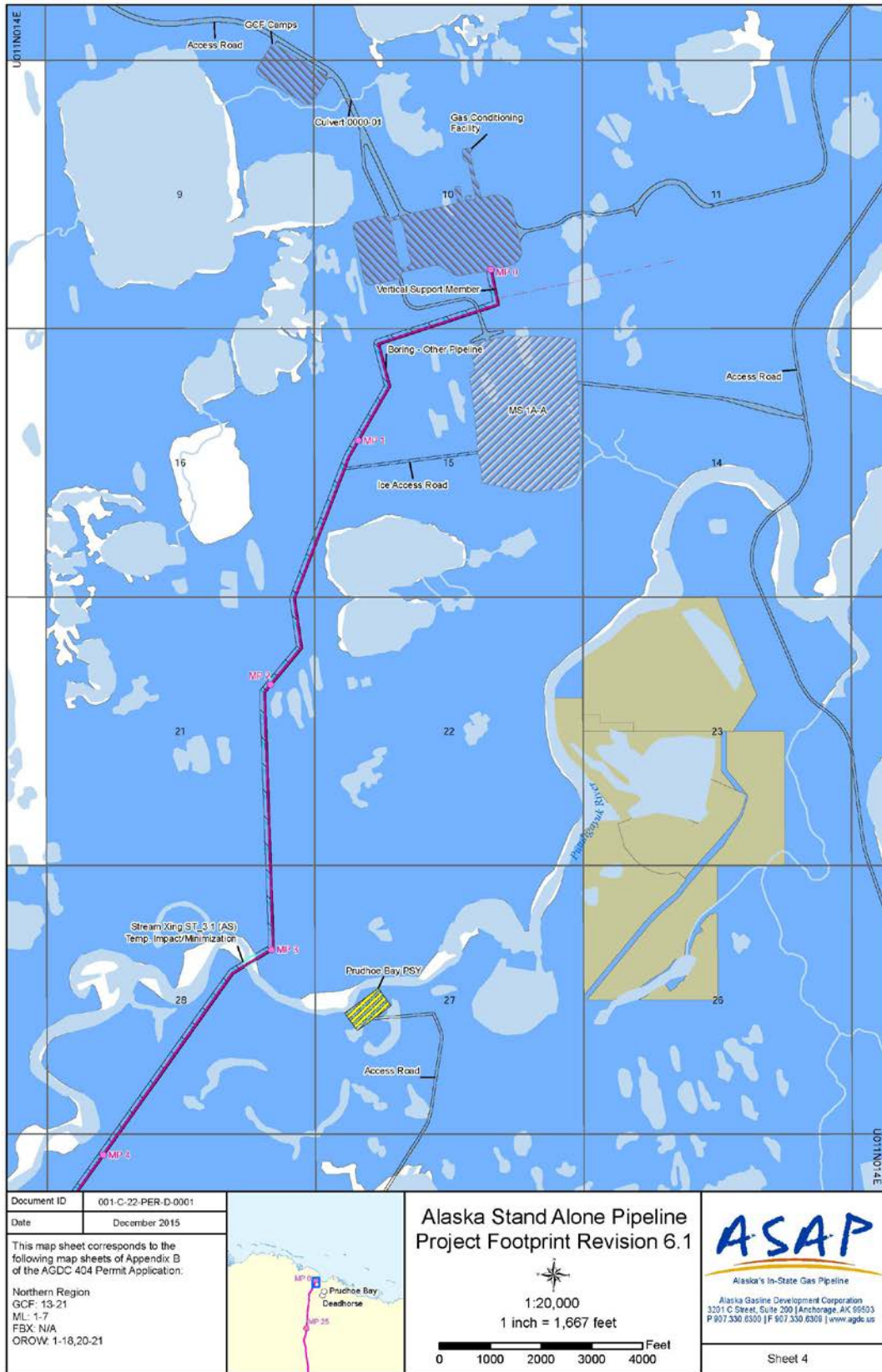
2.2.8.2. North Slope Routing Shifts (MP 0 to MP 175)

The location of the GCF is shown in Figure 2.2-13 and would be located approximately 5,500 feet northwest of the location proposed in the 2012 FEIS (USACE, 2012a). The northernmost section of the Mainline also shifted west of the previous alignment described in the 2012 FEIS (MP 0 to MP 29).

Near MP 28, the proposed 2012 alignment followed the Dalton Highway alignment east of the Sagavanirktok River to approximately MP 129. In this region, the current proposed alignment would follow higher elevation contours above the Sagavanirktok River and Dalton Highway.

At MP 129, the alignment shifts to the east and runs southwest where it would cross TAPS and the Dalton Highway at approximately MP 136.5. This straightens and shortens the alignment by more than 2 miles. From MP 136.5 to MP 219, the route follows the 2012 FEIS alignment.

Figure 2.2-13 GCF Location



2.2.8.3. Brooks Range to Yukon River (MP 175 to MP 356)

The route from the Brooks Range to the Yukon River would be adjacent to the Dalton Highway from MP 175 to MP 356. From MP 219 to MP 228, the route was shifted to the east to avoid three river crossings.

2.2.8.4. Yukon River to Fairbanks Lateral (MP 356 to MP 440)

The proposed route would follow the Dalton Highway to approximately MP 402. From MP 402 to MP 435, the proposed alignment departs to higher elevation contours to the east of the route proposed in the 2012 FEIS. Moving southward, the revised route would climb the crest of the Summer Ridge lying east of Minto Flats to the junction with the Fairbanks Lateral at MP 440, 2.5 miles south of the Mainline Chatanika River crossing. This change was made to avoid wetlands and improve constructability. As in the 2012 alignment, the proposed route crosses lands in the Minto Flats State Game Refuge and the Tanana Valley State Forest.

2.2.8.5. Fairbanks Lateral (MP 0 to MP 30.33)

The Fairbanks Lateral alignment also deviates from the previous 2012 route, which followed the Alaska Railroad Corporation (ARRC) transportation corridor adjacent to Goldstream Creek for 34.4 miles. The proposed route is 4 miles shorter and traverses east from the Mainline at MP 440 along the higher elevation of Murphy Dome, following the Old Murphy Dome Road and existing power lines. This avoids Department of Defense property and private property where possible.

2.2.8.6. Fairbanks Lateral to Cantwell (MP 440 to MP 566)

South of the Fairbanks Lateral, the proposed alignment deviates from the 2012 route near MP 440.8, moving upslope to the east to traverse drier terrain and avoid crossing Native allotments and private lands. Around MP 471.5, the proposed alignment shifts to the west side of the Nenana River. The two alignments cross at MP 497.5 where the proposed alignment shifts east closer to the Nenana River to avoid crossing Native allotments and private lands.

From MP 521 to MP 529, the proposed alignment shifts west to avoid Native allotments and private property around the town of Healy. The 2012 and current route alignments overlap between MP 529 and MP 559, and then shift to the east of the proposed alignment shifts east of the 2012 FEIS alignment along the Parks Highway to avoid Native allotments and private lands near Cantwell.

2.2.8.7. Cantwell to Willow (MP 566 to MP 707)

Between MPs 566 and 587, the proposed route would generally follow the 2012 route alignment. Between MP 587 and MP 605, in order to avoid private land, minimize stream crossing and utilize drier ground, the proposed route moves upslope and east of the 2012 route alignment to more suitable substrates. The proposed alignment follows the 2012 FEIS alignment between MP 605 and MP 638. Within this reach, the 2012 route

closely followed the Parks Highway ROW, whereas now, the proposed alignment deviates slightly to more suitable substrates and minimization of wetland impacts.

At MP 638, the proposed alignment would cross the Chulitna River and move south, west of the river, to avoid private land crossed by the 2012 route located east side of the river. Between MP 658 and MP 707, several sections of the current alignment shift slightly (less than 1 mile) from the 2012 route to minimize impacts to wetlands and avoid private property. Minor deviations to avoid crossing sensitive habitat areas, Native allotments, the Montana Creek State Recreational Area, and private property occur between MP 666.5 and 707.

2.2.8.8. Willow to Southern Terminus (MP 707 to MP 733)

Starting at MP 707 and heading toward MP 733, the proposed alignment overlaps the 2012 route with minor deviations to straighten and shorten the alignment and to avoid crossing sensitive habitat areas.

2.2.9. Facilities

The change in gas composition resulted in design refinements that eliminate the need for compressor stations, a straddle and offtake facility at the Fairbanks Lateral tie-in, and the NGL Extraction Plant at Cook Inlet. Off-ROW facilities would be collocated together where possible to avoid and minimize disturbance to environmental resources. A summary of facilities is provided in Table 2.2-1. Engineering drawings and schematics for ASAP facilities described in this section are provided in Appendix C.

2.2.9.1. Access Roads and Ice Roads

Access roads would be necessary for transporting equipment, materials, and personnel to access the pipeline ROW, MLBVs, camps, PSYs, material sites, and water sources from existing highways. The Project proposes 298 new access roads (174.4 miles) and 23 ice access roads (22.9 miles); the O&M phase would require continued use of 145 of these roads. Temporary or permanent culverts in fish streams would require Title 16 permits from the Alaska Department of Fish and Game (ADF&G) and would be required to maintain fish passage. Access roads are designed so as not to alter surface hydrology, ensuring the waterbody crossing structure is sized appropriately. Removal of temporary access road materials would be in accordance with the landowner and in most cases would require a transfer of permit authorization in order to retain and maintain the road.

Access road management decisions would be made in coordination with the landowner and Alaska Department of Transportation and Public Facilities (DOT&PF) (if jurisdictional). Access roads that are retained for use in multiple phases of the project would be managed to ensure the integrity of the pipeline while allowing for public access, where permissible. For roads not utilized for O&M, AGDC would remove crossing structures (culverts, bridges, etc.), and the approaches from a roadway or highway would be removed unless the landowner would like to maintain the road for

other public uses. Driveway permits would be applied for before construction. AGDC continues to work with DOT&PF to provide specific information on use of access roads to ensure safety, security, and maintenance. The AGDC ROW Lease from the State of Alaska requires a Highway Use Agreement with DOT&PF to be in place prior to initiating construction activities. The Highway Use Agreement is intended to facilitate coordination between the Lessee and DOT&PF on project activities that would impact state highways.

Public roads would be used to transport equipment, materials, and personnel to the greatest extent possible where marine and rail transport is not available. The Steese, Elliot, and Dalton highways would be used north of Fairbanks, whereas the Parks Highway would be used between Fairbanks and the southern terminus of the pipeline, while the Seward Highway would be used for personnel going to Seward. Other public access roads would be used to the greatest extent practicable to reduce the construction of temporary access roads.

GCF module offload and construction would require road improvements between West Dock and the GCF pad, as well as new road construction from K Pad near Prudhoe Bay to the GCF. Access roads would also be constructed from the GCF pad to material sites and from the GCF pad to the CGF.

Vehicles using the access roads during construction would include semi-trailer trucks with lowboy flatbed trailers hauling tracked equipment, pipe trucks, dump trucks, crew buses, and heavy-duty passenger vehicles, such as pickup trucks or sport-utility vehicles. Typical standard drawings for gravel access roads and culverts are presented in Appendix C. All access roads (except those that would be constructed of ice) would be considered permanent Project features.

On the North Slope, ice roads and pads would be constructed in order to provide a flat, stable working surface and move heavy equipment along the pipeline route. Approximately 104 acres of ice roads and 110 acres of ice pads would be used during construction. Ice roads and pads would be used for dredge and disposal work at West Dock (see Section 2.2.3), as well as for construction of the pipeline between MP 0 and MP 62. The location of all ice roads and pads are identified in the online interactive map viewer: <http://asapgas.agdc.us/interactivemap.html>.

2.2.9.2. Material Sites

The number of potential material sites under investigation in the 2012 FEIS totaled 546 (USACE, 2012a). The current proposed Project would include development and/or expansion of 89 material sites totaling 5,200 acres as shown on the ASAP Interactive Map Viewer, which can be accessed at: <http://asapgas.agdc.us/interactivemap.html>. A list of material sites and locations are provided in Table 2.2-5, and Figures 2.2-14 through 2.2-17. Material would also be purchased from two commercial sites. Approximately 25 MCY of material would be needed for construction.

AGDC would work closely with DOT&PF regarding use of existing material sites currently utilized by DOT&PF. AGDC and DOT&PF agree that it is in the state's interest to ensure DOT&PF gravel needs for highway maintenance and construction are met. New material sites could provide DOT&PF access to new material sources as a byproduct of the overall project. AGDC and DOT&PF have agreed to examine the use of each joint material site and develop a Material Site Plan, which would address the needs of both parties consistent with the Highway Use Agreement required by the State of Alaska ROW Lease.

A Material Site Mining Plan and a Reclamation Plan would be developed to reduce impacts associated with material extraction (AGDC, 2016b).

Table 2.2-5 ASAP Material Sites and Locations

ID	MP	Longitude	Latitude	Material Site Status	Area of Total Land Use (Acres)	Volume of Material* (MCY)	MTRS	Land Status
MS 1A-A	0.3	-148.544697	70.309997	New	136.89	2.00	U011N014E15	State of Alaska (SOA)
MS 1B-F	18.0	-148.539313	70.078687	New	75.15	0.28	U008N014E01	SOA
MS 1B-D	40.4	-148.684205	69.766051	New	174.29	0.28	U005N014E20, 29	SOA
MS 1B-G	54.8	-148.600831	69.575232	New	138.29	0.28	U003N014E25, 26, 36	SOA
MS 1C-A	65.1	-148.701147	69.422829	Existing	42.75	0.28	U001N014E21, 22	SOA
MS 1C-H	77.9	-148.776117	69.261600	New	72.33	0.28	U002S014E16, 21	SOA
MS 1C-G	85.2	-148.820412	69.148368	Existing	55.28	0.28	U003S014E29, 30, 32	SOA
MS 1C-D	90.8	-148.759031	69.081046	New	225.34	0.28	U004S014E21	SOA
MS 1C-E	109.5	-148.836168	68.825889	New	92.80	0.28	U007S014E17, 20, 21	SOA
MS 1C-F	113.6	-148.867843	68.782051	New	104.96	0.28	U007S014E32, U008S014E05, 06	SOA
MS 1D-A	113.8	-148.854805	68.763279	Existing	146.40	0.28	U008S014E07, 08, 17	SOA
MS 1D-C	130.2	-149.299688	68.619315	Existing	67.35	0.28	U009S012E33, 34	Federal
MS 1D-E	142.4	-149.480209	68.464213	Existing	147.77	0.28	U011S011E26	Federal
MS 1D-F	148.5	-149.334396	68.407421	Existing	74.79	0.28	U012S012E09, 16	Federal
MS 1D-H	155.8	-149.352454	68.305227	Existing	36.86	0.28	U013S012E21, 22	Federal
MS 1D-I	160.0	-149.415268	68.248182	New	38.43	0.28	U014S012E08	Federal
MS 1D-J	162.4	-149.396799	68.216568	Existing	84.25	0.28	U014S012E20	Federal
MS 1F-A	173.5	-149.563347	68.087328	Existing	30.85	0.28	U016S011E03	Federal
MS 2A-B	194.1	-149.824627	67.843388	New	46.85	0.28	F035N010W21	Federal
MS 2A-L	201.8	-149.752990	67.734562	New	36.83	0.28	F034N010W26, 35	Federal
MS 2A-C	207.6	-149.714403	67.656297	New	40.48	0.28	F033N010W25	Federal
MS 2A-D	218.8	-149.838538	67.514883	Existing	78.55	0.28	F031N010W17, 18	Federal
MS 2A-G	229.6	-150.070519	67.411314	Existing	87.54	0.28	F030N011W19, 20	Federal
MS 2A-H	230.4	-150.087273	67.397520	Existing	25.87	0.21	F030N011W30	Federal
MS 2A-I	236.1	-150.135873	67.319658	Existing	40.22	0.28	F029N012W24	Federal, SOA
MS 2A-J	238.3	-150.169371	67.287148	Existing	60.01	0.28	F028N012W03, F029N012W35	SOA

ID	MP	Longitude	Latitude	Material Site Status	Area of Total Land Use (Acres)	Volume of Material* (MCY)	MTRS	Land Status
MS 2B-A	241.4	-150.144967	67.240991	New	36.06	0.28	F028N012W22, 23	Federal, SOA
MS 2B-B	243.2	-150.203720	67.226911	Existing	21.38	0.26	F028N012W28	Federal
MS 2B-C	250.8	-150.340342	67.141927	Existing	57.44	0.28	F027N013W23, 26	Federal
MS 2B-D	255.3	-150.385741	67.079274	Existing	142.31	0.40	F026N013W14, 15, 16	Federal
MS 2B-F	260.3	-150.286470	67.020505	New	56.08	0.28	F025N012W06, F025N013W01	Federal
MS 2B-G	262.3	-150.289430	66.993983	Existing	32.40	0.28	F025N012W18, F025N013W13	Federal
MS 2B-H	271.7	-150.530553	66.895572	Existing	84.95	0.28	F024N014W23	Federal
MS 2B-I	276.4	-150.574902	66.827252	New	16.88	0.27	F023N014W10, 15	Federal
MS 2B-J	278.9	-150.610877	66.800723	New	86.87	0.10	F023N014W20, 21	Federal
MS 2B-K	283.5	-150.681221	66.744947	New	30.70	0.28	F022N014W07	Federal
MS 2C-A	287.2	-150.650208	66.694953	New	47.81	0.28	F022N014W29, 31, 32	Federal
MS 2C-B	289.2	-150.660772	66.663136	Existing	71.95	0.39	F021N014W05, 07, 08	Federal
MS 2C-D	296.3	-150.747595	66.577978	Existing	30.93	0.28	F020N015W10	Federal
MS 2C-E	299.6	-150.716397	66.531480	New	27.22	0.28	F020N015W26	Federal
MS 2C-F	305.1	-150.661075	66.460074	New	42.85	0.28	F019N015W24	Federal
MS 2C-G	312.3	-150.522091	66.383637	New	28.91	0.28	F018N014W15	Federal
MS 2C-H	315.8	-150.463032	66.338026	New	52.12	0.28	F018N014W36	Federal
MS 2C-J	324.3	-150.285142	66.243338	Existing	41.48	0.28	F016N013W03	Federal
MS 3A-A	336.6	-150.157471	66.082295	Existing	29.32	0.28	F015N012W31	Federal
MS 3A-B	337.4	-150.171158	66.064577	New	22.63	0.15	F014N012W06	Federal
MS 3A-C	341.0	-150.112304	66.026910	New	63.24	0.28	F014N012W20, 21	Federal
MS 3A-E	348.2	-149.920959	65.967745	Existing	182.91	0.30	F013N011W08	Federal
MS 3A-F	353.1	-149.776086	65.929522	New	33.26	0.28	F013N011W25	Federal
MS 3A-G	364.3	-149.519053	65.815925	Existing	120.34	0.28	F011N009W06, F011N010W01, F012N009W31, F012N010W36	SOA
MS 3A-I	371.2	-149.353792	65.748497	Existing	25.09	0.19	F011N009W25, 26	SOA
MS 3A-J	377.3	-149.190524	65.692424	New	35.49	0.28	F010N008W15	SOA

ID	MP	Longitude	Latitude	Material Site Status	Area of Total Land Use (Acres)	Volume of Material* (MCY)	MTRS	Land Status
MS 3A-M	383.6	-149.025229	65.643456	New	24.83	0.28	F009N007W04, F010N007W33	SOA
MS 3A-N	387.9	-148.928425	65.606682	New	34.97	0.28	F009N007W13, 14	SOA
MS 3A-O	393.7	-148.844180	65.529508	Existing	91.22	0.28	F008N006W07, 08, 17, 18	SOA
MS 3A-R	400.8	-148.657454	65.458220	New	79.92	0.28	F007N005W06, 07	SOA
MS 3C-B	456.0	-148.798944	64.728168	New	79.26	0.28	F002S006W20	Native Corporation
MS 3C-C	469.3	-149.112816	64.606949	New	41.14	0.28	F003S008W34, 35	Native Corporation
MS 3C-E	477.4	-149.149615	64.489172	New	10.44	0.15	F005S008W09	SOA
MS 3D-A	497.5	-149.294392	64.220461	New	41.08	0.28	F008S009W14, 15	SOA, Municipal/ Borough
MS 3D-B	502.0	-149.282523	64.152088	New	53.06	0.28	F009S009W03, 10, 11	SOA, Private
MS 3D-C	508.4	-149.205363	64.073629	Existing	31.92	0.28	F010S008W06	SOA
MS 3D-D	513.6	-149.125952	64.006984	New	25.94	0.28	F010S008W33	University of Alaska
MS 3D-I	520.6	-149.072893	63.912278	Existing	37.23	0.10	F011S008W35, F012S008W02	SOA, Municipal/ Borough
MS 3D-G	527.8	-149.003689	63.835396	Existing	38.17	0.27	F012S007W31	Alaska Railroad
MS 3D-H	529.1	-148.975519	63.819953	New	27.03	0.10	F013S007W06	SOA, Municipal/ Borough
MS 3F-A	538.1	-148.849368	63.712916	New	43.48	0.28	F014S007W11	Municipal/ Borough
MS 3F-B	541.3	-148.771808	63.685401	New	9.37	0.10	F014S006W20	SOA
MS 4A-A	543.6	-148.767239	63.655951	Existing	107.11	0.29	F014S006W32, F014S007W36	SOA, Municipal/ Borough

ID	MP	Longitude	Latitude	Material Site Status	Area of Total Land Use (Acres)	Volume of Material* (MCY)	MTRS	Land Status
MS 4A-B	546.8	-148.778585	63.616503	Existing	28.71	0.27	F015S006W18	Native Corporation
MS 4A-C	549.9	-148.816635	63.571302	Existing	40.97	0.28	F015S007W36	Native Corporation
MS 4A-E	557.8	-148.806960	63.469219	Existing	43.25	0.28	F017S007W01	Native Corporation
MS 4A-G	564.0	-148.883027	63.391399	New	20.68	0.28	F017S007W34, F018S007W03	SOA
MS 4A-H	571.3	-149.089082	63.354486	New	20.25	0.28	F018S008W16	Federal
MS 4A-I	580.0	-149.235975	63.251625	New	40.70	0.28	F019S009W22, 23	Native Corp., University of Alaska
MS 4A-J	584.2	-149.327252	63.209380	New	17.64	0.25	F020S009W05	SOA, Alaska Railroad
MS 4A-L	591.9	-149.451709	63.123939	Existing	43.44	0.28	F021S010W03	SOA, Mental Health Trust Authority
MS 4B-A	609.5	-149.716144	62.914789	Existing	77.22	0.28	S033N002W30, 31	SOA
MS 4B-C	622.7	-149.981260	62.783593	New	104.46	0.28	S031N004W11, 14, 15	SOA
MS 4B-G	645.7	-150.245613	62.540322	Existing	87.38	0.28	S028N005W05, 08	SOA, Municipal/ Borough
MS 4B-H	653.7	-150.252446	62.435380	New	11.68	0.10	S027N005W08, 17	SOA, Municipal/ Borough
MS 4C-B	670.3	-150.214461	62.205282	Existing	27.79	0.28	S024N005W04, S025N005W33	SOA
MS 4C-C	676.8	-150.105847	62.144321	New	49.48	0.28	S024N005W25	SOA
MS 4C-F	689.7	-150.057076	61.986673	Existing	14.08	0.06	S022N004W20	SOA
MS 4D-E	714.5	-150.189453	61.660838	New	77.61	0.28	S018N005W09	Municipal/ Borough

ID	MP	Longitude	Latitude	Material Site Status	Area of Total Land Use (Acres)	Volume of Material* (MCY)	MTRS	Land Status
MS 4D-F	720.9	-150.216807	61.574564	New	51.13	0.28	S017N005W08	Municipal/ Borough
MS 4D-G	725.7	-150.199532	61.509953	New	49.50	0.28	S016N005W04, 05	Municipal/ Borough
MS 4D-H	733.5	-150.014566	61.399770	New	20.63	0.28	S015N004W09	Municipal/ Borough
MS FL-A	FL 8.6	-148.428471	64.951825	New	15.31	0.25	F002N004W31	SOA
Totals					5,199.82	25.25		

a Material Site Status was denoted as “New” if the area of existing disturbance at the site was estimated to be < 1 acre.

b In total, 89 Material Sites are shown. It is expected that some additional material would be purchased from two commercial sites.

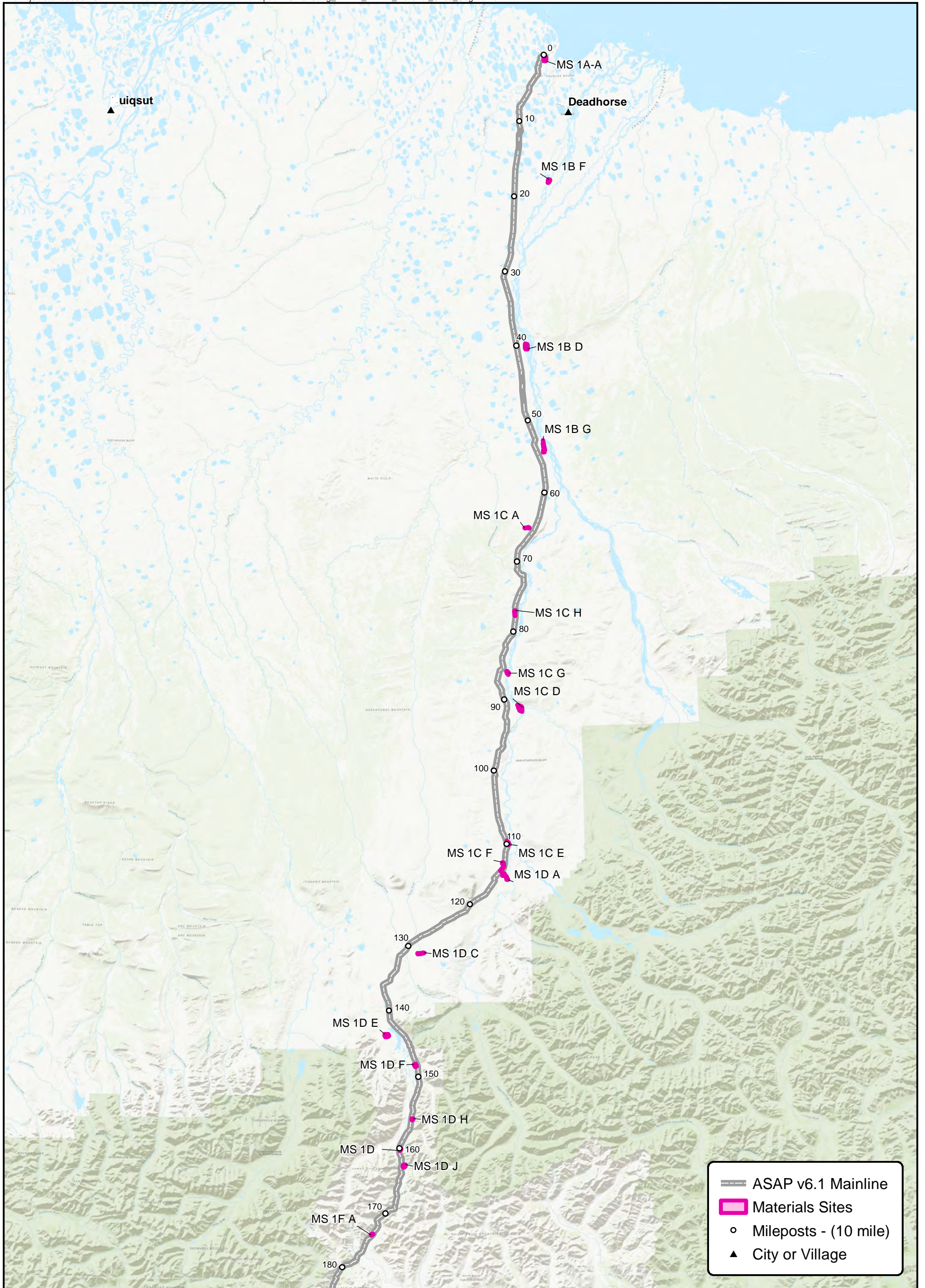
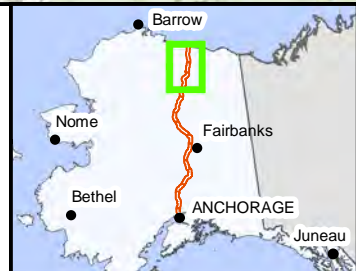
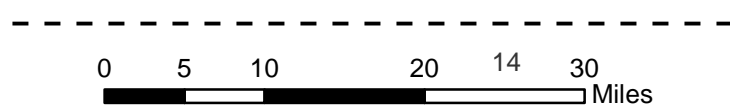
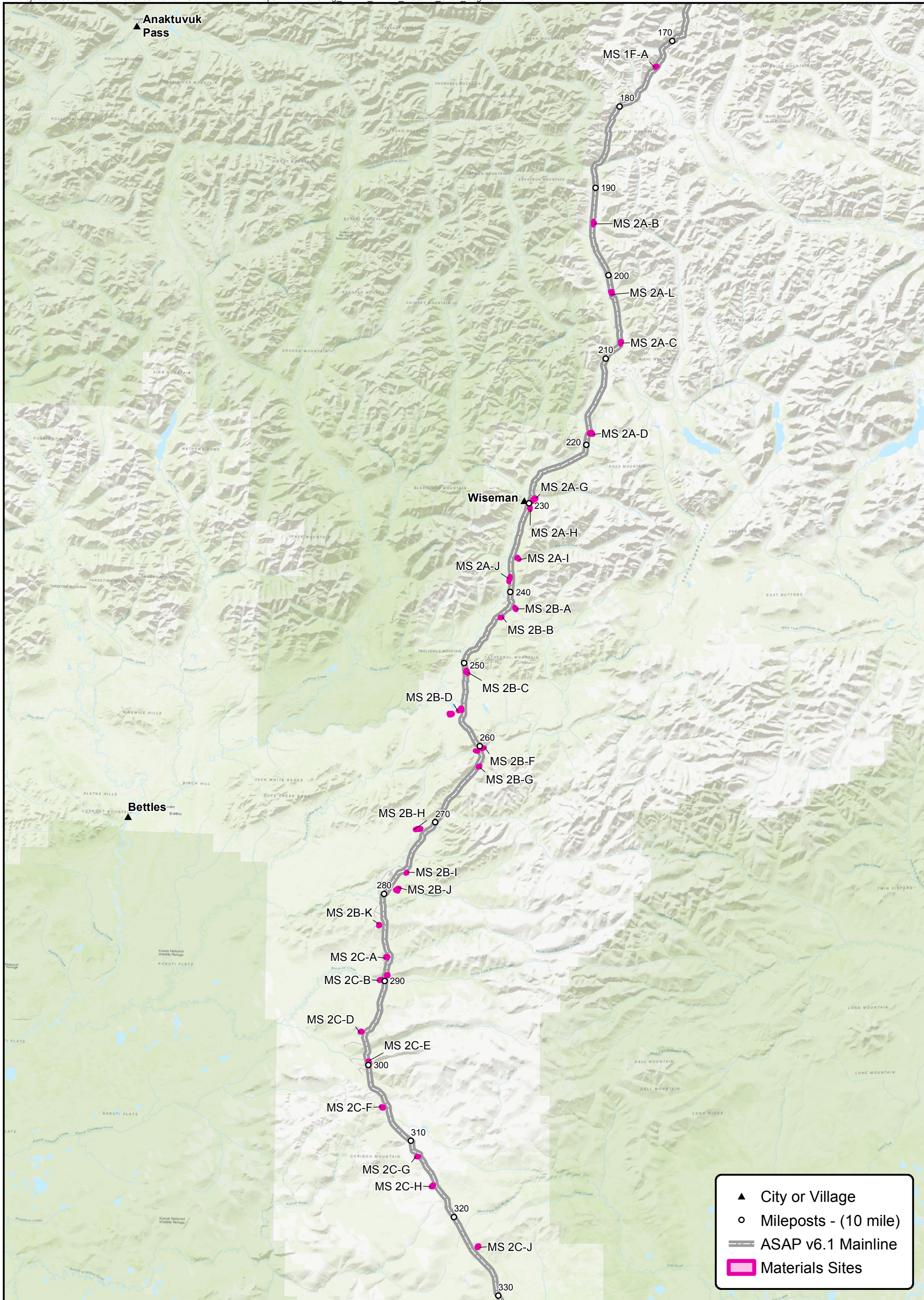


Figure 2.2-14: MATERIALS SITES SEGMENT 1 OF 4 ALASKA STAND ALONE PIPELINE



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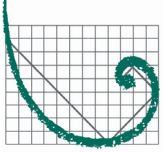
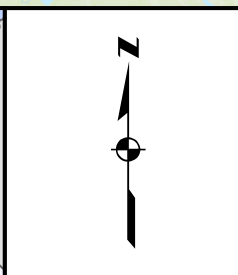
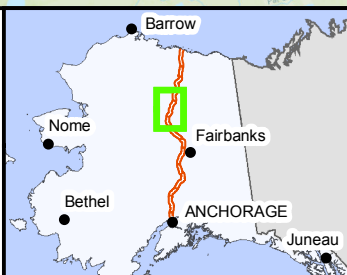

ERM
 DATE: MAR 2018
 CHKD: K.A.
 DRWN: A.V.K.
 PROJ. No.: 0416166
 825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

Figure 2.2-15: MATERIALS SITES SEGMENT 2 OF 4 ALASKA STAND ALONE PIPELINE

0 5 10 20 30 Miles



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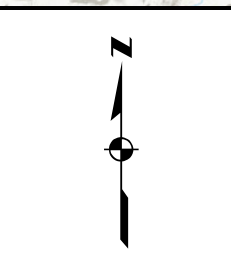
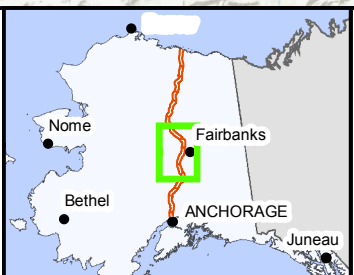
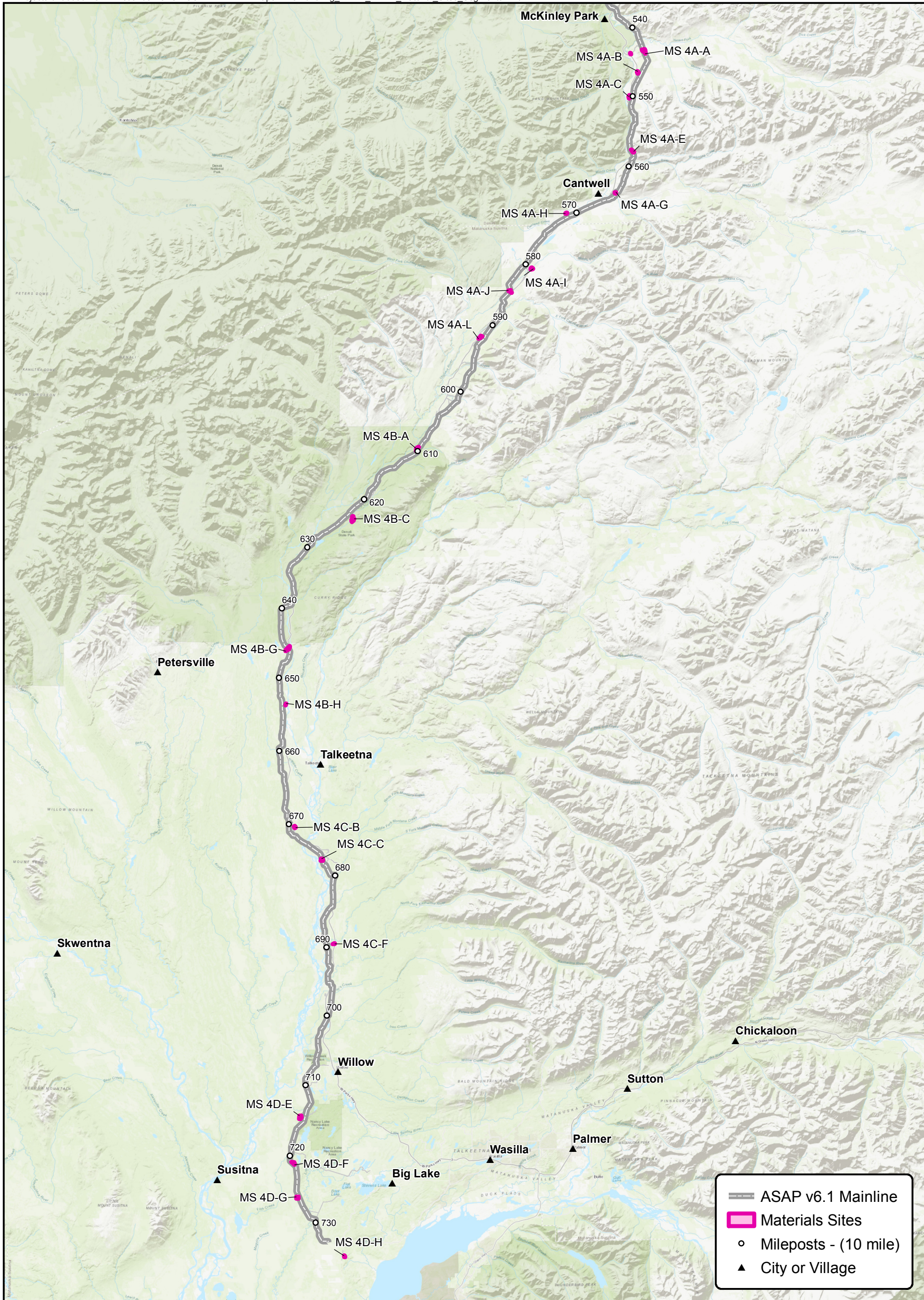

 DATE: MAR 2018
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 DRWN: A.M.K.
 PROJ. No.: 0416166
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 825 W. 8th Ave., Suite 450
 Anchorage, AK 99501, (907) 258-4880

Figure 2.2-16: MATERIALS SITES SEGMENT 3 OF 4 ALASKA STAND ALONE PIPELINE


0 5 10 20 30 Miles



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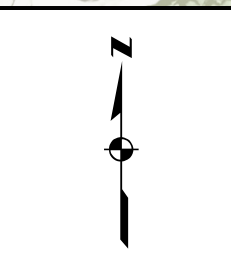
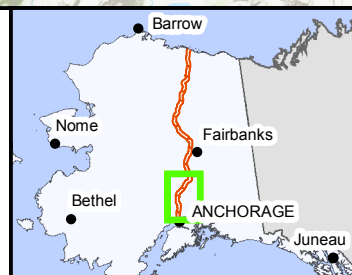
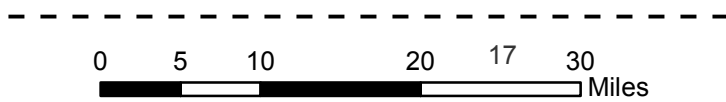


ASAP v6.1 Mainline
 Materials Sites
 Mileposts - (10 mile)
 City or Village



DATE: MAR 2018
 CHKD: K.A.
 DRWN: A.V.K.
 PROJ. No.: 0416166
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Figure 2.2-17: MATERIALS SITES SEGMENT 4 OF 4 ALASKA STAND ALONE PIPELINE



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2.2.9.3. Camps and Pipe Storage Yards

AGDC proposes to establish 13 stationary construction camps (SCCs) (12 along the Mainline, plus one at the GCF) and 26 PSYs to support construction (Figure 2.2-18) (AGDC, 2016e). Most of the SCC locations would be collocated within 1 mile of a PSY. The PSYs and SCCs would primarily be located in previously disturbed areas that were used for construction of TAPS, ARRC facilities, or public events. PSYs have been sized based on conditions at each specific location, but would average about 9 acres. The PSYs would require manpower of approximately 18 FTE management positions over 2.5 years; an additional eight FTE management positions would also be expected for supply warehousing at this time.

The SCCs would be erected along the proposed Mainline and would house project personnel, including construction workers, management, agency staff, and support service personnel. Further, SCCs would be used for fuel and equipment storage yards. These camps could house between approximately 600 and 1,000 workers, and would range in size from 26 to 40 acres. Additionally, approximately 800 workers could be housed in the GCF construction camp in Prudhoe Bay. The proposed Project would need approximately 130 employees or contractors for the GCF during a 3.5-year period and 6,000 employees or contractors for the pipeline over 2.5 years.

Mobile construction camps would be used during the construction preparation phase, or preconstruction. These mobile camps would be 8.5 to 10 acres in size and would exist at different locations for short durations. The intent of the proposed Project is to utilize previously disturbed areas for related facilities such as camps, storage areas, material sites, etc., where practicable (Table 2.2-6). Previously disturbed areas that would be available for siting camps and PSY facilities include pads used during construction of the TAPS, prior ARRC facilities, or areas used for public events. For camps not sited in previously disturbed areas, upland areas are proposed for use, where possible. Once a camp has been closed, AGDC would guide stabilization and revegetation efforts in coordination with each landowner (see Appendix H) and in accordance with other regulatory requirements. The use of mobile camps would primarily be limited to the construction preparation phase prior to the establishment of SCCs.

Figure 2.2-18 Construction Camps and Pipe Storage Yards

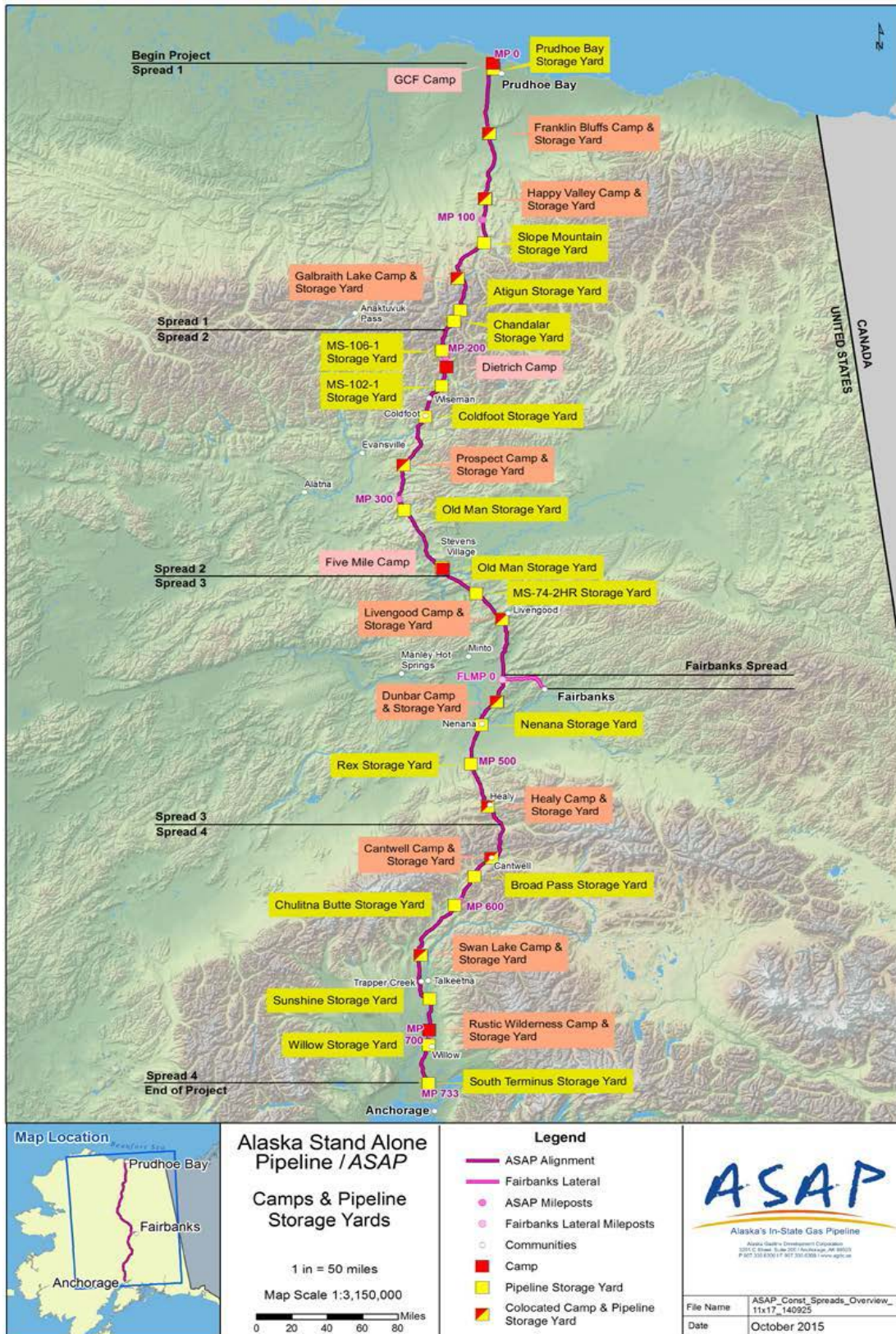


Table 2.2-6 Description of Use of Previously Disturbed Lands for Stationary Camps

Camp	MP	Acres	Description
GCF	0.0	20.2	Undisturbed land
Franklin Bluffs	43.6	35.2	Disturbed land
Happy Valley	85.2	26.6	Approximately 85% disturbed land
Galbraith Lake	142.6	40.7	Disturbed land, partial regrowth
Dietrich	205.7	26.1	Disturbed land
Prospect	278.0	32.1	Undisturbed land
Five Mile	351.9	29.7	Approximately 30% disturbed land
Livengood	400.0	28.6	Approximately 75% disturbed land
Dunbar	455.0	29.7	Undisturbed land
Healy	527.7	27.8	Undisturbed land
Cantwell	566.7	29.7	Undisturbed land
Swan Lake	645.4	23.3	Approximately 5% disturbed land
Rustic Wilderness	697.3	29.7	Undisturbed land

2.2.9.4. Block Valves

The proposed Project would install and maintain 40 MLBVs and one Fairbanks Lateral block valve. These MLBVs would be primarily belowground features, with one valve at least every 20 miles. Siting of exact locations would depend on suitability of terrain. The MLBVs would be spaced in accordance with 49 CFR 192.179 and are currently proposed to be controlled by the pipeline Supervisory Control and Data Acquisition (SCADA) system.

2.2.9.5. Pig Launchers and Receivers

To inspect and maintain operability and compliance of the pipe, pig launchers (a funnel-shaped Y section in the pipeline) would be used. Pig launchers for the 36-inch Mainline would be located at the GCF, Coldfoot, and the Fairbanks Lateral tie-in, while receivers would be located at Coldfoot, the Fairbanks Lateral tie-in, and the Mainline ENSTAR tie-in. Launchers and receivers would be collocated at Coldfoot and the Lateral tie-in.

The launcher for the 12-inch pipe would be collocated on the same pad with the 36-inch launcher/receiver at the Fairbanks Lateral tie-in location, while the receiver would be located at the Fairbanks offtake location.

2.2.9.6. Metering Stations and Offtake Facilities

Metering stations and offtake facilities would be located at the end of the Mainline and the Fairbanks Lateral where gas flow would be monitored and recorded. The Mainline would tie directly into an existing local distribution system for southcentral Alaska (ENSTAR). The Fairbanks Lateral would tie in to a local distribution system to be determined later.

2.2.9.7. Temporary Workspaces, HDD Pads, and False Rights-of-Way

Areas of supplemental use would be needed for the proposed ASAP Project during the construction phase of the Project, including TWs, HDD Entry and Exit Pads, and HDD False ROWs. The Project proposes use of 70 TWs and 8 sets of HDD Entry/Exit Pads and False ROWs.

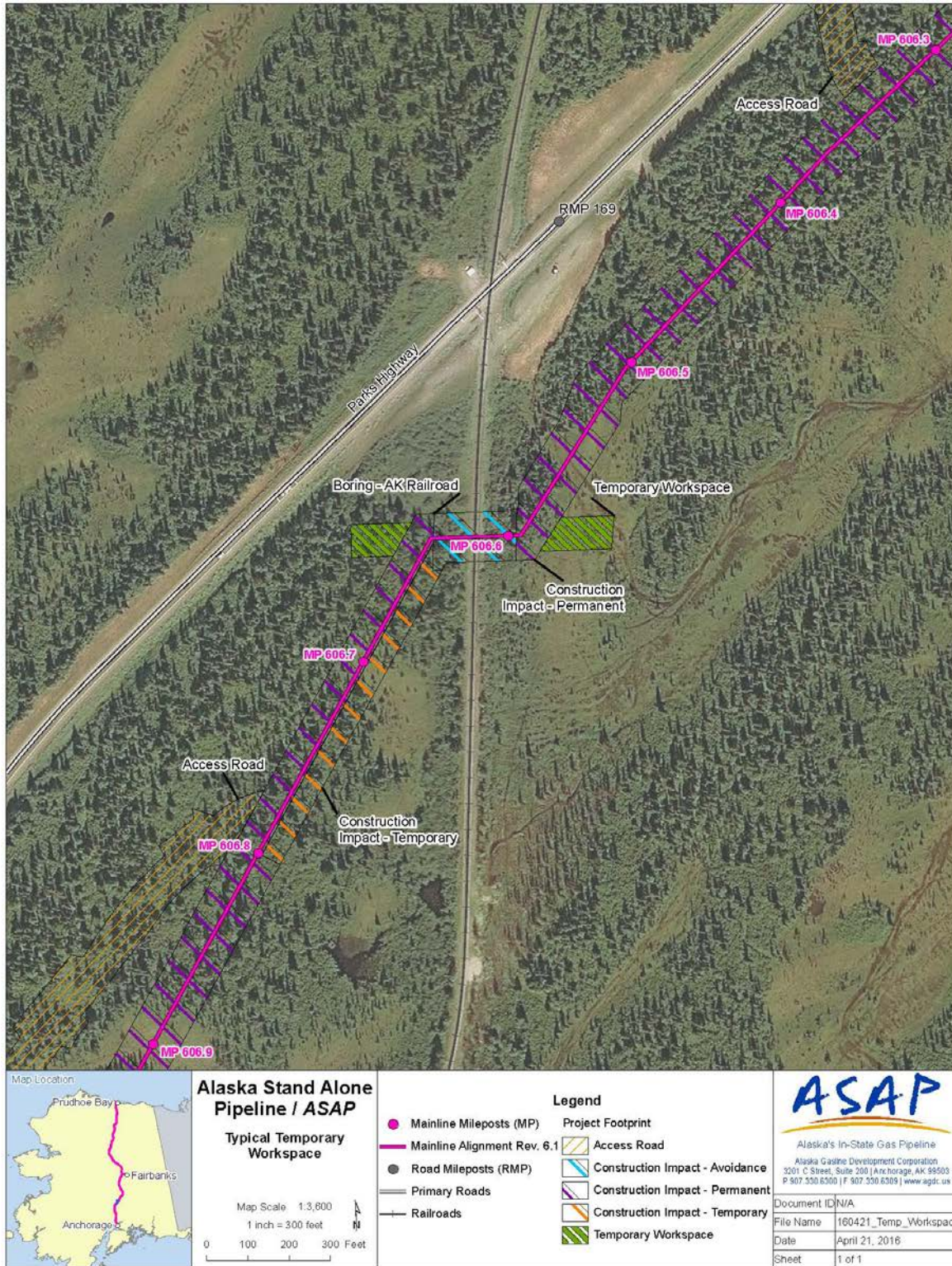
TWs would be needed for construction at road crossings, railroad crossings, crossings of existing pipelines and utilities, stringing truck turnaround areas, wetland crossings, points of inflection, and waterbody crossings. These TWs would be located adjacent to the construction footprint and could be used for things such as spoil storage, staging, equipment movement, material stockpiles, and pull-string assembly associated with HDD installation. Where feasible, TWs would be constructed outside of saturated/soft wetlands that would not support equipment (Figure 2.2-19).

TWs would range in size from 0.34 acres to 1.47 acres. There would be a total of 70 TWs; however, 29 of these would be situated inside of the construction impact area. A total of 41 TWs would be partially outside of the main pipeline construction ROW impact area. There are an additional 6.14 acres of wetlands and 10.1 acres of uplands associated with TWs that would lie outside of the construction impact area.

Along some sections of the proposed Project route (*e.g.*, at some major waterbodies, special use areas, roads, and railway crossings), pipeline installation would be accomplished via HDD or horizontal bores.

HDD requires an entry and exit box, typically 200 feet by 300 feet, placed on either side of the feature to be crossed. Typical sections of the HDD crossings are included on Sheet 40 in Appendix C. TWs associated with the HDD crossings of the rivers would likely require a total land use of 239 acres. Area would be needed for all the HDD crossings to string the pipe prior to pull back through the drilled bore. Some of these areas coincide with the typical construction easement; however, in some cases, false easements would be needed.

Figure 2.2-19 Depiction of Temporary Workspaces along Pipeline ROW



2.2.9.8. Marshalling Yards

Marshalling yards would consist of workspace and a PSY for safe, efficient, and secure storage and distribution of line pipe as it is delivered by ocean or railway transit systems to PSYs. Marshalling yard gravel pads would be constructed and operational several months prior to initial pipeline construction. Each yard would be approximately 21 acres and would have the capacity to store 40,000 tons of pipe. The yards would be located in Seward and Fairbanks and would be sited within existing rail yards or adjacent to railways to reduce the time and effort spent handling and hauling pipe. Figure 2.2-20 and Figure 2.2-19 show the locations and schematics of the proposed marshalling yards in Fairbanks and Seward.

Each marshalling yard would have an equipment storage area and a mobile office where staff would work. There would be office space for site management, administrative, logistical, quality assessment/quality control, and operational staff. The marshalling yard office / equipment storage areas would be surrounded by a chain-link fence with three 20-foot gates. This fence would serve a dual purpose to secure equipment and materials and to keep foot traffic safely segregated from the material haul routes associated with the pipe storage area. Areas have been identified for storing snow during the winter months. Office trailers, portable toilets, dumpsters, generators with accompanying fuel storage systems, an 80-foot by 120-foot cold storage/equipment maintenance facility, and secure lockable storage containers would be rented and temporary in nature. Marshalling yards would have 24 FTE management positions functioning over 2.5 years.

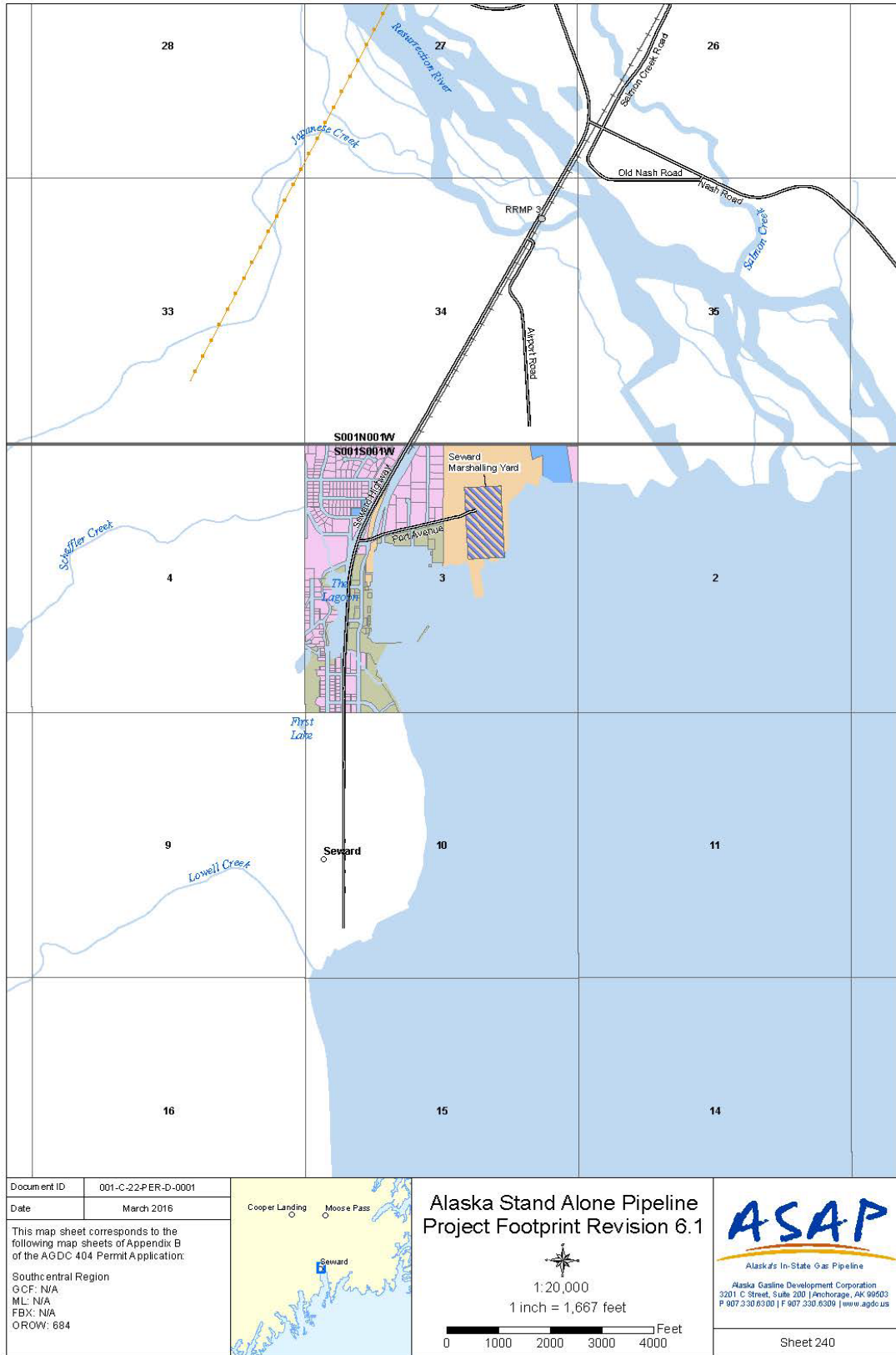
2.2.9.8.1. Seward Marshalling Yard and Anticipated Staffing

The Seward Marshalling Yard would be located near the Seward Harbor and the ARRC terminus. Pipe would arrive by barge and would be transported directly to the Seward Marshalling Yard or placed on railcars. The Seward Marshalling Yard would be required for 30 months, allowing four months to coordinate mobilization activities and two months for demobilization. It is assumed that pipe would be delivered to the Port of Seward and transferred to the Seward Marshalling Yard over a 24-month period, with each vessel requiring 7 to 10 days to fully discharge the load. During the vessel offload cycles, operations would proceed for 24 hours each day with multiple crews.

2.2.9.8.2. Fairbanks Marshalling Yard and Anticipated Staffing

The Fairbanks Marshalling Yard would be located in Fairbanks, adjacent to ARRC tracks (Figure 2.2-21). The pipe would arrive by rail to be stored and sorted before moving to smaller PSYs. The Fairbanks Marshalling Yard would be operational for approximately 30 months. Personnel would be tasked with a 6-day, 60-hour workweek. The staff assigned to the Fairbanks Marshalling Yard would provide management oversight for the rail siting near the Fairbanks Lateral tie-in to the Mainline. This siting would be used as a direct offload point from the ARRC tracks to truck pipe to PSYs.

Figure 2.2-20 Seward Marshalling Yard



2.2.9.9. Maintenance and Response Bases and Anticipated Staffing

Approximately 240 employees and contractors would be needed to staff the proposed Project during its O&M phase. Work at the Project's three MRBs would need a total of 24 FTE management positions. Some of these roles are noted in the facility descriptions below.

2.2.9.9.1. GCF/GCF Maintenance and Response Base

The GCF complex and the integrated GCF MRB would be located within the PBU and would be a stand-alone modular facility for gas processing, support (*e.g.*, office, storage, shop, and equipment) and camp facilities. The purpose of the GCF MRB would be to:

1. Provide self-sustaining utilities, power, and housing for the GCF complex.
2. Reliably process and provide conditioned gas for intra-state shipping via the pipeline to Fairbanks and to the ENSTAR-operated Beluga Pipeline near Big Lake.
3. Serve as the center of operations for the entire proposed ASAP Project, 24 hours per day, 7 days a week (24/7).
4. Support maintenance and emergency response activities for the GCF complex and the pipeline ROW from MP 0 through MP 183.

A high degree of reliability and prompt response times would be required of staff at this facility, and given the size of the GCF complex, a high volume and variety of maintenance activities would be likely. Key operational functions of the GCF complex and the GCF MRB would include:

- GCF process facilities operations;
- GCF camp operation;
- GCF and Pipeline Control Room, staffed 24/7;
- Upstream gas coordination (PBU);
- GCF metering and chain-of-custody;
- Mainline pipeline pressure and overpressure control;
- Valve position remote monitoring;
- Leak detection remote monitoring;
- Corrosion protection remote monitoring;
- River crossing remote (camera and sensor) monitoring;
- Unmanned security systems monitoring and alarms;
- Fairbanks Lateral remote metering;
- Fairbanks utility delivery rates and pressures;
- Fairbanks utility remote metering and chain-of-custody;

- Downstream Fairbanks utilities coordination;
- Beluga utility delivery rates and pressures;
- Beluga utility remote metering and chain-of-custody;
- Downstream Beluga utilities coordination (ENSTAR);
- Security crew; and
- Control and coordination of line-wide maintenance activities.

Primary support for maintenance activities along the ROW between MP 0 and MP 183 would be operated from the GCF MRB. These activities would be performed under a manager and a support team, which would be housed, deployed, and provided equipment and facilities support from the GCF complex. Their activities would be:

- Pig launching/receiving;
- Valve maintenance;
- Cathodic protection system maintenance;
- Communications system maintenance;
- SCADA Systems maintenance;
- Civil infrastructure maintenance (*e.g.*, bridge, access road, slope erosion, vegetation control, and flood damage);
- Ground monitoring of the ROW; and
- Aerial monitoring of the ROW.

A security crew would be based at the GCF. Emergency response for the GCF complex and the pipeline ROW from MP 0 through MP 183 would be managed from the GCF and supported by the GCF MRB. To provide first response, security and emergency response-trained personnel capable of delivering first response emergency services and contacting appropriate backup support would be on site at the GCF 24/7. Consistent with traditional North Slope scheduling protocol, personnel assigned to the GCF complex would typically work a 2-week on/2-week off schedule. Personnel based at the GCF would be housed at the permanent GCF camp. The GCF MRB would require approximately 10 FTE management positions stationed on site, which would function in roles of administration, staff supervision, management, and technical services.

2.2.9.9.2. Fairbanks Maintenance and Response Base

Natural gas would be shipped from the Mainline to the Fairbanks end users from the Fairbanks Lateral offtake point. Fairbanks is located approximately halfway along the entire ASAP corridor and possesses existing commercial and industrial infrastructure. For this reason, it would serve as a major coordination center for pipeline maintenance and response activities. The Fairbanks Maintenance and Response Base (FMRB) would be an urban industrial facility located near the Fairbanks offtake facilities at the corner of

Geist Road and the George Parks Highway. ASAP facilities and equipment that operated and maintained from the FMRB would include:

- Fairbanks Lateral ROW;
- Mainline pipeline ROW MP 183 to MP 529;
- FMRB facilities, including administrative, storage, warehouse, and equipment facilities; and
- Backup Control Room.

The key maintenance activities supported at the FMRB would include:

- FMRB administrative, storage, warehouse, and equipment facilities maintenance;
- FMRB Backup Control Room facility maintenance;
- FMRB roads and pads;
- Original Equipment Manufacturer maintenance; and
- Rolling-stock equipment.

Maintenance activities along the ROW between MP 183 and MP 529 would be supported from the FMRB by a manager and O&M team. Their activities would include:

- Pig launching/receiving;
- Valve maintenance;
- Cathodic protection system maintenance;
- Communication system maintenance;
- SCADA Systems maintenance;
- Civil infrastructure maintenance (*e.g.*, bridge, access road, slope erosion, vegetation control, and flood damage);
- Ground monitoring of the ROW; and
- Aerial monitoring of the ROW.

A security crew and emergency response personnel covering MP 183 through 529 would also be based at the FMRB and would be available 24/7. Personnel assigned to the FMRB would work a typical 8-hour day work schedule and live off site, rather than being housed at the facility. The FMRB would likely have three-shift schedules, including day, night, and swing shifts. The FMRB would have about nine FTE management positions including administration, staff supervision, management, technical services, scheduling, and outreach.

2.2.9.9.3. Big Lake Maintenance and Response Base

The Big Lake Maintenance and Response Base (BLMRB) would serve as a major support location for pipeline maintenance and response activities north of the local offtake point,

to utilize existing industrial and commercial infrastructure in the Mat-Su Borough. The BLMRB would be collocated with the Big Lake offtake facility at the end of the ASAP line near its tie-in to the ENSTAR system (Beluga line). ASAP facilities and equipment operated and maintained from the BLMRB would include:

- Mainline pipeline ROW MP 529 to MP 733; and
- BLMRB facilities, including administrative, storage, warehouse, and equipment facilities.

The key maintenance activities supported from the BLMRB would include:

- BLMRB administrative, storage, warehouse, and equipment facilities maintenance;
- BLMRB roads and pads;
- Original Equipment Manufacturer maintenance; and
- Rolling-stock equipment.

The BLMRB would support maintenance activities between MP 529 and MP 733. These activities would be performed under a maintenance manager and team and, similar to the other response facilities, their activities would be:

- Pig launching/receiving;
- Valve maintenance;
- Cathodic protection system maintenance;
- Communications system maintenance;
- SCADA Systems maintenance;
- Civil infrastructure maintenance (*e.g.*, bridge, access road, slope erosion, vegetation control, and flood damage);
- Ground monitoring of the ROW; and
- Aerial monitoring of the ROW.

A security crew and emergency response personnel would respond to needs along the pipeline from MP 529 through MP 733 and be available 24/7. Similar to Fairbanks, personnel assigned to the BLMRB would work a standard work schedule and would not be housed on site. The BLMRB would need approximately five FTE management positions in administration, staff supervision, management, and technical services.

2.2.9.9.4. Anchorage Headquarters

The ASAP Project corporate headquarters would be located within the Municipality of Anchorage, and would be an urban office facility that would provide offices for corporate staff. Technology would be leveraged, as necessary, to provide real-time monitoring of pipeline functions by support teams in the Anchorage headquarters. The ASAP Anchorage offices would be the administrative center of the corporate

organization. Key management and administrative functions that support the organization would be centrally resourced in the corporate offices. The Anchorage headquarters would need 88 FTE positions for O&M, which would include:

- Executive management;
- Finance and accounting;
- Commercial and gas distribution;
- Operations;
- Legal services/land management;
- Government and external affairs;
- Engineering;
- Health, safety, security, environmental, and quality;
- Human resources; and
- Information technology.

The ASAP Project corporate organization would be staffed with professionals to support management and administrative functions. Personnel assigned to the corporate offices would work a standard workweek, while security positions necessary for 24/7 shifts would be staffed using a third-party contractor using a three-shift schedules, including day, night, and swing shifts. All Anchorage staff would reside locally. Headquarters are currently proposed to be located at AGDC's present office at 3201 C Street, Suite 200, Anchorage, Alaska 99503.

2.2.9.9.5. Airports

The ASAP Project currently plans to use existing airports or runways for transport of personnel. The proposed Project does not plan to build, improve, or expand any runways.

For construction activities in close proximity to existing runways, AGDC would coordinate with the Federal Aviation Administration and DOT&PF to ensure Notice to Airmen are published, if required.

2.2.10. Project Footprint

The ASAP Project footprint was not fully defined in the 2012 FEIS, although several components were quantified. Material site acreages and several access road locations were not determined at that time (USACE, 2012a). Quantifiable uses of land included approximately 4,100 acres for permanent use and 10,900 acres of land for temporary use (15,000 acres total), among several other lands considered while the Project developed (USACE, 2012a).

The current revised and complete ASAP Project footprint, which includes full construction easements and all off-ROW features (including material sites), would impact 21,237.3 acres of land, including wetlands as well as uplands.

This total Project footprint acreage comprises 7,914.7 acres of impact to freshwater wetlands (7,277.8 acres permanent, 637.0 acres temporary), 172.3 acres of impact to marine waters (170.9 acres permanent, 1.4 acres temporary), and 11,051.4 acres of impact to uplands. Additional information on impacts to water resources, vegetation, and wetlands is provided in Chapter 4, Sections 4.7, 4.8, and 4.9, respectively.

2.2.11. Waterbody Crossings

The ASAP Project footprint would impact 491 waterbodies at 496 locations, including 310 streams and 181 inundated areas that do not meet criteria under the USACE's jurisdiction; 1 of the waterbodies would be impacted at 5 locations. While these inundated areas do not meet the definition of a streams defined in 33 CFR 328.3(b), they do require special consideration for pipeline design and as such have been identified by AGDC.

There would be a total of 423 Mainline waterbody crossings, 7 Fairbanks Lateral waterbody crossings, 61 access road waterbody crossings, and 5 in-river material site extraction locations at the Sagavanirktok River to help meet North Slope gravel needs. Of the total waterbody crossings, the proposed ASAP Project would impact 71 anadromous waters² at 75 distinct locations (*i.e.*, some waterbodies are crossed more than once). A total of 57 anadromous waterbodies would be impacted along the Mainline and Fairbanks Lateral. As described in Table 2.2-1, for the Mainline, stream crossings (all temporary) include:

- Six aerial (bridge);
- 155 isolated open cut;
- 95 open cut; and
- Seven trenchless crossings using HDD, including the Yukon River.

The 12-inch Fairbanks Lateral would cross streams or creeks as follows:

- Three open cut; and
- Four isolated open cut.

A total of 13 anadromous waterbodies would be impacted by access roads. Access roads would result in culverts (pipes) or bridges placed in or over streams or creeks as follows:

² The 71 anadromous waters impacted by the total Project Footprint are the sum of impacts to waterbodies on the mainline (57 anadromous waters impacted), access roads (13 anadromous waters impacted), and at material extraction sites (1 anadromous water impacted). However, this is a conservative number because of some duplications between mainline crossings and access road crossings of the same stream.

- 17 bridges (14 temporary and 3 permanent); and
- 23 culverts (4 temporary and 19 permanent).

The ASAP Project would utilize material from five sites on the Sagavanirktok River, which is anadromous, and would be managed in coordination with ADF&G. Figure 2.2-22 provides a schematic of the proposed HDD crossing at the Yukon River. HDD is a steerable trenchless method of installing underground pipe, conduit, or cable in a shallow arc along a prescribed bore path by using a surface-launched drilling rig, with minimal impact on the surrounding area. HDDs would be scheduled to occur during both winter and summer construction seasons with construction-related activities occurring around the HDD site for 24 hours per day until pipe placement is complete. In winter, glycol or other antifreeze additives would not be required because of ongoing circulation of fluids in the bellhole resulting from the ongoing drilling activity. The HDD crossings, coatings, pressure testing, and isolation valves would be installed in accordance with 49 CFR 192.

Additional information including the location of the ASAP Project's HDD with associated source location, HDD length, proposed disposal site location, probable water required, and proposed average daily water consumption are provided in Chapter 3, Section 3.3, Water, of this SEIS.

Since 2012, changes in pipeline routing and the addition of new access roads and other facilities have occurred, and better desktop and field data for streams and wetlands have been collected resulting in fewer stream crossings. The pipeline construction ROW would be positioned near streams that would not be crossed or directly impacted. Nearby streams would be evaluated on a site-by-site basis to determine if special planning or mitigation is needed at these sites during construction or operation of the pipeline. Some material sources along the Sagavanirktok River in the Northern region would utilize gravel from riverbanks in close coordination with the ADF&G. AGDC would follow any stipulations and installation requirements specified by ADF&G in permits required for culverts in fish-bearing waters.

2.2.12. Alternative 1 Construction Spread Plan (Schedule)

Table 2.2-7 provides the anticipated schedule of construction activities for Alternative 1 (Proposed Action). The construction schedule (referred to as the "Construction Spread Plan") is an important consideration for assessing impacts to resources.

Figure 2.2-22 Yukon River Crossing Horizontal Directional Drilling Option

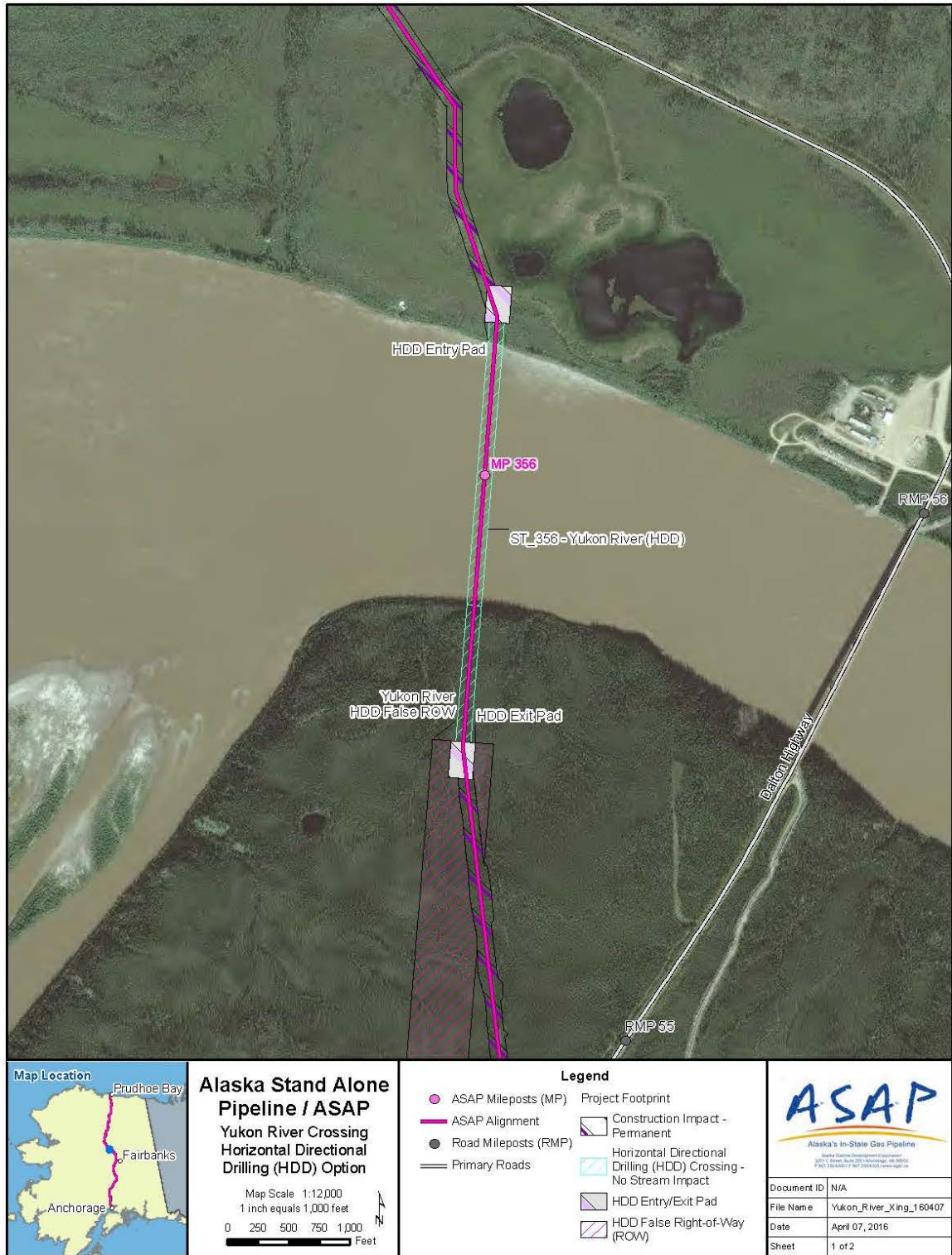


Table 2.2-7 Alternative 1: ASAP Construction Spread Plan (Schedule)

Spread	Section	Location	Start (MP)	End (MP)	Length (Miles)	Early Civil Work Season ^a	Civil ROW Construction Season ^b	Pipeline Construction Season
1	1AB	GCF to MP 62 (Confluence of Sagavanirktok & Ivishak Rivers) (includes ice road and ice pad construction)	0	62	62	S1.5	W2	W2
	1C	MP 62 to MP 113 (Slope Mountain)	62	113	56	S1.5	S1.5-W2	W2-S2.5
	1D	MP 113 to MP 161 (Atigun River)	113	161	48	S0.5	S0.5-W1	S1.5
	1EF	Atigun River Valley to Upper Dietrich River Valley	161	185	24			
Spread 1: 4 Section Estimates			Spread 1 Total:		185			
2	2A	Chandalar Shelf to Coldfoot	185	241	56	S0.5	S0.5-W1	S1.5
	2B	Coldfoot to Prospect Creek	241	285	44			
	2C	Prospect Creek to Ray River	285	334	49	S1.5	S1.5-W2	S2.5
	2D	Ray River to South of Yukon River	334	360	26			
Spread 2: 4 Section Estimates			Spread 2 Total:		175			
3	3A	Yukon River to Livengood	360	406	46	S1.5	S1.5-W2	S2.5
	3B	Livengood to Little Goldstream	406	448	42	S1.5	W2	W2
	3C	Little Goldstream to Rex	448	489	41			
	3D	Rex to Healy (Moody Bridge)	489	530	41	S0.5	S0.5-W1	S1.5-W2*
	3E	Moody Bridge to McKinley Village (Glitter Gulch)	530	535	5			
	3F	McKinley Village to Yanert Fork	535	542	7			
Spread 3: 6 Section Estimates			Spread 3 Total:		182			
4	4A	Yanert Fork to Hurricane Gulch (Chulitna Butte)	542	605	63	S1.5	S1.5	S2.5
	4B	Hurricane Gulch to Susitna River	605	675	70	S0.5-W1	N/A	S1.5
	4CD	Susitna River to Terminus	675	733	58	S1.5	N/A	W2
Spread 4: 3 Section Estimates			Spread 4 Total:		191			
All Asap Mainline: 17 Section Estimates			ASAP Mainline Total:		733			
Fairbanks Lateral	1	Tie-in to Mainline (MP 440) to Fairbanks	0	30	30	S1.5	N/A	S2.5
Fairbanks Lateral Pipeline: 1 Section Estimate			Total:		30			
Key: Primary Seasons S = summer construction (May 1 thru October 31) W = winter construction (November 1 thru April 30) * = winter construction would terminate by November 30 in this area			Numbers following 'W' or 'S' refer to the year of construction (e.g., 'S0.5' and 'W1' refer to the first summer and winter of construction, respectively)					

Spread	Section	Location	Start (MP)	End (MP)	Length (Miles)	Early Civil Work Season ^a	Civil ROW Construction Season ^b	Pipeline Construction Season
<p>^a = The Early Civil Work Season is when any kind of civil work (access roads, camp pads, pipe storage yards, etc.) will begin for a particular segment. This work is not specific to the pipeline ROW.</p> <p>^b = Civil ROW Construction Season is when civil work specific to just the pipeline ROW begins (this could be clearing, grading, development of ice pads, continuation of ice roads or access roads, snow removal, etc.).</p>								

2.3. Connected Actions

The 2012 FEIS listed as a Connected Action (USACE, 2012a):

...the construction and operation of four aboveground pipelines that would connect the Prudhoe Bay Central Gas Facility to the Gas Conditioning Facility (GCF) for supply of natural gas and natural gas liquids (NGLs), and return of byproducts...

The ASAP design has advanced to a level that the concept of the aboveground connecting lines between the GCF and CGF has been assimilated into the Project Description. As discussed in Section 2.2.4, the NGL line has been eliminated from the current Project design plans (AGDC, 2016e). A single natural gas feed line would transport gas between the CGF and the GCF, where gas would be conditioned, and waste products would be returned via the two return lines (one for CO₂ and one for liquids). This element of the proposed Project should no longer be considered a Connected Action, but instead would be part of the ASAP Project design. The analyses of potential effects associated with these aspects of the Project are presented in Chapter 4.

The ASAP Mainline would terminate at its connection and tie-in to a local distribution system, the ENSTAR natural gas pipeline near Big Lake. The Fairbanks Lateral would end west of the University of Alaska Fairbanks campus. The scope of the project does not include any community infrastructure (e.g., offtake valves, decompression stations, or local distribution infrastructure for communities along the line); however, it is a reasonably foreseeable action that some communities would want access to gas and request to tap into the line to feed local distribution infrastructure, which would be developed in the future (see Section 4.20, Cumulative Impact Assessment).

2.4. Alternative 2: Denali NPP Route Variation including Dock Head 2, Ocean Disposal & Aboveground Pipeline Mode (Denali NPP Route Variation)

On September 18, 2013, the Denali National Park Improvement Act (Public Law 113-33) passed, which includes the following language:

Sec. 3. B) Permit (1) a high-pressure natural gas transmission pipeline (including appurtenances) in non-wilderness areas within the boundary of Denali National Park within, along, or near the approximately 7-mile segment of the George Parks Highway that runs through the Park; and (2) any distribution and transmission pipelines and appurtenances that the Secretary determines to be necessary to provide natural gas supply to the Park.

This alignment would be subject to title XI of the Alaska National Interest Lands Conservation Act (ANILCA). The 2013 legislation and the recent energy bills underscore the need to evaluate the Denali NPP Route Variation in the ASAP Draft SEIS. Therefore, this route has been carried forward for detailed analysis in Chapter 4.

2.4.1. Assessment of the Denali NPP Route Variation in the 2012 FEIS

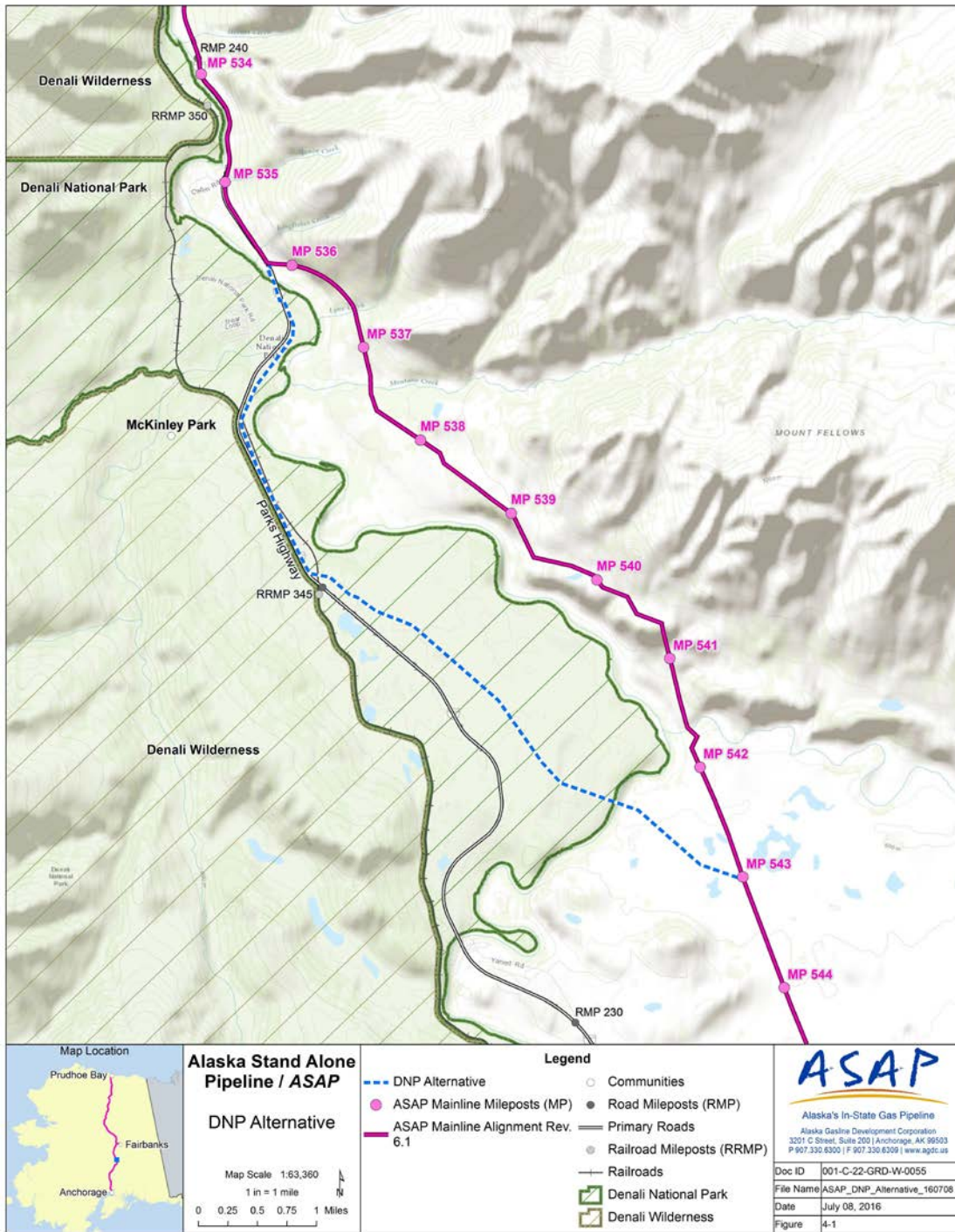
An alternative route through Denali NPP was assessed in the 2012 FEIS. Since 2012, AGDC has carried out additional reconnaissance surveys, reviewed additional geotechnical data, conducted pedestrian surveys, and collected other environmental data that have resulted in a revised Denali NPP alignment, as shown in Figure 2.4-1. Additional information on wetlands is summarized in Chapter 3, Section 3.5, Wetlands, of this SEIS.

2.4.2. 2016 Denali NPP Route Variation Analyzed in this SEIS

The Denali NPP Route Variation (Alternative 2) is depicted as the blue dotted line shown in Figure 2.4-1. The Denali NPP Route Variation would begin at MP 535.8 and enters the Denali NPP boundary approximately 0.2 miles after crossing the Nenana River on the pedestrian bridge to the west of the Parks Highway (also contained within Denali NPP). Just south of the pedestrian bridge, the Denali NPP Route Variation would cross the Parks Highway again (from west to east) and remain on the east side of the road. The route would parallel the highway until the second at-grade railroad crossing south of the Denali NPP entrance, at which point the route would diverge from it. At this point, the route would shift to the southeast, away from the Parks Highway, crossing the Nenana River downstream (east) of McKinley Village. The Denali NPP Route Variation would rejoin the proposed route at MP 543. The lengths of both routes are similar, only differing by about 0.3 miles.

Routing and design through Denali NPP have attempted to utilize uplands and minimize environmental impacts to the extent practicable. A more detailed discussion of the resources located within the Alternative 2 Denali NPP corridor are provided in Chapter 3, while potential impacts associated with this alternative are presented in Chapter 4. Additional aspects of Alternative 2 are discussed in Section 2.4.3 of this SEIS.

Figure 2.4-1 Denali NPP Route Variation Alternative



2.4.3. Aboveground Pipeline Mode, Dock Head 2, Ocean Disposal of Dredge Material and Aerial Crossing at Yukon River

Additional components of Alternative 2 include the following aspects:

- Aboveground pipeline mode (MP 0 - 62) and belowground (buried) pipeline mode (MP 62 - 733.5) as well as the Fairbanks Lateral;
- DH2 at West Dock;
- Ocean disposal of dredge material; and
- Aerial crossing at Yukon River.

Through development of SEIS alternatives, cooperating agencies expressed concern about burying the proposed pipeline in the northern most portion of the route in an area referred to as the Arctic (or Beaufort) Coastal Plain. If the active layer of insulation is disturbed during construction (*i.e.*, trenching), permafrost could be vulnerable to thermokarst and subsidence during the summer due to exposure to higher temperatures. In addition, USFWS specifically requested consideration of elevating the pipeline on VSMs for the first several miles through the Arctic Coastal Plain where ice-rich, saturated soils and continuous permafrost are found. The first 30 miles in particular contain a high density of oriented thaw lakes, which provide important habitat for North Slope species. A more detailed description of the Arctic Coastal Plain is provided in Section 3.4.

To address this issue, Alternative 2 proposes to elevate the pipeline on VSMs through the extent of the Arctic (Beaufort) Coastal Plain from MP 0 to approximately MP 62 as shown in Figure 2.4-2. The majority of wetlands impacted by the project would occur within the area of continuous permafrost, which extends to approximately MP 168 as shown in Figure 2.4-2. Table 2.4-1 provides the estimated percentages and acres of wetlands impacted in areas of continuous, discontinuous, and sporadic permafrost within the proposed pipeline ROW for Alternative 2. Therefore, by elevating the pipeline on VSMs in this section, impacts to permafrost and waters of the U.S., including wetlands, may be minimized.

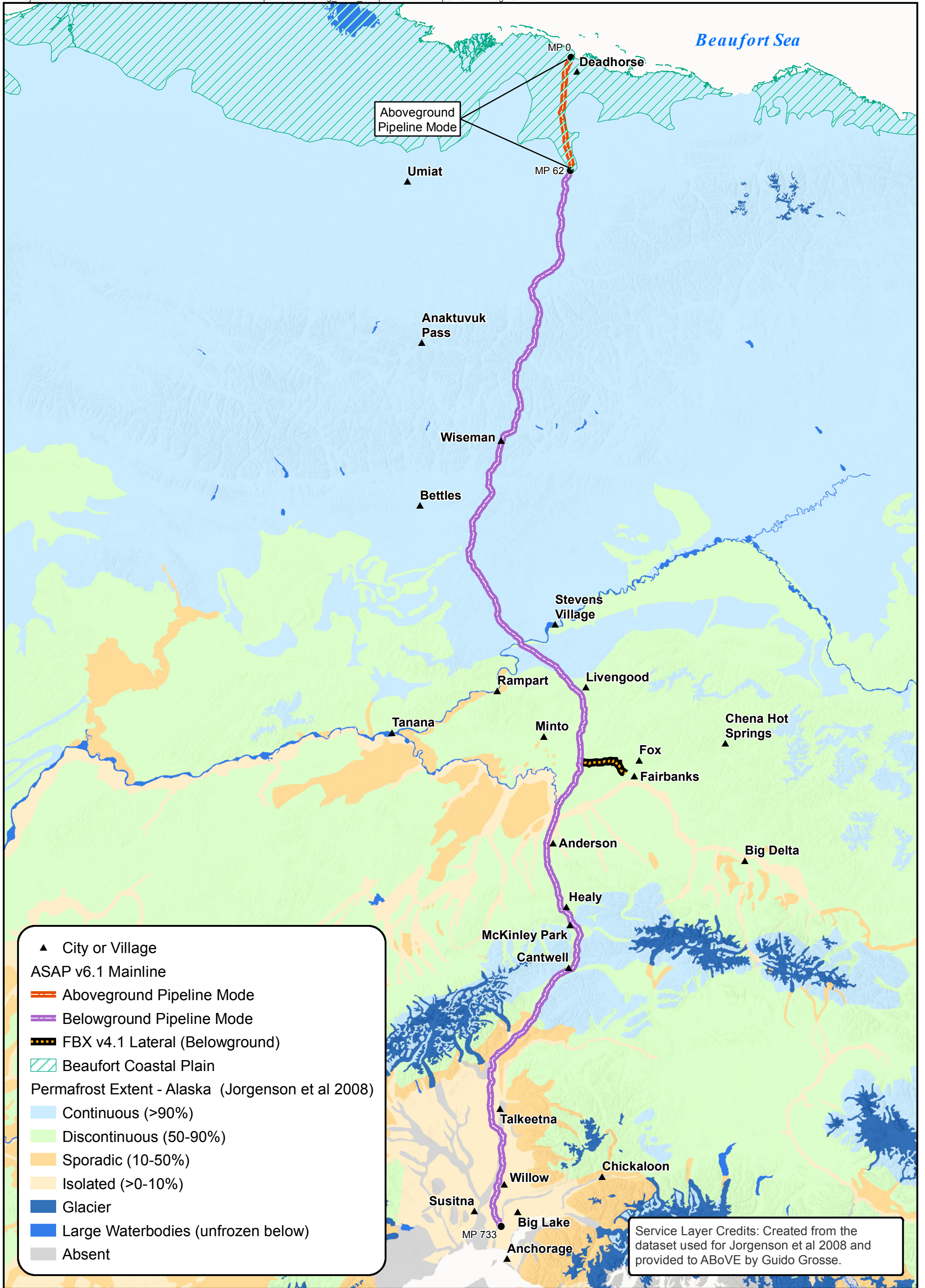
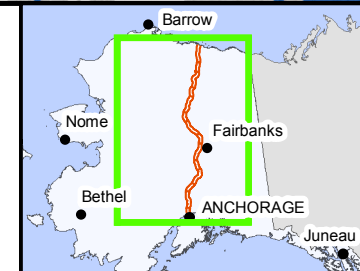



Figure 2.4-2: MILEPOST LOCATION WHERE VSMS END AND PIPELINE BURIAL OF THE PIPELINE USING STRESS-BASED DESIGN BEGINS ALASKA STAND ALONE PIPELINE




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Table 2.4-1 Acres and Percent of Total Wetlands Impacted through Areas of Continuous, Discontinuous & Sporadic Permafrost within the ASAP Pipeline ROW

Section	Section Impacted Wetlands (Acres)	Total Impacted Wetlands (Acres)	Section Impacted Wetlands as Percent of Total Wetlands Impacted	Section Uplands (Acres)	Total Section Impacts (Acres)	Wetlands Impacted as Percent of Section Impacts
MP 0 to MP 161 - Continuous	4,533.4	9,704.83	46.7%	1466.72	6,000.12	75.6%
MP 168 to MP 605 and Fairbanks Lateral - Discontinuous	4,741.83	9,704.83	48.9%	7,535.28	12,227.11	38.6%
MP 605 to Terminus - Sporadic	429.61	9,704.83	4.4%	2786.21	3,215.82	13.4%

Sources: AGDC GIS wetlands data provided December 14, 2017, and modified by USACE March 23, 2018; AGDC GIS Project infrastructure data provided October 31, 2017

Note that the mileposts used in the Section column do not match the mileposts used in permafrost type discussions elsewhere in this SEIS. This is because the wetland data segments was broken up in these segments instead. Values in this table should be considered estimates.

South of MP 62 to MP 733.5, the majority of the pipeline would be buried according to 49 CFR 192 (Pipeline Safety: Standards for Increasing the Maximum Allowable Operating Pressure for Gas Transmission Pipelines; Final Rule). As described under Alternative 1, the pipeline would be constructed aboveground at fault zones, elevated bridge stream crossings, pigging facilities, and block valve locations. Alternative 2 would be constructed in accordance with the general guidance in 49 CFR 192.103, which states:

Pipe must be designed with sufficient wall thickness, or must be installed with adequate protection, to withstand anticipated external pressures and loads that will be imposed on the pipe after installation. If additional thickness is found to be required for reasons other than pressure containment, the allowable pressure must not be increased through a re-computation of the design pressure formula to take advantage of this additional thickness (see Appendix F Pipeline Design Approach).

The Alternative 2 design would address thermal differences that could occur in areas of continuous permafrost in the north. Under Alternative 2, the potential disturbance of permafrost for the first 62 miles would be addressed by elevating the pipeline on VSMs.

Additional information on pipeline design are provided in Appendix A, Part I (The ASAP Belowground Pipeline Mode: Selection, Construction, Operation, and Maintenance on Alaska’s North Slope). Industry standards and supplemental guidance are provided by the American Society of Mechanical Engineers ASME B31.8 – Gas

Transmission and Distribution Piping Systems. The 2003 edition of this document is publicly available online at <https://law.resource.org/pub/us/cfr/ibr/002/asme.b31.8.2003.pdf>. This is the previous edition to the one (2007 edition) currently partially incorporated by reference into 49 CFR 192.

DH2 is located in shallower waters and could not accommodate the weight and offloading of the modules without retrofitting, including the addition of a third berth. Under Alternative 2, the existing channel from DH2 would need to be widened and deepened to the 9-foot depth contour to accommodate large vessels delivering the modules. Bathymetric data suggest the depth at DH2 could require dredging more than 750,000 cubic yards (CYs) to allow for the barges. To stabilize DH2, new sheet piling would be installed prior to beginning any dredge work. The proven maximum cargo offload at DH2 is 2,500 s/tons. As under Alternative 1, dredging of the navigational channel would occur during the previous winter; however, due to the location of DH2 and expected rate of infill, subsequent summer dredging may be necessary.

Under this alternative, dredge material would be disposed of in the ocean at the location depicted in Figure 2.2-4 above. Currently, no offshore disposal sites have been designated by U.S. Environmental Protection Agency (EPA) near the proposed Project Area. The closest disposal site is off the shore of Nome, nearly 800 miles away. In coordination with EPA, a disposal site would be identified and designated, as specified in the conditions under Section 103 of an individual Marine Protection, Research, and Sanctuaries Act permit. USACE authorization is required for transporting dredged material to any EPA-designated ocean disposal site.

The process for obtaining an ocean disposal permit for dredged material typically ranges between 6 to 18 months after application. Similar to Alternative 1, Alternative 2 would include development, approval, and implementation of a sampling and analysis plan and an assessment of compliance with the ocean disposal criteria (40 CFR 220-229).

Alternative 2 includes aerial crossing of the pipeline across the Yukon River using a new suspension bridge. This option was analyzed in detail in the 2012 FEIS and is carried forward as part of Alternative 2 in the SEIS. No permanent structures, such as footings, would be installed within the Yukon River under this alternative. Figure 2.4-3 depicts the conceptual Yukon River suspension bridge crossing details, while Figure 2.4-4 provides a graphic depiction of the footprint for the aerial crossing.

For the purposes of analyses presented in Chapter 4, it is assumed the construction schedule for Alternative 2 would be the same as presented in Section 2.2.12 for Alternative 1.

Figure 2.4-3 Conceptual Suspension Bridge for Aerial Crossing at Yukon River

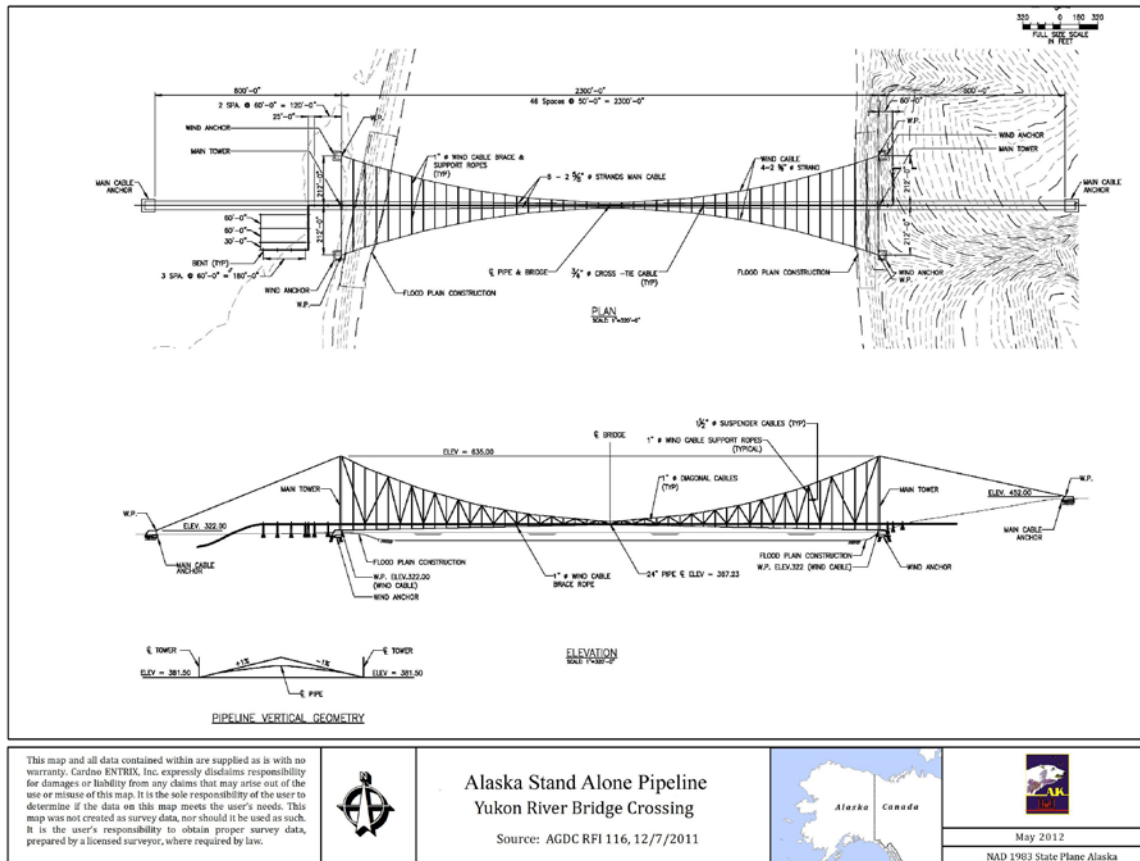
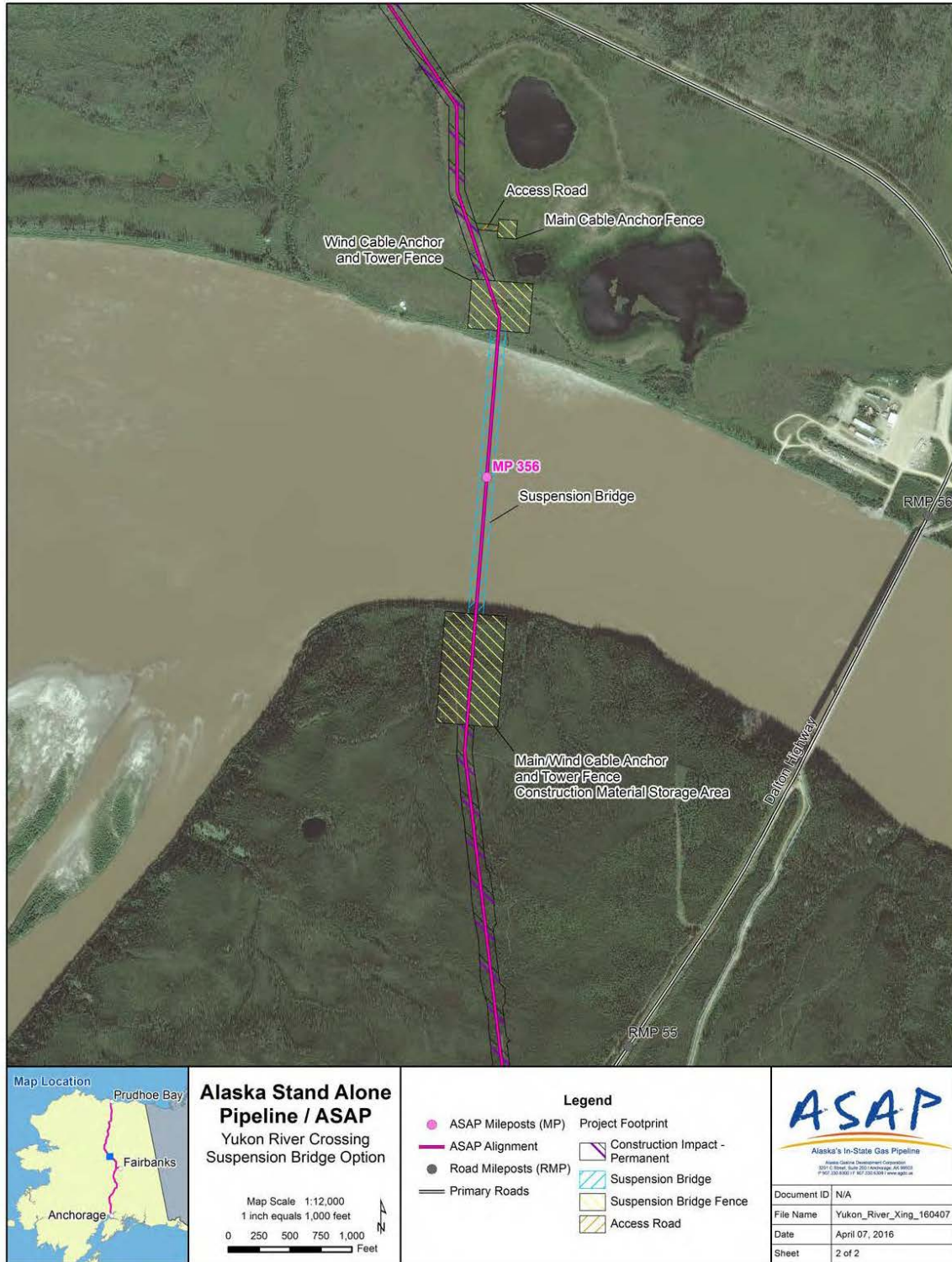


Figure 2.4-4 Graphic Depiction of Aerial Crossing at Yukon River



2.5. Alternative 3: No Action

Section 1502.14 of NEPA requires federal agencies to explore all reasonable alternatives, including the alternative of No Action. The No Action alternative provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives. In this case, the No Action Alternative would mean that utility grade natural gas would not be transported via pipeline from the North Slope to southcentral Alaska because no pipeline would be constructed.

2.6. Alternatives Evaluated in the 2012 Final Environmental Impact Statement and Those Eliminated from Detailed Analysis

This section presents an overview of the screening process used to determine which alternatives were eliminated from detailed study in this SEIS. The screening process was based on USACE's General Regulatory Policies (33 CFR 320) known as the "public interest review," which reflect the national concerns for the protection and utilization of important resources. Additionally, the process complies with CEQ requirements for screening and prioritizing potential alternatives in the SEIS process. As described in Section 2.1, any alternative that fails to meet the agency's purpose and need (Section 1.2) or federal environmental statutes and regulations, need not be carried forward for further consideration in the SEIS. In compliance with CEQ guidance, alternatives were "rigorously explored and objectively evaluated" using the criteria shown in Table 2.6-1, which also includes a brief description of the rationale for eliminating alternatives. Rationale for eliminating certain alternatives that may have required a more in-depth review is provided in Sections 2.6.1 through 2.6.7.

As an SEIS, it is important to also recognize, and incorporate by reference, the alternative screening process presented in the 2012 FEIS. In 2012, USACE considered four categories of alternatives including the No Action Alternative, energy source alternatives, natural gas transport alternatives, and pipeline route alternatives (including several route variations). As a result of the 2012 screening process, the FEIS analyzed four alternatives in detail (including the 2012 Proposed Action).

Information on the alternatives previously evaluated can be found in the following sections of the 2012 FEIS (USACE, 2012a):

- Energy Source Alternatives (2012 FEIS, Section 4.2);
- Natural Gas Transport System Alternatives (2012 FEIS, Section 4.3);
- Pipeline Route Alternatives including Route Variations (2012 FEIS, Section 4.4); and
- Aboveground Facility Alternatives (2012 FEIS, Section 4.5).

2.6.1. 2012 Alternatives Eliminated from Detailed Analysis in this SEIS

Since 2012, alternatives previously eliminated from detailed study warranted renewed consideration due to Project changes, economic changes or other conditions. These

alternatives were re-screened for the purposes of this SEIS. Following USACE's General Regulatory Policies (33 CFR 320), as well as other laws and statutes, key reasons for eliminating alternatives generally include the following: 1) does not meet the purpose and need of the proposed Project; 2) is not "reasonable" or "practicable"; or 3) does not include features that would reduce environmental impacts when compared to the proposed Project. The term practicable is defined under the Clean Water Act (40 CFR 230.3(q)) as "...available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." Technological constraints may consider issues such as available engineering data, geology, or spatial/temporal distribution.

For additional context, case law on appropriate ranges of NEPA alternatives is provided in *The NEPA Book: A Step-by-Step Guide on How to Comply with the National Environmental Policy Act* (Bass *et al.*, 2001), which contains the following principles related to the "range of alternatives" (as adapted from USACE, 2011):

- The range should be governed by the "rule of reason" - in the case of the proposed ASAP Project, the natural gas pipeline-related alternatives are based on Alaska Statute (AS) 31.25.005, as described in the purpose and need (Section 1.2). The range must achieve the proposed Action's objectives, as stated in the purpose and need;
- The range must be feasible - both economic and technical feasibility exists for the natural gas pipeline Alternatives 1 and 2. Certain site-specific engineering requirements and mitigations would need to be finalized once a preferred alternative is chosen;
- Alternatives that are remote or speculative need not be considered in an SEIS just for the purpose of comparison;
- Alternatives with more significant adverse effects than the proposed actions need not be evaluated in an SEIS just for comparison purposes; and
- Alternatives with impacts that are indistinguishable from the proposed action relative to costs, benefits, or environmental effects, need not be evaluated in an SEIS.

A list of alternatives eliminated from detailed analysis is presented in Table 2.6-1. Sections 2.6.2 through 2.6.7 provide additional detail on the rationale for eliminating certain alternatives that required additional review.

Table 2.6-1 Alternatives Eliminated from Detailed Analysis

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria ^a																																
Option Considered	Meets Purpose & Need (AS 31.25.005 (4)0	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b	(c) Fish and Wildlife							Dredging	Disposal of Dredge Material	(e) Historic, Cultural, Scenic, and Recreational Values			(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(j) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination
				Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Cultural Resource Sites			Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses	Communities / Population	Road Crossings / Railroad Crossings	Safety & Reliability										Feasibility of Construction (Engineering Considerations)	Practicability of Construction / Schedule Considerations		
Kenai Peninsula & Cook Inlet Natural Gas	N	N	Y	L	M	M	L	H	H	H			M	H	H	M	H	H	H	Y	H	L	H	M	M	M	L	L	L	L	In 2014, Hilcorp performed 88 well workovers and drilled 22 new wells. Since 2010, there have been 75 new oil and gas wells drilled in Cook Inlet and production increased to just under 16,000 barrels per day (Alaska Oil and Gas Association, 2015). These reserves reduce, but do not replace the existing and future need for natural gas to support the statewide need within the proposed Project's timeframe (2024).	
Gubik Field Natural Gas	N	N	Y	H	M	M	L	M		H			M	L	M	L	M	M	L	Y	H	L	H	L	M	M	H	L	M	M	Gubik Field remains a commercially unproven source of gas.	
Nenana Basin Field Natural Gas	N	N	Y	H	M	M	L	M	L	H			M	L	M	L	M	L	L	Y	L	L	H	L	M	M	H	L	M	M	Doyon, Limited planned to drill a third exploration well in the Nenana Basin in summer 2016 in search of natural gas. Doyon, Limited drilled an 8,667-foot well (Nunivak No. 2) in mid-2013. As with the first well, Nunivak No. 2 encountered encouraging geology, but no commercial volumes (Petroleum News, 2016). While exploration continues, gas reserves remain unproven.	
Liquefied Natural Gas Import	N	N	Y	M	M	M	L	L	M	M	H	H	L	L	M	M	M	L	H	Y	L	L	L	M	M	M	L	M	L	L	The economic benefits of utilizing an in-state gas source would not be realized and the purpose and need would not be met.	
Hydro Power	N	N	Y	M	H	M	L	L	M	H	L	L	M	H	M	H	H	M	H	Y	H	M	H	L	M	H	H	L	M	M	On December 2, 2015, the Federal Energy Regulatory Commission (FERC) published the updated licensing schedule (FERC, 2015) for the Susitna-Watana Hydroelectric Project, currently the largest hydro project in the state. Since re-evaluation of the project was initiated in 2010, funding and support has fluctuated. The viability of the project remains unknown. Several smaller hydro projects are underway; however, this type of energy is not available for all communities.	
Nuclear Power	N	N	Y	M	L	L	L	L	L	L			M	L	M	M	H	L	L	Y	L	L	H	L	M	M	H	H	M	M	According to the U.S. Nuclear Regulatory Commission's (NRC), Region IV Office, there are no operating nuclear reactors or fuel cycle facilities located in Alaska. Alaska is not an Agreement State meaning that NRC is responsible for pursuing and licensing nuclear energy projects in the state. Currently no such projects are being pursued (NRC, 2015).	

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria^a

Option Considered	Meets Purpose & Need (AS 31.25.005 (4))	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b										(c) Fish and Wildlife						(e) Historic, Cultural, Scenic, and Recreational Values			(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(i) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination
				Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Dredging	Disposal of Dredge Material	Cultural Resource Sites	Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses	Communities / Population	Road Crossings / Railroad Crossings	Safety & Reliability	Feasibility of Construction (Engineering Considerations)	Practicability of Construction / Schedule Considerations																	
Coal & Coal Gas	N	N	Y	H	H	H	L	L	M	H			M	M	M	M	M	L	H	Y	M	M	L	L	L	M	M	M	M	M	M	M	M	M	M	The USACE application has been withdrawn for the Chuitna Coal Project to develop a 300 million ton, ultra-low sulfur, subbituminous coal resource, the center of which is approximately 12 miles from the coast of Cook Inlet (http://chuitnaseis.com). The project was intended for export of coal; however, there is currently no commercial market for coal in southcentral Alaska.		
Renewable Sources (Wind, Geothermal, Biomass, Tidal)	N	N	Y	L	L	L	M	L	M	L			M	M	M	L	L	L	M	Y	L	L	H	M	H	M	M	L	M	M	M	M	M	M	Alaska Energy Authority (AEA) is pursuing several small renewable energy projects and the Alaska Renewable Energy Fund helps reduce and stabilize the cost of energy across Alaska. While these projects are reducing energy costs in some communities, the availability, reliability and cost-effectiveness of these sources is highly variable.			
Energy Conservation Measures & Programs	N	N	Y																Y			H		H										Enhanced programs could result in a reduction of the region's capacity and annual energy requirements, but not in sufficient quantities to meet future energy needs.				
Smaller Diameter Pipeline	Y	Y	Y	H	M	M	M	H	L	M	M	M	M	L	L	L	L	L	L	Y	L	L	H	L	H	H	H	L	M	M	M	M	M	M	A smaller diameter pipeline would not reduce the project footprint and would limit the volume of gas that could be transported.			
Pipeline from North Slope to Fairbanks, Transport by Rail Car to Southcentral Alaska	N	Y	Y	H	M	M	L	M	L	M	M	M	M	M	M	M	H	L	Y	L	L	M	L	M	M	M	M	H	H	H	H	H	H	Not a logistically practicable or reasonable means of moving large volumes of natural gas from Fairbanks to Southcentral Alaska for 30 or more years.				
Richardson Hwy Route Alternative	Y	Y	Y	M	M	M	M	M		M			M	M	M	L	M	M	L	Y	L	L	H	L	M	M	H	L	H	H	H	H	H	Longer route does not include features that would lessen environmental impacts when compared to the proposed Project.				
Fairbanks Route Variation Extending to North Pole	Y	Y	Y	M	M	M	M	M		M			M	L	M	L	M	M	L	Y	L	L	H	L	M	M	H	L	H	H	H	H	H	Longer route does not include features that would lessen overall environmental impacts when compared to the proposed Project.				

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria^a

Option Considered	Meets Purpose & Need (AS 31.25.005 (4))	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b		(c) Fish and Wildlife						(e) Historic, Cultural, Scenic, and Recreational Values			(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(i) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination	
				Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Dredging	Disposal of Dredge Material	Cultural Resource Sites	Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses	Communities / Population										Road Crossings / Railroad Crossings	Safety & Reliability	Feasibility of Construction (Engineering Considerations)		Practicability of Construction / Schedule Considerations
Alaska Intertie Route Variation	N	Y	Y	M	M	M	M	M		M			M	L	M	M	M	H	L	Y	L	L	H	L	M	M	H	M	H	H	Route has access, engineering and constructability issues, and does not include features that would lessen overall environmental impacts when compared to the proposed Project.
Curry Rail Route Variation	N	Y	Y	M	M	M	M	M		M			M	L	M	L	M	M	L	Y	L	L	H	L	M	M	H	L	H	H	Route has access and constructability issues and does not include features that would lessen overall environmental impacts when compared to the proposed Project.
Port MacKenzie Rail Project Route Variation	N	Y	Y	M	M	M	M	M		M			M	L	M	L	M	M	L	Y	L	L	H	L	M	M	M	L	M	M	Route does not include features that would lessen overall environmental impacts when compared to the proposed Project.
Interior Energy Project - Supplying LNG by truck to Fairbanks	N	Y	Y	M	M	M	M	M		M			M	M	M	H	M	H	L	Y	L	L	L	L	L	M	M	H	M	M	The project only provides LNG to Fairbanks communities. Transporting LNG by truck and train burns fossil fuels and contributes to greenhouse gas emissions. Increased traffic on existing roads and railways creates additional risks to the public.
Alt to West Dock - Seawater Treatment Plant	Y	Y	Y						M	L	L	L			M	H			H	Y				M		H	H			H	Using the existing STP as a makeshift dock is engineering prohibitive because it would require installing multiple large berths, new pilings, new bulkhead, new permanent bridge, and ocean fill to widen the road. This would likely also disrupt ongoing use of the facility by other entities.
Alt to West Dock - Dock Head 4	Y	Y	Y						H	L	L	L			M	H			H	Y				M		M	H			H	Use of the DH4 area would require full development and build out of a brand new port or dock that would need to be maintained or deconstructed, in addition to the existing infrastructure. With the use of DH4, the entire causeway would need to be widened to accommodate module transport. A smaller breach North of DH3 would need to be engineered for crossing with large modules.
Alt to West Dock - East Dock	N	Y	Y						M	M	H	H			M	H			H	Y				M		H	H			H	Using East Dock would require significantly more dredge quantity at a substantial horizontal distance from the dock to accommodate barge draft. No pre-existing dock infrastructure or staging area.

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria^a

Option Considered	Meets Purpose & Need (AS 31.25.005 (4))	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b	(c) Fish and Wildlife							(e) Historic, Cultural, Scenic, and Recreational Values			(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(i) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination
					Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Dredging	Disposal of Dredge Material	Cultural Resource Sites	Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses										Communities / Population	Road Crossings / Railroad Crossings	Safety & Reliability	
Alt to West Dock - Badami	N	Y	Y						M	M	H	H			M	H						M		H	H			H	Using Badami's dock would require constructing a new 40-mile road to connect the facility to the Prudhoe Bay road system. Significant dredging would be required; new docking berths would need to be built.	
Alt to West Dock - Point Thomson	N	Y	Y						M	M	H	H			M	H						M		H	H			H	Using Point Thomson's dock would require constructing a new 60-mile road to connect the facility to the Prudhoe Bay road system. Significant dredging would be required; new docking berths would need to be built.	
Alt to West Dock - Endicott Main Production Island	N	Y	Y						M	L	M	M			M	H						M		H	H			H	Using the Endicott Main Production Island dock would require an additional berth and staging area to accommodate the project. The four bridges on the route from Endicott would need to be replaced to accommodate transportation of the modules. The existing roads would need to be widened.	
Alt to West Dock - Endicott Satellite Drilling Island	N	Y	Y						M	L	L	L			M	H						M		H	H			H	Using the Endicott Satellite Drilling Island dock would require two new berths, four bridges would need to be replaced to accommodate transportation of the modules, and the existing road would need to be widened.	
Alt to West Dock - Oliktok Dock	N	Y	Y						M	L	H	H			M	H						M		H	H			H	Using the Oliktok Dock would require two new berths and a staging area, significant dredging would be required, three bridges would need to be replaced to accommodate transportation of the modules, and existing Kuparuk infrastructure would obstruct the transportation route from Oliktok Dock to the project site.	
Summer Dredging	Y	Y	Y					M	M	M	H	H			M	H						M		H	M			H	Dredging during the summer would likely result in disturbance to marine species including fish and marine mammals due to vessel traffic and dredging operation itself. The plume of dredge material would extend over a larger area in the water column, resulting in greater disturbance for marine species. Summer dredging off West Dock could also substantially affect BPXA operations for an additional year before the sealift.	

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria^a

Option Considered	Meets Purpose & Need (AS 31.25.005 (4))	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b	(c) Fish and Wildlife										(e) Historic, Cultural, Scenic, and Recreational Values	(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(i) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination
					Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Dredging	Disposal of Dredge Material	Cultural Resource Sites		Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses										Communities / Population	Road Crossings / Railroad Crossings	Safety & Reliability	
Module Transport: Smaller Vessel Scenario	Y	Y	Y					M	M	L	M	M			M						H	Y			M	M	M	M	H	H	Barges < 30,000-square-foot deck not capable of carrying multiple large modules (< 20-foot side shell [height]); prohibitive to match industrial area dock height. Smaller-sized barges and tugs, would result in a greater number (>> 25) required, which becomes cost prohibitive and would mean slower offloading process.
Ocean Disposal of Dredge Material Seaward of the Territorial Sea Boundary	Y	Y	Y						M	L	H	H			M						H	Y			H	H	H	H	H	H	Disposal of dredge material seaward of the Territorial Sea Boundary would require transport of material much farther from shore resulting namely in increased safety concerns for vessels, increased potential for interaction with migrating bowhead whales, additional burdens associated with logistics and increased cost.
Upland Disposal of Dredge Material	Y	Y	Y		M	M		M							H						Y										Please see detailed description.
Aboveground Pipeline Construction (i.e., using VSMs)	Y	Y	Y	H	M	M	L	M		L	H	H	M	H	M	H	H	H	M	Y	L	L		L	M	H	H	H	H	H	Please see detailed description. This includes screening a pipeline elevated for the entire length as well as hybrid options including elevating the pipeline MP 0 - 168 or elevating the pipeline MP 0 - 634, with the remainder of the pipeline buried.
KEY:				Notes:																											
Yes				Y																											
No				N																											
Low Risk of Impact Likely				L																											
Medium Risk of Impact Likely				M																											
High Risk of Impact Likely				H																											
				Criteria from (f), (i) and (k) from 33 CFR 320.4 were not evaluated as part of this proposed Action because they do not apply. Criterion (r) evaluated in Chapter 4, Environmental Consequences and proposed mitigation measures are detailed in Appendix M.																											
				(f) Effects on limits of the territorial sea																											
				(i) Activities affecting marine sanctuaries																											
				(k) Safety of impoundment structures																											
				(r) Mitigation - 33 CFR 320.4 (r)1. iii. Mitigation should be developed and incorporated within the public interest review process to the extent that the mitigation is found by the district engineer to be reasonable and justified. Only those measures required to ensure that the project is not contrary to the public interest may be required under this subparagraph.																											

USACE 33 CFR 320.4 General Policies for Evaluating Permit Applications (a) Public Interest Review Criteria^a

Option Considered	Meets Purpose & Need (AS 31.25.005 (4))	Utilize proven gas supplies that provide economic benefit to Alaska through royalties	Contrasts among Alternatives	(b) Effects on Wetlands ^b	(c) Fish and Wildlife					(e) Historic, Cultural, Scenic, and Recreational Values	(g) Consideration of Property Ownership			(h) Activities Affecting Coastal Zones	(i) Other Federal, State or Local Requirements	(l) Floodplain Management	(m) Water Supply & Conservation	(n) Energy Conservation & Development	(o) Navigation	(p) Environmental Benefits	(q) Economics	Cost of Construction	Other Considerations Specific to the Proposed Action			Additional Rationale to Support Elimination
				Wetland Acres & Features	Anadromous Fish Stream Crossings	Waterfowl Habitat	Raptor / Eagle Nesting Habitat	Other Terrestrial Wildlife Habitat	Marine Mammal Habitat	Fish / Fish Passage	Dredging	Disposal of Dredge Material	Cultural Resource Sites										Visual Impacts	Subsistence Areas	Compatibility with Other Land Uses	
Blank cells indicate Not Applicable				Footnotes:																						
				^a (i) The relative extent of the public and private need for the proposed structure or work; (ii) Where there are unresolved conflicts as to resource use, the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work; and (iii) The extent and permanence of the beneficial and/or detrimental effects, which the proposed structure or work is likely to have on the public and private uses to which the area is suited.																						
				^b 33 CFR 320.4 (p) Some activities that require Department of the Army permits result in beneficial effects to the quality of the environment. The district engineer would weigh these benefits as well as environmental detriments along with other factors of the public interest.																						

2.6.2. Upland Disposal of Dredge Material Eliminated

Put 23 is an approximately 214-acre gravel mine site within the Greater Prudhoe Bay area on the North Slope. It is located within an oxbow of the Putuligayuk River. The gravel within the mine site is of high quality and rarely needs additional processing prior to its intended use; the gravel from Put 23 is frequently used as “pit run,” meaning it does not require screening or crushing in most situations. Approximately 21 MCYs of gravel have been extracted from the mine site since it opened in 1974. The mine site serves as the primary gravel source for oil and gas operations east of the Kuparuk River and serves some of the gravel needs for public projects.

The site is operated by both the State of Alaska (northern half) and the North Slope Borough (southern half), with BPXA serving as the pit operator. The material site would continue to be the most significant source of gravel until a new large source could be established. Geotechnical investigations conducted by BPXA indicate that gravel mining could continue an additional 30 feet deeper throughout the pit. This would allow for continued use of the site several years into the future, which would concentrate gravel mining impacts to a large distinct location instead of fragmenting habitat and impacts among multiple smaller gravel sources.

Put 23 was evaluated as a potential site for disposal of dredge material resulting from activities at West Dock under Alternatives 1 or 2. While disposing of dredged material onshore would reduce the short-term increase in turbidity caused by disposal in water, it would likely result in long-term adverse effects to wetlands and vegetation at the disposal site. Long-term degradation of surrounding habitat could also occur as a result of saltwater leaching. To encumber a portion of the mine site and possibly contaminate the site with high concentrations of salt (and possibly other contaminants) would reduce future rehabilitation and reclamation potential. Therefore, use of Put 23 as an upland disposal site is not a preferred use of state-managed lands. Use of a portion of the mine site for dredge material disposal would most likely not exceed or equate to the current and future public benefit of continued use of the mine site for gravel needs (ADNR, Head, M. Pers. Comm. March 7, 2016). For these reasons, this alternative was eliminated from further discussion.

2.6.3. Aboveground Pipeline Alternatives Eliminated: Aboveground for Entire Project Length; Aboveground from Milepost 0 - 634; or Aboveground from Mile Post 0 - 168

A cost estimate comparison of aboveground and belowground pipeline modes prepared by the Applicant concluded the cost associated with a completely elevated (aboveground) pipeline for the entire 733 miles would be economically infeasible because it would add extraordinary costs. On April 6, 2016, USACE submitted a request for information asking AGDC to estimate the cost of constructing the ASAP pipeline in the aboveground mode for 1) its entire length stretching from pipeline MP 0 to MP 733, and 2) a hybrid pipeline design with the first 634 miles in the aboveground mode and

the remaining 99 miles in the belowground mode. [The primary consideration of this request was related to potential large-scale reduction of wetland and stream impacts, within areas supported by continuous and discontinuous permafrost]. The Fairbanks Lateral would remain buried in both cases per the USACE Project manager. In addition, agency comments received during the Draft SEIS comment period in 2017 requested that USACE consider evaluating a third³ hybrid design that would involve elevating the pipeline over the estimated extent of continuous permafrost at MP 168 (see Figure 2.4-2 and Table 2.4-1). To support additional screening of the third hybrid option, USACE submitted a request for information to AGDC on November 9, 2017 to provide another cost estimate for elevating the pipeline from MP 0 – 168. [The purpose of these requests was to assist USACE in determining the range of alternatives to be analyzed in the ASAP Draft SEIS.]

The cost estimates provided by AGDC were based on a set of assumptions and included estimates for construction, maintenance, and mitigation. [It should be noted] that the [cost estimate] for the ASAP Project (as described in its Clean Water Act 404/10 application) is based on an Association for the Advancement of Cost Engineering Class 3 level of engineering design and cost information. In contrast, the aboveground cost estimates are a Class 5, order of magnitude estimate with very limited Project definition or engineering analysis. Due to the proprietary nature of the information provided in AGDC's cost estimates, the details of the reports are not included here. However, the following conclusions, based upon cost estimates provided by the Applicant, are provided as part of the rationale for determining the final range of alternatives described in in this chapter.

- The capital costs for the completely aboveground pipeline mode were estimated to be 81 percent more than the belowground mode. The cost estimate for the aboveground mode accounts for differences in design associated with features such as expansion loops needed to allow for expansion and contraction of the pipe, VSMs, horizontal support members, saddles, anchors, pipe coating and insulation and induction bends.
- Based on information provided by AGDC, the proposed hybrid design to elevate the pipeline MP 0 – 168 presents additional geotechnical challenges. In the area between MP 62 (the edge of the Arctic Coastal Plain) and MP 168 (approximately the base on Atigun Pass), the subsurface conditions are less uniform (*i.e.*, a mixture of silts, sands, gravels, cobbles, boulders, and rock) than the Arctic Coastal Plain. Installing VSMs in this area would require that multiple types of specialized equipment be on location depending on conditions encountered.

³ Alternative 2 includes a hybrid design that would involve elevating the pipeline above ground from MP 0 – 62.

- The aboveground pipeline mode would increase the overall pipeline length by approximately 40 miles due to the use of expansion loops and would require a minimum of 2,900,000 feet (549 miles) of steel pipe piles for VSMs.
- The aboveground modes would require a higher level of effort for dismantlement, removal, and remediation [because at the conclusion of the Project, all aboveground features would be removed, and belowground pipe would be abandoned in place].
- The capital costs for the hybrid pipeline mode (*i.e.*, elevated to MP 634) are estimated to be 71 percent more than the belowground mode. Based on information provided by AGDC, elevating the pipeline from MP 0 – 168 would cost approximately three to four times more than a buried pipeline design for this section due to additional materials and specialized drilling and installation equipment required as described above. The extra cost to consumers associated with a completely aboveground project is estimated at a minimum of \$670,000,000 per year. A hybrid project in which approximately 634 miles is aboveground would be approximately 10 percent less [than the completely elevated pipeline].

In 2014, the estimated tariff for the ASAP Project was reported at \$8.00 to \$9.75 per million British thermal unit (MM/Btu) for southcentral Alaska (about \$2.75 less for Fairbanks). AGDC Commercial indicated that the costs associated with converting ASAP to an aboveground project would increase southcentral Alaska's tariffs by almost \$4.00 per MM/Btu. Tariff rate increases associated with a hybrid project would equate to approximately 90 percent of the cost increase associated with an aboveground design. Based on these estimated tariff rate increases, the aboveground and hybrid project concepts would significantly degrade the commercial viability of the ASAP Project. Aboveground construction could be applied as a design feature in specific situations, which may be driven by geotechnical or other environmental considerations, as is the proposed design for some fault crossings. Visual impacts would be greater. Regarding impacts to wetlands, as described in Section 2.4, approximately 96 percent of the total wetlands impacted by the pipeline would be between MP 0 and MP 634, while approximately 4 percent of total wetlands impacted would be to the south between MP 634 and 733.5. Therefore, an aboveground pipeline south of MP 634 would not significantly reduce impacts to wetlands. To the contrary, an aboveground pipeline south of MP 634 would pose greater risks for safety and reliability because the population density increases in this area.

An aboveground pipeline also poses several risks associated with safety and security of the pipeline and nearby communities. The primary hazard from natural gas is an explosion or fire immediately following and near the point of the release. A variety of causes, including natural disasters, excavation, and other outside forces, corrosion, mechanical failure, and operator error can result in accidental pipeline releases. While incidents from transmission pipelines are infrequent, the potential serious consequences may significantly impact local communities (PHMSA, 2016).

Pipelines are also vulnerable to physical attacks from explosives, firearms or other means (Congressional Research Service, 2016). A man planning to bomb TAPS in 1999 was arrested by Vancouver police before he was able to carry out the attack (Cloud, 1999). In 2001, TAPS was attacked by vandals with a high-powered rifle, causing a 2-day shutdown of the pipeline resulting in economic and environmental damage. In 2006, federal authorities acknowledged the discovery of a web posting purportedly linked to Al Qaeda that reportedly encouraged attacks on U.S. pipelines, especially TAPS, using weapons or hidden explosives (Congressional Research Service, 2016). With more than 305,000 miles of natural gas pipeline systems in the U.S. (U.S. Energy Information Administration, 2008), the incidence of sabotage or terrorism may be relatively low; however, these threats do exist.

For a completely elevated (aboveground) or partially elevated pipeline, the extraordinary capital costs for construction and maintenance, geotechnical challenges, additional mobilization and demobilization requirements, as well as concerns for safety and security risks, make these alternative variations infeasible and impracticable. Therefore, these variations have been eliminated from detailed analysis. Alternative 2 presents a reasonable alternative⁴ to the proposed Project and evaluates the aboveground mode between MP 0 and 62, the portion of the pipeline across the sensitive habitat in the Arctic Coastal Plan and an area of continuous permafrost. The portion of the Alternative 2 design that would intersect more populated areas (*i.e.*, where they may be additional safety or security risks) would be buried (see Section 2.4).

2.6.4. Alternative Energy Sources Eliminated

Since 2012, the status of some alternative energy source projects has changed, warranting a second review to confirm they should still be eliminated. Detailed information on alternative energy sources is provided in the following sections.

2.6.4.1. Interior Energy Project – Supplying LNG by truck to Fairbanks

The proposed ASAP Project would help meet the statewide demand for improved access to an energy source that is clean, reliable, and affordable. These demands have intensified to such a level in the Fairbanks area that in 2013, the Alaska State Legislature enacted Senate Bill 23, authorizing the Alaska Industrial Development and Export Authority (AIDEA) to finance a project to provide some Fairbanks North Star Borough communities with liquefied natural gas (LNG) by truck until an in-state gas pipeline can be developed (AS 44.88.010(a)). Gas supply is sourced from either the North Slope of Alaska or the Cook Inlet basin.

House Bill 105 was enacted June 30, 2015 to advance the Interior Energy Project, a project designed to bring low-cost energy to Interior Alaska residents as quickly as possible. AIDEA is currently working to evaluate railroad and road alternatives. The

⁴ Council on Environmental Quality, NEPA'S 40 Most Frequently Asked Questions CEQ Memo 1981.

ARRC received notice from the Federal Railroad Administration during November 2015 allowing an increase in the volume of LNG transported and extending the time period during which LNG could be transported. A pilot project is underway to test the performance of the large capacity LNG trailers. If the performance of large capacity LNG trailer meets design expectations, the use of a large capacity trailer would present an additional option to reduce transportation costs for LNG. The build-out of the distribution system in the Interior is currently underway with more than 60 miles of new distribution pipe in the core of Fairbanks and 73 miles of pipe in the North Pole area (AIDEA, 2016).

2.6.4.2. Kenai Peninsula and Cook Inlet Natural Gas (New Production)

Increased activity in Cook Inlet has recently lead to natural gas reserve additions and a steady increase in both oil and gas production. In 2014, Hilcorp performed 88 well work-overs and drilled 22 new wells. Since 2010, players in Cook Inlet have drilled 75 new oil and gas wells. Additionally, new gas fields have also been discovered. Expanded gas storage in the Cook Inlet natural gas storage facility has helped stabilize production. All told, Cook Inlet oil production has increased by 80 percent since the revitalization effort began in 2010. A 2015 presentation by ADNRC confirmed significant additional potential in existing fields in Cook Inlet, in addition to previously undiscovered resources (Alaska Oil and Gas Association, 2015).

2.6.4.3. Hydroelectric Power from Susitna-Watana or Chakachamna

In December 2014, Governor Bill Walker issued Administrative Order 271, stopping all discretionary spending on six projects, including the Susitna-Watana Hydroelectric Project. At that time, the Alaska Energy Authority (AEA) was in the midst of the Initial Study Report process. The Initial Study Reports are essentially a progress report of the environmental studies. During summer of 2015, AEA was authorized to use existing funds to restart the federal licensing process to advance to the Study Plan Determination in 2016 (AEA, 2015a). Given the uncertainty of this Project, it has been eliminated from detailed analysis as an alternative.

2.6.4.4. Renewable Sources (Wind, Geothermal, Tidal)

Several small renewable energy projects are underway in Alaska. These include biomass, geothermal, heat recovery, hydropower, ocean (tidal/wave), solar, and wind (Table 2.6-2). AEA's Energy Efficiency and Conservation program is working to improve energy efficiency in Alaska by 15 percent between 2010 and 2020 (AEA, 2016a).

Table 2.6-2 Summary of Alternative Energy Sources Relative to the Proposed Project Purpose and Need Statement

Energy Source	A Long-term, Stable Supply of up to 500 MMscfd of Natural Gas	Deliverable to Markets in the Fairbanks & Cook Inlet Areas	Deliverable by 2024	Utilize Proven Gas Supplies that Provide Economic Benefit to the State through Royalties & Taxes	Other Considerations
Kenai Peninsula and Cook Inlet Natural Gas (New Production)	No	Yes	Yes	Yes	Speculative
Gubik and/or Nenana Field Natural Gas	No	No	No	No	Speculative
LNG Import	Yes	Yes	Yes	No	Distribution to Fairbanks would be limited to truck/trailer
Hydroelectric Power from Susitna-Watana, Chakachamna or Other New Projects	No	Yes	No	No	Would provide only electrical power
Renewable Sources (Wind, Geothermal, Tidal)	No	Yes	Yes	No	Would provide only electrical power
Nuclear Power	No	No	No	No	Would provide only electrical power
Energy Conservation Measures and Programs	No	Yes	Yes	No	Could reduce natural gas consumption by up to 15%

2.6.5. West Dock Alternatives Eliminated

2.6.5.1. Seawater Treatment Plant or Dock Head 4

While extending into deeper water, using the existing STP as a makeshift dock off the tip of West Dock has engineering challenges because it would require installing multiple barge berths (zero existing), new pilings and bulkhead, a new permanent bridge, and ocean fill to widen the road over the length of the entire causeway. The STP was constructed on a barge that was sunken in place, with fill placed around it. The STP has not been built to receive large modules or a sealift payload of 5,500 s/tons. The 50-foot breach on the causeway north of DH3 is weight-limited and would not be passable with SPMTs carrying the heavy modules without a major overhaul involving new permanent infrastructure. Given that the northern breach is narrower (50 feet) than the breaches to the south of DH3, which total 1,300 feet; use of DH3 would require a temporary bridge consisting of ballasted barges and supporting infrastructure to form a temporary breach bypass with minimal environmental disturbance. Using the STP would mean increasing the width of entire existing West Dock causeway. Given the relatively short, ice-free season, and the importance of the STP for BPXA facility operations to treat seawater, it would likely be disruptive to ongoing operations.

The ASAP Project would require a single-year sealift to deliver modules. DH3 has existing infrastructure that could be utilized, including three barge berths, and require minor modifications. Use of Dock Head 4 (DH4) or the STP would require full development and build out of a new port or dock that would require additional maintenance or deconstruction after use. The maximum weight of barges for ASAP would be 5,500 s/tons with a maximum 9-foot draft. If larger barges were required, then a much deeper draft and much higher dredge volume would be necessary, and the use of the STP or DH4 may be more appropriate. However, the size of the proposed ASAP barges would require dredging but reduces the construction that would be required at DH4 or the STP to build a new port. In addition, ASAP proposes a single year of winter dredging at DH3. If the sealift were 3 to 4 years and subsequent maintenance dredging of the channel were required, the rate of infill and level of annual maintenance dredging would need to be assessed to see if these impacts would be greater than using DH3. However, the single year of winter dredging makes this one-time event less impactful.

A barge bridge to bypass the existing 650-foot breach would be required for use of either DH3 or DH4. However, there is a smaller breach north (seaward) of DH3 that would need to be engineered for crossing with large modules, and potentially additional causeway road or causeway widening to the north with the use of DH4. Finally, the causeway around DH3 would be expanded landward further reducing potential effects.

2.6.5.2. East Dock

The water depth at East Dock is shallower than both DH2 and DH3 (4-foot minimum) and would require a significantly greater dredge quantity (approximately 2,000,000 CYs) at a substantial horizontal distance from the dock to accommodate the barge draft. The

roadway corridor from East Dock to the proposed GCF location (*i.e.*, ASAP Project site) would require substantial widening and additional lifts of gravel placed to facilitate the offload of module. Additionally, the East Dock does not have any preexisting dock infrastructure or staging area; therefore, it would all need to be developed. The site is also 15 miles from the GCF location.

2.6.5.3. Badami

Badami is 40 miles from the proposed ASAP Project site. There is no existing road connecting Badami to Prudhoe Bay, nor is there a preexisting staging area. To use the Badami dock, a road would need to be constructed to connect Badami to the Prudhoe Bay road system and a staging area large enough to accommodate the modules would need to be developed. The dock is located in shallow water (6 feet) and would require extensive dredging to reach the required minimum depth of -8.5 feet, for a substantial horizontal distance. Two additional docking berths would need to be built because the dock can currently accommodate only one barge.

2.6.5.4. Point Thomson

The Point Thomson dock is 60 miles from the proposed ASAP Project site. There is no existing road connecting Point Thomson to Prudhoe Bay, nor is there a staging area. Constructing new connecting roads and a staging area would have substantial impacts on the terrestrial environment. The dock at Point Thomson is located in water depths of approximately -7 feet and would require extensive dredging to accommodate the proposed barges.

2.6.5.5. Endicott Main Production Island

Although the Endicott causeway is close to Prudhoe Bay, the Endicott Main Production Island currently is limited as a dock facility because it only has room for two barge berths, has no staging area and water depth is 7 to 8 feet, thus requiring a dredged channel for access. An additional berth and a staging area would be required at this dock to accommodate the proposed Project. This option would require continuous monitoring to ensure response vessels would be berthed on the lee side of the structure. There are four bridges along the route from Endicott to the ASAP Project site. Three of these are rated to 200 s/tons, and the fourth is only rated to 150 s/tons. Each would have to be replaced to facilitate the 5,500-s/ton modules. Finally, the 19-mile road from Endicott to the proposed Project site would have to be widened using additional lifts and placement of gravel. This would result in the road being closed to other uses for several weeks.

2.6.5.6. Endicott Satellite Drilling Island

Endicott Satellite Drilling Island is 15 miles from the proposed Project site along the Endicott causeway. The dock is constructed in waters extending to 14 feet deep; therefore, it is assumed only a minimum amount of maintenance dredging may be

needed. However, the berthing area could only accommodate one barge; therefore, two more berths would have to be built. The transportation route is the same for the Endicott Main Production Island where rebuilding four bridges, widening the road, and placing additional lifts of gravel on the road would be needed.

2.6.5.7. Oliktok Dock

The Oliktok Dock has space for only one barge berth, is constructed in water depths of -7.5 feet, and has no staging area. To use this location, it would require constructing two additional berthing spaces and a staging area would be needed, as well as extensive dredging. To move the modules from the dock to the proposed ASAP Project site, three bridges (current maximum carrying capacity of 3,000 s/tons) would need to be rebuilt and 5 feet of gravel would need to be added to roadways to accommodate the modular weight. Additionally, the Kuparuk infrastructure would present several obstructions along the transportation corridor from Oliktok Dock to the ASAP Project site.

2.6.6. Summer Dredging

Summer dredging and disposal would need to be conducted by marine vessels and occur approximately 1 year before the sealift. Summer dredging would result in increased vessel traffic and use of existing or new roads to transport spoils. Dredging during the summer would likely result in disturbance to marine species, including fish and marine mammals due to vessel traffic and the dredging operation itself. Due to the lack of sea ice, the plume of dredge material would extend over a larger area in the water column, resulting in greater disturbance for marine species. Summer dredging off West Dock could also substantially affect BPXA operations for an additional year before the sealift. For these reasons, summer dredging as the only method for removing dredge material (*i.e.*, without first conducting winter dredging to remove a majority of the material) was eliminated from further consideration.

2.6.7. Gas Conditioning Facility Construction Options Eliminated

Several options were evaluated for transporting, offloading, and constructing the GCF on the North Slope (AGDC, 2016o). These options included:

- GCF Mode Selection:
 - Built-on-Site Facilities
 - Water-Dependent Transport of Modularized Units
- Module Transport Mode Analysis
 - Small Vessel Scenario
 - Large Vessel Scenario

2.7. Identifying a Preferred Alternative

NEPA guidance directs an agency to identify a preferred alternative in the FEIS,

... unless another law prohibits the expression of such a preference” (40 CFR 1502.14[e]). The USACE, in the establishment of their regulatory rules (51 FR 41220; 33 CFR 320.1(a)(4)), clearly stated their neutrality in issuing permits by affirming that they are “neither a proponent nor opponent of any permit proposal.

To maintain this neutrality, USACE does not identify a preference within a draft or final EIS, but rather identifies the Applicant’s proposal as the “Applicant’s preferred alternative” in the FEIS (33 CFR 325, Appendix B). USACE cannot take a position on a permit, and would thus not identify its selected alternative until after the public interest review and finding of conformity with the 404(b)(1) Guidelines, which will be summarized in USACE’s Record of Decision for the permit. Cooperating agencies have the option to identify separate agency-preferred alternatives in an EIS. Two of the cooperating agencies for the ASAP SEIS, BLM and the State Pipeline Coordinator Services on behalf of the State of Alaska, have a regulatory decision to make in association with this NEPA process and will also choose a preferred alternative.

2.7.1. *Environmentally Preferable Alternative*

An environmentally preferable alternative is one that would best meet the goals set forth in Section 101 of NEPA (42 United States Code §4331). The environmentally preferable alternative generally would cause the least damage to the biological and physical environments and “best protects, preserves, and enhances historic, cultural, and natural resources” (50 FR 15618). The environmentally preferred alternative or other alternative could be the agency-preferred alternative, but may not be, due to considerations made by each agency based on their statutory mission. The environmentally preferable alternative will be identified in the Record of Decision prior to USACE’s decision on the Applicant’s DA Application.

2.7.2. *Least Environmentally Damaging Practicable Alternative*

Section 404(b)(1) Guidelines require USACE to determine if the Applicant’s proposal is the LEDPA. To be practicable, an alternative must be available and capable of being done after consideration of cost, existing technology, and logistics in light of overall Project purposes. Only the LEDPA can be permitted. The LEDPA will be identified in the Record of Decision, which will be written after a Final SEIS is published. In the Record of Decision, USACE will analyze the impacts of the proposed Action and the other alternatives described in this chapter. At that point, USACE, in coordination with the cooperating agencies, will have examined the full scope of possible alternatives necessary to determine the LEDPA, and ultimately make a permit decision. At the completion of the Record of Decision, USACE has the option to deny the permit, issue the permit, or issue the permit with Project modifications in order to achieve the

LEDPA; the Section 404(b)(1) Guideline Checklist can be access at:

<http://www.nap.usace.army.mil/Portals/39/docs/regulatory/regs/40cfr230.pdf>.

2.8. Final Supplemental Environmental Impact Statement

This Final SEIS discloses potential impacts associated with the Applicant's (AGDC) proposed Project and alternatives. USACE has considered comments received on the Draft SEIS in preparing this Final SEIS, and associated mitigation measures are listed that have further informed USACE's permit decision. The alternatives and impact analysis herein also provide a basis for determination of compliance with the Section 404(b)(1) Guidelines.

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