4. FACILITY DESIGN FACTORS

4.1 TECHNICAL SUMMARY

Table 6 identifies the pipeline location classes, Wall Thickness (WT), and MAOP. The AGDC plans to use American Petroleum Institute (API) X70 for the mainline pipe and X52 for the Fairbanks Lateral. AGDC will meet applicable U.S. Department of Transportation (USDOT) integrity management (49 CFR 192, Subpart O) and corrosion control requirements (49 CFR 192, Subpart I).

Table 6. Pipeline Pressure Standards

LOCATION CLASS[a]	WT (INCHES)	MAXIMUM ALLOWABLE OPERATING PRESSURE (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	0.957	1,480
Notes: Source: (MBJ, 2014b) [a]Location Class 1, Division 1 not used.		

4.2 TOXICITY OF PIPELINE PRODUCT

The product to be carried by the ASAP is utility-grade natural gas, which is composed of over 88 mole percent methane, with minor amounts of light hydrocarbons, such as ethane, propane, and butane. Natural gas is colorless and odorless.

Toxicity is the degree to which a substance is able to damage an organism exposed to it. Toxic and hazardous substances are regulated, generally based upon their use. The Toxic Substances Control Act (TSCA) established requirements and authorities for identifying and controlling toxic chemicals hazardous to human health and the environment. The USEPA maintains a list of chemicals that are in commercial use within the United States (U.S.) called the *TSCA Inventory of Chemical Substances* (commonly referred to as the TSCA Inventory).

Methane, the primary component of the ASAP natural gas product, is biologically inactive and not considered toxic. The remaining components, such as ethane and propane, are listed in the TSCA Inventory.

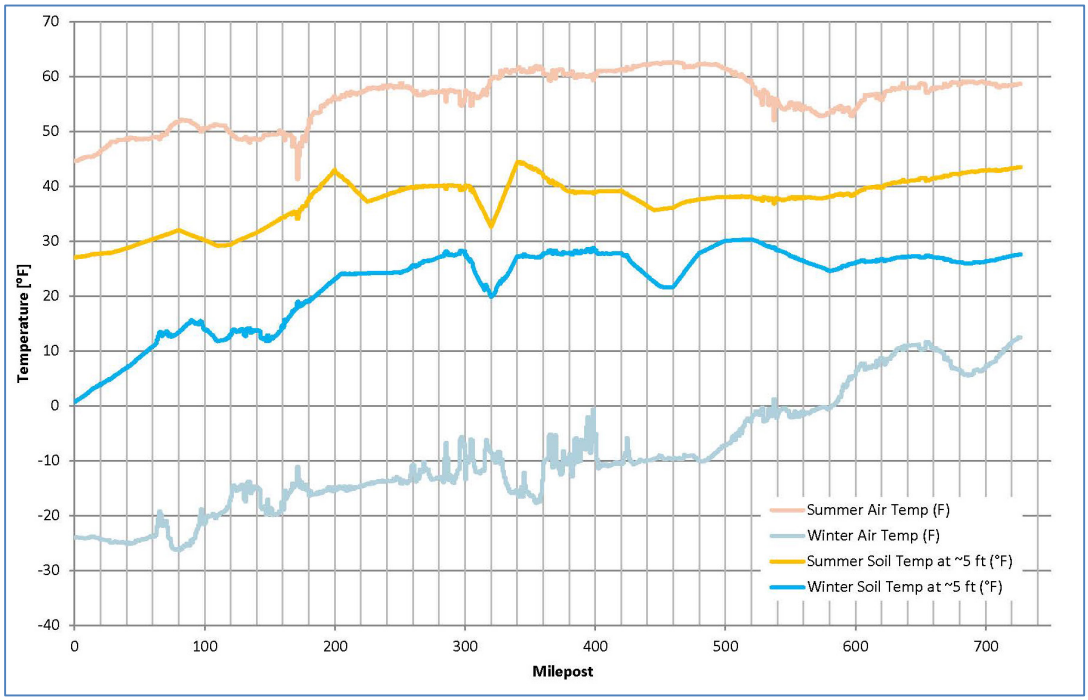
4.3 ANTICIPATED OPERATING TEMPERATURES

"Anticipated operating temperatures" refers to the pipeline operating temperature and changes along the route, seasonally and as a function of throughput. The operating temperature of the buried pipeline could affect the frozen/thawed nature of the surrounding subsurface, which, in turn, could affect the pipeline trench support conditions, as well as potentially cause subsurface expression, such as local subsidence or heave.

The proposed mainline and Fairbanks Lateral pipeline will operate at temperatures closely approaching the seasonal temperature of the surrounding ground. The pipeline ambient operating temperature will be governed by the combined influence of Joule-Thompson cooling associated with gas pressure drop, pipe-wall heat transfer between gas and surrounding soil, and heat input from gas compression.

Figure 4 shows preliminary ground and surface temperature profiles over the ASAP route.

Figure 4. Ground and Surface Temperature Profiles over the Proposed Alaska Stand Alone Pipeline Route



The temperature of the ASAP will follow seasonal ground temperature at low flow rates. At full capacity, it is anticipated that the cooling associated with gas pressure drop is unlikely to result in non-ambient pipeline operation.

As designed, the pipeline will be operated at below-freezing temperatures in predominantly permafrost terrains to protect the thermal stability of the surrounding ground. Similarly, the pipeline

will be operated at above-freezing temperatures in predominantly thawed settings so as not to create frost bulbs around the pipe that could lead to frost-heave displacement of the pipeline or adverse hydraulic impacts on drainages crossed by the pipeline. Pipeline design will mitigate potential freezing of thawed ground or thawing of frozen ground in areas of discontinuous permafrost.

As part of the treating process to make utility-grade natural gas, there will be three main processing steps: (1) compression, (2) propane refrigeration, and (3) treatment to remove CO_2 and H_2S. The gas exiting compression will be hot (approximately 200 to 250°F). This gas must be cooled to less than -12°F to facilitate proper treatment. Cooling will be accomplished by a combination of air cooling followed by propane refrigeration. As the gas goes through the treatment process, it will warm up to between 10 and 30°F. With this temperature range, the gas will be ready to enter the pipeline and be compatible with the ground temperatures expected in the northern sections of the route. After leaving the GCF, the gas will be cooled by propane refrigeration units to approximately 30°F at the mainline pipeline inlet.

4.4 PERMANENT WIDTH OR SIZE

The permanent width or size of the ASAP ROW will be 53 feet. At certain crossings or other sensitive locations, the permanent ROW widths may be greater.

4.5 TEMPORARY AREAS NEEDED

The typical construction easement width needed for construction activities will be 120 feet. Specific construction requirements, such as HDD pads at stream crossings, road and foreign pipeline crossings (Section 7.4.5), and temporary facilities, such as construction camps and temporary storage areas (Section 7.2), will require additional land for TEWSs during construction (Section 2.6). Attachment 1 provides typical standard drawings for stream crossings.