

## 6.0 CONCLUSIONS

This section summarizes the conclusions of the Final EIS for the proposed Alaska Stand Alone Pipeline (ASAP). The proposed intrastate, 24 inch, 737 mile, 500 million standard cubic feet per day (MMscfd) capacity pipeline<sup>1</sup> is designed to transport presently stranded natural gas and natural gas liquids (NGLs) from the North Slope gas fields to markets in the Fairbanks and Cook Inlet areas by 2016. As envisioned, the ASAP is independent of other possible interstate gas pipeline projects presently under consideration.<sup>2</sup>

Cook Inlet natural gas production accounts for nearly all of Alaska's natural gas supply at present.<sup>3</sup> Cook Inlet natural gas production has been declining in recent years and, looking to the future, both proven developed Cook Inlet reserves and estimates of undeveloped Cook Inlet reserves are insufficient to match even historical levels of natural gas consumption in Alaska. Thus, absent construction and operation of this or some alternative gas pipeline system, Alaska will be in the position of having large natural gas reserves,<sup>4</sup> but a shortfall of supply. The Proposed Action is intended to serve developed and developing markets within Alaska, including Fairbanks and the Railbelt.

Construction and operation of the ASAP would entail both positive and negative impacts of various types—identified and discussed in detail in earlier sections of this Final EIS. This section summarizes these impacts in a series of tables. Table 6.0-1 provides a narrative summary of the predicted impacts (including physical, biological, socioeconomic and cumulative impacts<sup>5</sup>) associated with (i) the Proposed Action, (ii) the Denali National Park Route Variation,

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<sup>1</sup> The proposed Project also includes a 12-inch diameter, 35-mile length Fairbanks Lateral pipeline to tie-in with the main pipeline at MP 458, a gas conditioning facility located on the North Slope at Prudhoe Bay, as many as two compressor stations located along the pipeline, a straddle and off-take facility located at the Fairbanks Lateral tie in, and a Cook Inlet NGLP. Connected actions are described in detail in Section 3.0.

<sup>2</sup> ASAP is an intrastate project independent of other proposed interstate natural gas pipeline projects. The Alaska Pipeline Project (APP), the project sponsored by the Alaska Gasline Inducement Act (AGIA), and Denali–The Alaska Gas Pipeline project have studied the feasibility of exporting Alaska's North Slope natural gas via a large-diameter pipeline. As these export plans and studies develop, the near-term needs (2013) for additional natural gas supplies to supplement Cook Inlet reserves and to serve developed and developing markets within Alaska remain.

<sup>3</sup> Comparatively minor amounts of natural gas are produced on the North Slope for industry consumption on the slope. Additionally the North Slope Borough constructed Nuiqsut Natural Gas Pipeline to transport natural gas from the ConocoPhillips Alpine production pad to the village of Nuiqsut, located within the Colville River Delta. Natural gas from the North Slope is also used to heat homes and generate electricity in Barrow.

<sup>4</sup> According to the Bureau of Ocean Energy Management, Regulation, and Enforcement (see <http://www.alaska.boemre.gov/re/natgas/akngases.htm>) Alaska contains 39.88 trillion cubic feet (tcf) of gas remaining in developed and known undeveloped fields. Some of this gas is in fields too small or remote to justify economic development. Of the known gas reserves, 26.92 tcf may be considered available for export at appropriate market prices and pending construction of new gas transportation systems. Most of this gas is in onshore fields and mostly beneath State of Alaska surface or submerged lands.

<sup>5</sup> The health impacts associated with this proposed Project are very substantial and are discussed in the narrative descriptions in Table 6.0-1. However, these effects (discussed at length in Section 5.15) were evaluated using a specific scheme recommended in the *Technical Guidance for Health Impact Assessment* (HIA) in Alaska, also termed the 'HIA Toolkit.'

(iii) the No Action Alternative, and (iv) the options related to crossing the Yukon River described under the Proposed Action. Mitigation measures currently committed to by the AGDC are described in Section 5.23, Mitigation.

Selection of the No Action Alternative means that the negative impacts associated with the proposed alternative are avoided and so effects can rightly be described simply as having ‘no impact.’ However, the proposed Project (including the Denali National Park Route Variation, the preferred option for a Yukon crossing and two other Yukon River crossing options) also offers substantial benefits (positive impacts), such as providing a reliable, relatively low-cost, supply of natural gas. This potential supply could enable, for example, the provision of additional natural gas to residents of Fairbanks thereby displacing other fuel types (e.g., wood, coal, or fuel oil) with significantly greater air emissions of various types. Displacing fuel types that have greater air emissions will improve air quality and have a positive impact on public health in the Fairbanks North Star Borough region (See Section 5.15, Public Health, for more detail). Selection of the No Action Alternative would forego these benefits.

Tables in Section 6.1 provide more information on the predicted impacts and cumulative effects of the proposed Project, Alternatives and Options, and ranks the magnitude and probability of those impacts.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Regional Geology and Topography	Impacts to regional geology and topography would occur, particularly in areas of rugged terrain and steep slopes. Significant grading may be necessary in some areas to reduce slopes to grades suitable for construction. Existing infrastructure would be utilized to the extent practicable. In areas where the proposed Project crosses laterally along the side of a slope, cut-and-fill grading may be required.	Same as proposed action.	No impact would occur.	For the MP 0 to MP 540 segment, the existing bridge option would result in fewer impacts to geology as the construction areas and support structures associated with the suspension bridge (the preferred option) and construction areas and subsurface drilling associated with the HDD crossing option would not be built. Utilizing the existing bridge would not result in any new impacts.
Soils	Impacts to soil conditions within the proposed Project right-of-way (ROW) would occur during both construction and operations activities. Construction, excavation, grading, and maintenance of slopes and work pads may result in increased soil erosion and siltation.	Same as proposed action.	No impact would occur.	For the MP 0 to MP 540 segment, the existing bridge option would result in fewer impacts to soils as the construction areas and support structures associated with the suspension bridge (the preferred option) and construction areas and subsurface drilling associated with the HDD crossing option would not be built. Utilizing the existing bridge would not result in any new impacts.
Permafrost	The proposed Project may also affect adjacent permafrost by heat transfer. In concept, the pipeline would be operated at below freezing temperatures in predominantly permafrost terrains, and above freezing temperatures in predominantly thawed-ground settings. A pipeline that is maintained at a higher temperature than the surrounding media could create thaw bulbs along the proposed ROW. Conversely, permafrost aggradation could occur in areas where the pipeline is operated	Same as proposed action.	No impact would occur.	For the MP 0 to MP 540 segment, the existing bridge option would result in fewer impacts to permafrost as the construction areas and support structures associated with the suspension bridge (the preferred option) and construction areas and subsurface drilling associated with the HDD crossing option would not be built. Utilizing the existing bridge would not result in any new impacts.

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	at below-freezing temperatures. Ground ice could grow, producing frost heave in some areas, especially in areas where fine-grained soils are dominant in the subsurface.			
Seismic Zones and Faults	Seismic activity can trigger mass wasting processes such as landslides and soil instabilities such as liquefaction. Landslides and liquefaction could result in a gas release from the pipeline to the surrounding environment.	Same as proposed action.	No impact would occur.	Utilizing the existing bridge or construction of a new suspension bridge (the preferred option) would not result in any new impacts. Construction of the HDD crossing option could encounter unstable subsurface areas.
Material Resources	The main impact of material resources would be the mining activity itself. Other impacts associated with this extraction would be minor modifications of local topography, loss of surface vegetation, creation of landscape scars, and a temporary increase of soil erosion and siltation near the operation material sites (OMSs). In some OMSs, destruction of permafrost could produce ponding.	Same as proposed action.	No impact would occur.	The preferred option of a new suspension bridge or the other two options would not result in any new impacts.
Paleontological Resources	Any action that involves ground disturbance creates a potential for impacts to paleontological resources existing in the proposed Project area.	Same as proposed action.	No impact would occur. Previously unknown paleontological resources in the ROW area might remain unknown.	Utilizing the existing bridge would not result in any new impacts. The suspension bridge (the preferred option) and HDD option could encounter paleontological resources.

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Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Water Bodies	The proposed action would cross 495 water bodies. Excavation in a water body during pipeline installation, permanent facility construction, or access road construction may result in erosion in streambeds causing increased sediment loading of surface water, or contamination of surface water due to excavation equipment refueling leaks.	This route variation would have four fewer stream crossings if chosen (total crossings 491).	No impact would occur.	The proposed suspension bridge (the preferred option) or two additional options would not result in any new impacts to water bodies.
Floodplains	Placement of fill for pipeline or aboveground facility installation may result in a reduction in flood storage capacity (if within a floodplain). This may cause increased upstream stages due to backwater effects. Construction and operation of the proposed Project is not expected to cause long-term effects on stream flow, stream profile, or structural components of streams or water bodies.	Same as proposed action.	No impact would occur.	The proposed suspension bridge (the preferred option) or two additional options would not result in any new impacts on floodplains.
Use of Surface Water	Use of surface water for O&M may result in alteration of surface water hydraulics or a new groundwater recharge area. Any altered hydraulics due to use of surface water for construction purposes would disappear after construction is complete.	Same as proposed action.	No impact would occur.	The option to use the existing bridge or the preferred option of a new suspension bridge would not result in any new impacts. The HDD option would utilize surface water for the drilling process.
Vegetation	Construction of the proposed Project would result in the clearing and grading of vegetation within the proposed Project construction ROW and work areas. Disturbance to non-forested vegetation types would recover relatively quickly, while clearing of forest and woody vegetation would require an extended time period to recover. In those areas outside of the permanent ROW, forested vegetation communities would be	This route variation would result in fewer impacts to vegetation resources, primarily by development of approximately 35 percent less forested vegetation and 13 percent less scrub/shrub than the corresponding MP 540 to MP 555 segment. General impacts associated with construction of the Denali National Park Route Variation	No impact would occur.	Overall, more forested vegetation would be impacted from building a suspension bridge (the preferred option) or using the HDD method than utilizing the existing E.L. Patton Bridge. Wetland vegetation impacts would be 8.6 acres less for construction and 4 acres less in the permanent ROW for the existing bridge option, compared to the new bridge and HDD crossing options.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	<p>much slower to recover and require several decades to several hundred years to reach pre-disturbance conditions. In the interim period, forested vegetation communities would be replaced by early successional-stage vegetation, such as grasses, shrubs, and young trees. Proposed Project construction could propagate invasive plants through several pathways. It is anticipated that construction equipment and personnel would be brought from several different locations, potentially including the continental United States where invasive plants are common.</p>	<p>would be similar to those described for the proposed Project.</p>		
Wetlands	<p>Approximately 4,830 acres of wetlands within the temporary pipeline construction ROW (generally 100 feet, up to 230 feet in sloped areas) would be impacted by clearing and construction activities during the pipeline construction process. After construction has been completed, the temporary construction ROW would, over time, revert to wetlands similar in type and function to those that existed prior to construction. Forested wetlands would require more time to reestablish than shrub or herbaceous wetlands. The permanent ROW (30, 51, or 52 feet in width) would also support wetland vegetation and characteristics, but would be altered by maintenance and inspection activities. Vegetation height and density would be limited, forested wetlands would be converted to shrub wetlands within the permanent maintained ROW. Approximately</p>	<p>This route variation would have impacts to fewer wetland acres than the segment of the proposed mainline (MP 540-MP 555) that it would replace. The route variation would have 4.4 acres versus the 177.3 acres associated with the corresponding proposed Project segment. The Denali National Park Route Variation would not have impacts to forested wetlands (PFO) while the MP 540 to MP 555 segment would impact 2.6 acres of forested wetlands.</p>	<p>No impact would occur.</p>	<p>The construction ROW for the existing bridge option would result in approximately 8.6 fewer acres of wetlands impacts than the suspension bridge (the preferred option) or HDD options. The permanent ROW for the existing bridge option would result in 4.0 fewer acres of wetlands impacts than the suspension bridge or HDD options.</p>

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	516 acres of wetlands would be affected by the TEWs. Construction of above ground facilities would impact approximately 73 acres of wetlands. Construction of temporary and permanent access roads would impact approximately 172 acres of wetlands. Wetland impacts resulting from above ground facilities and access roads would exist as long as those features were in place.			
Wildlife	The proposed Project would affect wildlife resources through habitat loss, alteration, and fragmentation; direct mortality during construction and operation; altered hunting mortality patterns. Indirect mortality because of stress or avoidance of feeding; reduced breeding success; reduced survival or reproduction; and altered survival, mortality, or reproduction due to exposure to equipment fuel or lubricants spilled during construction or maintenance. Construction of the proposed Project would result in loss and alteration of about 9,117 acres of habitat, including 848 acres of tundra habitat (Dwarf Scrub), 4,880 acres of boreal forested habitat (Deciduous, Evergreen, and Mixed Forest), and 4,150 acres of wetland habitat (Scrub/Shrub, Sedge Herbaceous, Woody Wetlands, Emergent Herbaceous Wetland).	This route variation would impact a total of 87.80 acres of wildlife habitat as compared to a total of 447.5 acres of wildlife habitat that would be impacted by the corresponding MP 540 to 555 segment of the preferred alternative.	No impact would occur.	Overall, more forested habitat would be impacted from the building of a suspension bridge (the preferred option) and using the HDD method than utilizing the existing E.L. Patton Bridge. Wetland habitat impacts would be 8.6 acres less for construction and 4 acres less in the permanent ROW for the existing bridge option, compared to the new bridge and HDD crossing options.

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Resource	Predicted Impacts			
	Proposed Action	Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Fish	<p>Pipeline construction would most likely cause short-term disturbances to fishery resources. Potential impacts to fishery resources that would occur during construction include reduced survival and/or productivity and habitat loss or alteration. The majority of the stream crossings (400) would occur between the GCF and MP 540. Eleven stream crossings in this segment would be conducted using HDD and there would be a new crossing of the Yukon River in this segment. Twenty-nine of the stream crossings contain anadromous fish and 13 stream crossings contain Fish of Conservation Concern. Six stream crossings would occur between MP 540 and MP 555. None of these crossings contain anadromous fish. One crossing does contain Fish of Conservation Concern. All crossings are proposed to be crossed using open cut methods during the summer months. Ninety stream crossings would occur between Mile 555 and the Cook Inlet NGLEP Facility. The majority of the streams containing anadromous fish occur in this segment, with 53 water body crossings containing anadromous fish. Twenty-five of these anadromous fish-bearing stream crossings would be constructed using open cut methods, 26 would use HDD methods, and 2 stream crossings would use existing bridges.</p>	<p>This route variation would have four stream crossings. The Nenana River is considered an anadromous stream containing chum, coho and chinook salmon and would be crossed two more times under this alternative.</p>	<p>No impact would occur.</p>	<p>Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in any new impacts.</p>

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Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Marine Mammals (not ESA listed)	The proposed Project would incrementally increase vessel traffic at the Port of Seward for several years during construction (9 shipments are expected). Impacts on marine mammals would be minimal since large vessels frequent this port and marine mammals would be habituated to the disturbance. Transportation of the modules for the gas conditioning facility to West Dock at Prudhoe Bay has the potential to displace marine mammals from the port area and interfere with their communications, especially marine mammals that use low frequencies for communication such as the baleen whales and gray whales.	Same as proposed action.	No impact would occur.	Same as proposed action.
Threatened and Endangered Species	Federally-protected threatened or endangered species and federal candidate species with the potential to occur in the proposed Project area include 9 marine mammals, 1 terrestrial mammal, 4 birds, and 2 fish species. Most federally-listed threatened or endangered species would not be affected or not likely to be adversely affected through construction of the proposed Project. The polar bear and its critical habitat are likely to be adversely affected during proposed Project construction. The spectacled eider is likely to be adversely affected by construction and operations of the proposed Project.	This route variation would not impact any of the identified threatened and endangered species.	No impact would occur.	The impacts to the threatened and endangered species that would result from the proposed suspension bridge (the preferred option) and the two other Yukon River crossing options would be negligible.

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Land Use	<p>The proposed Project ROW would impact lands owned by the federal government and managed by the BLM, DoD, and NPS. The State of Alaska, University of Alaska, AHTNA, Inc. and the Toghothele Corporation have selected federally-owned lands within the proposed Project ROW. The state of Alaska owns the greatest number of parcels within the proposed ROW. Lands owned by the state of Alaska are managed by the ADNR. With the exception of the Denali National Park and Preserve (DNPP) and 6(f) lands, all other lands with applicable land use plans or documents would have provisions for utility crossings; therefore, the proposed Project would be compatible with these plans. The Proposed Action ROW would cross railroads, utilities (including the TAPS), trails, driveways, and local and arterial roads. Potential effects include disruption to traffic flow and utility service. Effects to agricultural land would be minimal, with only 0.1 percent of the construction area affected by the Proposed Action ROW consisting of agricultural land. The proposed Project has the potential to affect developed land by exposing residences or commercial/industrial buildings located near the proposed Project ROW and aboveground facilities to dust and noise primarily during proposed Project construction.</p>	<p>The Denali National Park Route Variation would cross mainly federal (51.3 percent) and state-owned (36.4 percent) lands. In contrast, the corresponding MP 540 to 555 segment of the preferred alternative would cross mostly state-owned (51.3 percent) and Native corporation (46.2 percent) lands, and would not intersect federally-managed lands. The variation would be approximately 15.3 miles in length, and would be within Denali National Park for approximately 7 miles, parallel to the Parks Highway. Currently, Federal laws do not allow construction of this route variation within Denali NPP. Federal legislation that would allow the route variation has been introduced by the Alaska delegation, and is currently being considered by the U.S. Congress. If authorized by Congress, the NPS would have authority to authorize a ROW for the alternate route or mode which would result in the fewest or least severe adverse impacts upon the area. This route would intersect the railroad ROW twice. It would not cross roads, trails/driveways, utilities, or the TAPS. All railroad crossings would be installed by slick-boring; therefore, no disruption to</p>	<p>No impact would occur.</p>	<p>More land would be impacted from building a proposed suspension bridge (the preferred option) and using the HDD method than utilizing the existing E.L. Patton Yukon River Bridge. The preferred option and the HDD river crossing would intersect one or more Native allotments.</p>

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Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
		railroad service would occur.		
Recreation	Although the proposed pipeline alignment was designed to avoid, to the greatest extent practicable, recreation areas, the mainline pipeline would either cross or be located nearby (less than one mile) a number of key recreation features in Alaska, including the East Fork Chulitna River Campground, Denali State Park, Montana Creek State Recreation Area, Arctic National Wildlife Refuge, Denali National Park and Preserve, Nancy Lakes State Recreation Area, Tanana Valley State Forest, Susitna Flats State Game Refuge, Minto Flats State Game Refuge, Willow Creek State Recreation Area, and the Little Susitna Recreation River. In addition, both public and private land along the mainline route (outside designated recreation areas) is commonly subject to dispersed recreation activities.	Construction of the Denali National Park Route Variation would result in the same types of recreation impacts as those described above for the proposed action. These impacts include short-term adverse effects on tourism and recreation attributed to restricted access to localized areas of the Denali NPP.	No impact would occur.	Utilization of the existing E. L. Patton bridge or an HDD crossing would not result in impacts to recreation that would be different than those for the preferred suspension bridge option.
Visual	Short-term impacts that would be associated with construction include extra workspace, clearing and removal of existing vegetation in the ROW, exposure of bare soils, earthwork, trenching, and machinery and pipe storage. Long-term impacts during operations would be associated with maintenance of access in the ROW, various landform changes including earthwork and rock formation alteration, pipeline markers, and new aboveground structures located along the route such as compressor stations, mainline valves, pig launchers/receivers, and a straddle and off-take facility. Short-term visual impacts would	This route variation would be within Denali National Park for approximately 7 miles, parallel to the Parks Highway. This section of the route would be typically installed within the road ditch or in a few areas, within the road prism, or possibly under the road shoulder. Denali NPP has high recreation and tourist use in the summer months, and such users have high viewer sensitivity. The area also includes tourist facilities near the Park entrance. The land cover in the area	No impact would occur.	Visual impacts on the existing E.L. Patton Bridge crossing would be expected to be low as the pipeline infrastructure would hang below the bridge surface and blend in with the existing linear bridge structure and provide weak contrast to viewers traveling on the bridge roadway or traveling in the river corridor. No hill cuts or aboveground segments are anticipated in this section, indicating that long-term visual impacts would likely be low and would be consistent with VRM management objectives. The preferred

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		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	be higher during construction and re-vegetation time period than during operations and maintenance.	along the route includes 7.4 miles in developed areas, 5.4 miles are in forest, 1.1 miles are in scrub/shrub vegetation, and 0.2 miles pass through water/wetland areas.		suspension bridge option would result in a new structure in the visual landscape. The HDD crossing option would result in temporary visual impacts during construction.
Socioeconomics	In total, the construction of the ASAP would support between a minimum of 350 and a maximum of 6,400 jobs during the 2 year construction period. Non-resident construction workers would temporarily increase the population in the study area, which may be particularly noticeable in low population density areas in the YKCA, Denali and North Slope boroughs. Given the extreme remoteness of the areas traversed by the Proposed Action, it is anticipated that most of the mainline construction workers would live in work camps and mobilize and demobilize to these camps primarily using air transportation. It is estimated that the GCF and Prudhoe Bay O&M facility would employ a total of 10 people that would be housed in Prudhoe bay on rotation. Ten additional Wasilla O&M facility employees are estimated and the applicant has not yet determined the personnel requirements for the compressor stations or straddle and off-take facility.	The 15.3-mile-long Denali National Park Route Variation would replace a 15.5 mile long segment of the mainline, therefore the socioeconomic effects would be the same as for the proposed action.	The material economic benefits associated with increased employment and local and state tax revenues during the construction and operations phase will not occur. The residents and businesses of Fairbanks will not have access to relatively inexpensive (and less polluting) natural gas and would continue to rely on more expensive fuels such as wood, coal, and oil for heating.	Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in any new impacts.
Environmental Justice	Minority and low-income communities would likely be positively affected by the proposed Project through the creation of both temporary and permanent jobs, as well as income- and tax-effects. Some adverse quality of life effects are anticipated on many communities adjacent	Same as proposed action.	The economic and sociocultural benefits associated with increased employment and local and state tax revenues during the construction and operations phase will not occur. Minor negative impacts to quality of	Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in any new impacts to disadvantaged populations or minority and low-income communities.

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Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	to the proposed Project during the construction phase due to increased traffic and noise, but those adverse effects are expected to be minor to moderate, of a temporary nature, and not concentrated in low income or minority areas or higher income non-minority areas. Overall, the analysis identifies minor to no environmental justice effects of the Proposed Action and Alternatives on low-income and minority groups.		life from increased traffic and noise will not occur.	
Cultural Resources	Direct effects to cultural resources within the ROW from ongoing or proposed activities could include physical destruction of or damage to all or part of the resource, removal of the resource from its original location, change of the character of the resource's use or of physical features within the resource's setting that contribute to its historic significance, change in access to traditional use sites by traditional users, or loss of cultural identity with a resource. Indirect effects could be characterized within a 1-mile radius of the ROW and include vibration, noise, or atmospheric elements, neglect of a property that causes its deterioration, transfer, lease, or sale out of Federal ownership without proper restrictions, vulnerability to erosion, and increased access to and proximity of proposed Project components to culturally sensitive areas. The pipeline ROW would encounter 37 AHRS sites and 705 sites are within 1 mile of the ROW.	For the Denali National Park Route Variation segment there are no reported sites that could potentially experience direct effects from the proposed Project construction and 12 sites that fall within the area for potential indirect effects (Table 5.13-11). No RS 2477 trails would be crossed by the proposed Project within this segment (Table 5.13-12). The potential for unanticipated discovery of archaeological deposits would be lower for this alternative than for the corresponding MP 540 to MP 555 segment as this alternative follows the Parks Highway, which has already been previously disturbed.	No impact would occur.	Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in any new impacts to cultural resources.

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	Proposed Action	Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Subsistence	<p>Subsistence use impacts common to all alternatives include direct and indirect effects on subsistence use areas, user access, resource availability, and competition in those areas. The magnitude of impacts to subsistence would vary however; communities that are located along the proposed ROW or whose use areas are bisected by the proposed Project would likely experience greater impacts versus those communities located further away or only have a small portion of their use areas intersected by the proposed Project. Construction related activities resulting from the development of the proposed Project would have both direct and indirect effects on subsistence resources, use areas, and subsistence users in terms of availability, access, and competition, as well as hunter responses and effects on culturally significant activities. Where increased employment and workforce development among subsistence users are concerned, subsistence users might have less time available for subsistence activities due to employment commitments and might travel less to traditional places. Further, a decline in the consumption of traditional foods means an increase cost for obtaining substitute foods and nutrition concerns. Employment does however provide the benefit of increased income which residents can in turn use to purchase equipment and supplies required for participation in subsistence activities.</p>	<p>Types of potential construction (e.g., resource disturbance due to noise) and operation related subsistence impacts would be similar as those described for the Mainline. Subsistence related impacts from the Denali National Park Route Variation would likely be less than the corresponding Mainline route between MP 540 and MP 555 because the Nenana Route is immediately adjacent to the Parks Highway where noise and disturbance are already occurring.</p>	<p>No impact would occur. The No Action Alternative eliminated the potential need for subsistence users to purchase non-traditional foods because subsistence resources have been temporarily disturbed by the proposed Project. In contrast, subsistence users who might have benefited economically from the proposed Project will forgo income that could fund subsistence activities.</p>	<p>Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in any new impacts to subsistence uses.</p>

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Public Health	<p>Possible health impacts considered include water and sanitation; accidents/injuries; health infrastructure and delivery; exposure to hazardous materials; food, nutrition, and subsistence; infectious diseases (perhaps transmitted by pipeline construction workers); non-communicable and chronic diseases; and social determinants of health. Using the rating system described in the HIA toolkit, nearly all these impacts would be described as 'low.'</p> <p>The possibility of fatal and nonfatal injuries to members of the general public from incremental road and railroad traffic associated with pipeline construction and operation are scored medium using the rating scheme. Although the health effects could be severe for those impacted, quantitative estimates of the number of persons injured are quite low. Adverse impacts on social determinants of health could arise from anxieties/concerns related to possible loss or lowering of lifestyle quality and fears about accidents/fires/explosions resulting from leaks from the pipeline during the operations phase. Estimates of leak frequency are provided. The largest health impact of the pipeline would occur during the operations phase (assuming that the gas distribution network was expanded in Fairbanks). Natural gas emits fewer pounds of various pollutants, particularly fine particulates, than other fossil fuels (coal, oil) or wood. Substitution of natural gas for other fuels presently used for heating would reduce fine particulate emissions in Fairbanks</p>	Same as proposed action.	<p>The No Action Alternative foregoes all of the major health benefits associated with the availability of clean burning natural gas in Fairbanks. Airborne particulate matter generated by the combustion of wood, oil, and coal for heating continues to contribute to increased morbidity and mortality for Fairbanks residents. In all parts of the study area there is no incremental impact associated with infectious diseases but there are none of the outreach and health education plans proposed as a mitigation measure associated with the proposed action. With regard to other health effects, no impact would occur.</p>	Same as proposed action.

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		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	substantially—particularly in winter months when heaters are used extensively and air inversions more frequent. Concentrations of fine particulates even at levels below ambient air quality standards have been proven to result in increased morbidity and mortality. Fairbanks is presently a non-attainment area for fine particulates. Thus, the potential public health benefits of ready availability of natural gas in Fairbanks would be substantial. Natural gas from the pipeline is estimated to be less expensive than other fuels, so there would be positive economic benefits as well. The analysis presented in this section did not address the possibility of substitution of natural gas for gasoline or diesel motor fuel, which would add to the stated benefits.			
Air Quality	Air quality effects associated with construction of the proposed Project mainline would include emissions from fossil-fuel fired construction equipment, fugitive dust, and open burning. The mainline would be constructed in four construction spreads or completed lengths. Simultaneous activity would occur on all four spreads. Total worst-case emissions were calculated to be 1,059,100 tpy for CO <sub>2</sub> , 21,740 tpy for NO <sub>x</sub> , 8,008 for CO, 2,304 for VOC and the PM-10 is calculated to be 165,075 tpy. Operations emissions from the pipeline itself would be non-existent. Preliminary emission estimates for the GCF trigger the requirement for a PSD permit for NO <sub>x</sub> , CO, VOC, PM-10, PM-2.5, and GHGs. For the compressor stations and straddle off-take facility,	Same as proposed action.	There would be no impact to air quality throughout the entire ROW with the exception of Fairbanks. Fairbanks area residents will forgo the air quality benefits associated with the availability of natural gas for home heating. As a result, Fairbanks area residents will continue to experience increased morbidity and mortality from airborne particulate matter associated with combustion of wood, oil, and coal for heat.	The existing bridge option would result in fewer impacts to air quality resulting from construction than the proposed suspension bridge (the preferred option) or HDD option.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Predicted Impacts			
	Proposed Action	Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	preliminary estimates trigger the requirement for a PSD permit for NOx. In concert with a Fairbanks natural gas distribution system, natural gas made available by the ASAP would replace wood and fuel oil currently used for heating and power generation and could result in improvements to air quality in the Fairbanks area.			
Noise	Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. In addition, construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance. Ground-borne vibration would also occur in the immediate vicinity of construction activities, particularly if rock drilling, pile driving, or blasting is required. Although noise levels from the industrial equipment at the proposed gas conditioning plant and compressor stations are estimated at approximately 85 to 95 dBA at 50 feet. This noise level would be perceived as insignificant, thus, creating a no noise impact (i.e., increase of 0 dBA over estimated ambient levels). Furthermore, vibration levels from operation at this distance would also be insignificant.	The nearest sensitive receptor to Denali National Park Route Variation construction would be McKinley Park, approximately 2.3 miles (12,403 feet) from the route.	No impact would occur.	Neither the proposed suspension bridge (the preferred option) nor two other Yukon River crossing options would result in significantly different noise impacts.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Predicted Impacts			
	Proposed Action	Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Navigation	The proposed pipeline would use underground installation for all stream crossings except for four bridge crossings. Two bridge crossings would use existing bridges and a new bridge would be built across the Yukon River if the suspension bridge option is implemented. Pipeline construction using open cut methods across waterways are anticipated to be completed in one to three days from initiation and are expected to result in short-term disturbance to navigability along the proposed pipeline. Navigability along waterways using open cut methods would be temporarily impeded by construction materials and equipment during the pipeline construction process. No impacts to navigation are expected from operation and maintenance of the proposed Project. The pipeline would meet or exceed DOT standards at 49 CFR 192.327 and would be buried below the ground surface at the depth required for safe crossing of water bodies or on bridges designed and constructed in compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways.	This route variation would have two crossings of the Nenana River that have been determined to be navigable by the USACE. It is anticipated that impacts would be similar to those described for the proposed action.	No impact would occur.	Short term, temporary impacts to navigation could occur during installation of the pipeline on the existing Yukon River bridge or construction of a suspension bridge. Impacts to navigation would not occur from the HDD option.
Reliability & Safety	The pipeline and aboveground facilities associated with the proposed Project must be designed, constructed, operated, and maintained in accordance with the USDOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures.	Same as proposed action.	No impact would occur.	Impacts associated with the preferred option and the other two Yukon River crossing options are the same as the proposed action.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Proposed Action	Predicted Impacts		
		Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
Long-Term Versus Short-Term Productivity of Environment	Proposed gas pipeline construction and operation would require short-term and long-term uses of land and other resources. Short-term would be considered for the duration of the construction period, and long-term would be for the life of the proposed Project (30 years). Over the long term, the proposed Project could have a beneficial effect on air quality in the Fairbanks area, which currently is in non-attainment status for particulates due to the use of oil, coal and wood for home heating.	The relationship between short-term uses and long-term productivity would not be appreciably different for the proposed action and the Denali National Park Route Alternative.	Fairbanks area residents will forgo the air quality benefits associated with the availability of natural gas for home heating. As a result, Fairbanks area residents will continue to experience increased morbidity and mortality from airborne particulate matter associated with combustion of wood, oil, and coal for heat.	Impacts associated with the preferred option and the other two Yukon River crossing options are the same as the proposed action.
Irreversible & Irretrievable Commitment of Resources	Large amounts of construction materials would be committed to the proposed Project. Sands, gravels, rip rap, and other materials would be required at various locations for infrastructure, pad construction, and production and ancillary facilities along the proposed Project ROW. Irreversible impacts to the physical setting would be associated with maintenance of access in the ROW, various landform changes including earthwork and rock formation alteration, pipeline markers, and new aboveground structures located along the route such as compressor stations, mainline valves, pig launchers/receivers, and a straddle and off-take facility. The proposed Project would require a total of 1,088.02 million gallons of surface water for construction of ice work pads, ice access road construction, ice armoring of snow roads, earthwork (dust control and compaction), and hydrostatic testing of the pipeline and for horizontal directional drilling (HDD) operations. Vegetation and habitats in the permanent pipeline ROW would be altered	Irreversible & Irretrievable Commitment of Resources would not be appreciably different for the proposed Project and Denali National Park Route Alternative.	No impact would occur.	Impacts associated with the preferred option and the other two Yukon River crossing options are the same as the proposed action.

**TABLE 6.0-1 Summary of Predicted Impacts and Proposed Mitigation**

Resource	Predicted Impacts			
	Proposed Action	Denali National Park Route Variation	No Action Alternative	Yukon Crossing Options
	<p>due to the requirements of maintenance and inspection activities. Timber resources would not be restored within the permanent proposed Project footprint; therefore, there would be a long-term conversion and irretrievable loss of approximately 1,340 acres of forested land that could contain timber. The proposed Project would intersect and affect historic trails, and known cultural resources within the ROW. Cultural resources (archaeological sites, historic trails, structures and sites, cultural landscapes, and traditional cultural properties) are nonrenewable resources, and any loss of such resources would be irreversible and irretrievable. Proposed pipeline construction and operation would require permanent commitment of land for the ROW, access roads, and associated aboveground facilities. All proposed Project construction activities would consume fuel, mostly in the form of diesel. This would be an irreversible use of nonrenewable fossil fuels.</p>			

## 6.1 RANKING OF POTENTIAL EFFECTS / IMPACT TABLES

This section builds on the information presented in Table 6.0-1 and describes the impacts and effects identified in the analysis throughout Section 5 of this Final EIS. This section presents tables of data for impacts associated with the Proposed Action and short analysis of the impacts associated with the No Action Alternative, the Denali National Park Route Variation, and options for crossing the Yukon River identified in the Proposed Action.

The purpose of the subsequent tables is to explain how direct, indirect and cumulative effects were ranked for magnitude and probability for each impact associated with the Proposed Action in the three major resource classes (physical, biological, and socioeconomic). Effects are then plotted on a magnitude and probability chart.

The tables and plots below are organized by major resource class as found in the rest of the document. The initial set of tables and figures address the impacts associated with the Proposed Action. The first set of tables (Table 6.1-1 and Table 6.1-2) and Figure 6.1-1 rank the predicted impacts to the physical environment. The second set of tables (Table 6.1-3 and Table 6.1-4) and Figure 6.1-2 rank the predicted impacts to the biological environment, and the third set of tables (Tables 6.1-5 and Table 6.1-6) and Figure 6.1-3 rank the predicted impacts to the socioeconomic environment. Where appropriate and to aid in referencing rankings, potential effects associated with specific alternatives or options are listed in the tables. Subsequent tables list impacts for the other alternatives that are significantly different than the impacts for the Proposed Action.

For each major resource class, the first table shown describes the definitions used to rank predicted impacts with respect to magnitude and probability of occurrence. These tables (Tables 6.1-1, 6.1-3, and 6.1-5) provide the definitions used to characterize magnitude and probability for each of the major resource classes (physical, biological, and socioeconomic) and were designed to provide some consistency across the various major resource classes. Thus, for example, Table 6.1-1 contains the classification criteria for physical effects. As used here 'magnitude' is the average of ratings (low, moderate, or high) for intensity, geographic scope, and frequency/duration, each of which is defined in Table 6.1-1. As used here 'probability' classes of low, medium, and high correspond to estimated probabilities of  $<0.3$ ,  $0.3 \leq 0.6$ , and  $>0.6$ , respectively.

Following the definitions are longer tables (Tables 6.1-2, 6.1-4, and 6.1-6) listing impacts by class and number (e.g., Phy10) with a short description of the effect and the results of applying the ranking criteria. Each individual impact within each broad impact category (such as 'Phy10: Contamination of ground or surface water from heavy equipment use' within the physical effect category) is classified in terms of both magnitude and probability. The abbreviations used are 'L' for Low, 'M' for Moderate and 'H' for High. The right most columns list the magnitude and probability rankings for the impact and are shaded to help the reader track the importance of the relative rankings.

Magnitude rankings shown in Tables 6.1-2, 6.1-4, and 6.1-6 are the average of criteria ratings (low, moderate, or high) for intensity, geographic scope, and frequency/duration. The averaging process is straightforward and each rating is given equal weight. As an example, if intensity, geographic scope, and frequency/duration are rated as L, M, and H the average magnitude is ranked as M for Moderate. Low magnitude rankings result from criteria ratings (in any order) of L, L, L, or L, L, M. Moderate magnitude rankings result from criteria ratings (in any order) of L, L, H; L, M, H; H, H, L; L, M, M; M, M, M; or M, M, H. High magnitude rankings result from criteria ratings (in any order) of M, H, H or H, H, H.

Subsequent to the tables of definitions and rankings is a summary figure for each major resource class (Figures 6.1-1, 6.1-2, and 6.1-3). These figures are termed ranking matrices and are included to summarize the various impacts of the proposed Project in terms of two broad attributes, the magnitude (subdivided into three classes of low, moderate, and high magnitude) and the probability (also subdivided into three classes of low, moderate, and high) of the effect. The results of the impact rankings are plotted in the appropriate cell in the ranking matrix. Thus, to continue the example, referring to Table 6.1-2, which contains the ranking matrix for physical effects, impact 'Phy10' is determined to be of moderate magnitude, but a low probability event. Inspection of the ranking matrices is an efficient way to understand the pattern of impacts of the proposed Project and to identify impacts in each class, such as high probability, high magnitude impacts.

As noted above, impacts are characterized in terms of both probability and magnitude (the average of ratings [low, moderate, or high] for intensity, geographic scope, and frequency/duration). Assessments of probability and the components of magnitude were made by the subject matter experts who drafted the applicable sections of this report on the basis of their professional judgment. Ratings for each of the three components of magnitude (also assessed by subject matter experts) were made in accord with criteria they defined. Judgments of magnitude and probability are, to a degree subjective, but the rating process was designed to help ensure consistency and transparency. The decision rule to average the ratings of the various components of magnitude was selected in the interests of simplicity and conservatism (in order to reduce the likelihood of understating the magnitude of various adverse impacts). For example, it might be argued that the magnitudes of certain negative impacts during the operational phase of the Proposed Action (which has a high duration) are overstated for certain impacts where both the intensity and geographic scope were assessed as 'low.' Readers may disagree with the judgments herein, but the process can fairly be described as organized, explicit, transparent, and not overly complex.

The USACE has identified three alternatives: the Proposed Action, the No Action Alternative, and the Denali Route Variation Alternative. Within the Proposed Action, there are two Options relating to crossing the Yukon River. The impacts of the Proposed Action are identified and described in Tables 6.1-1 through 6.1-6 and Figures 6.1-1 through 6.1-3. The relevant impacts associated with the other two alternatives and the three options are discussed below relative to the impacts associated with the Proposed Action. For convenience, tables describing the Alternatives and Options in this section only show the potential effects that are impacted by the choice of a particular alternative or an option. For consistency, figures ranking the relevant impacts associated with the No Action Alternative and the Denali Route Variation Alternative,

the Preferred Option and the other two Options are provided as well (see Figures 6.1-4 through 6.1-8).

### **6.1.1 The No Action Alternative**

Under the No Action Alternative the Proposed Action is not undertaken and all of the impacts associated with the Proposed Action (numbered Phy1-30, Bio1-74, and Soc1-59 in Tables 6.1-2, 6.1-4 and 6.1-6, respectively) will not occur. For these impacts, no effect is anticipated so they cannot be ranked for magnitude or probability. However, while selection of the no action alternative eliminates the negative impacts, this choice also eliminates the positive impacts associated with the Proposed Action. Table 6.1-7 lists the differences associated with the No Action Alternative relative to the Proposed Action with comments on selected impacts. The selected impacts that would not materialize under the No Action Alternative include beneficial impacts to air quality (and an improvement in public health related to improved air quality) in and around Fairbanks (Phy18) and economic opportunities along the proposed route (Soc31, Soc33, Soc37 and Soc39). These impacts are ranked in the same format used for the tables describing the Proposed Action. The ranked impacts are plotted in Figure 6.1-4. For all other identified potential impacts, the No Action Alternative has no effect and therefore effects are not plotted in Figure 6.1-4.

As noted elsewhere in this Final EIS, under the No Action Alternative, the goal of the Proposed Action is not achieved. Absent construction and operation of this or some alternative gas pipeline system, Alaska will continue to be in the position of having large natural gas reserves, but a shortfall of supply to serve developed and developing markets within Alaska, including Fairbanks and the Railbelt.

### **6.1.2 The Denali Route Variation Alternative**

The Denali Route Variation Alternative is described in detail in Section 2, Project Description. The principal difference between the Proposed Action and the alternative is that the alternative pipeline route is altered slightly to run through Denali National Park. Assuming approval is granted for such a project (see Section 2 for details on the need for special approval from the U.S. legislature), the overall pipeline project would be identical to the Proposed Action except for a route variation of approximately 15.3 miles. The variation route does not materially change the positive and negative impacts associated with the Proposed Action. Under the Denali Route Variation Alternative the route would include all of the positive and negative impacts (numbered Phy1-30, Bio1-74, and Soc1-59 in Tables 6.1-2, 6.1-4 and 6.1-6, respectively) identified with the Proposed Action with a few minor changes. Table 6.1-8 lists the potential effects relevant to this alternative. For example, the route variation will have 4 fewer stream crossings (with a total of 491) but this will not impact the overall rankings of stream-related impacts for the proposed Project (see potential effects Phy8, Bio47 – Bio49 and Soc17 in Table 6.1-8). The route variation will cross the Nenana River, a navigable waterway, two more times compared to the Proposed Action (see potential effects Phy22-26 in Table 6.1-8). Potential effects on recreation, visual resources, and socioeconomics are also referenced in Table 6.1-8

Because this alternative involves slightly less forest, wetland, and wildlife habitat between pipeline MP 540 and 555 compared to the Proposed Action, the direct effects in the area of the route variation are somewhat less. In principle, subsistence impacts are expected to be marginally lower near the route variation when compared to the Proposed Action because the Alternative will place the pipeline alongside the existing Parks Highway where noise and disturbance are already occurring. However, this Alternative does not materially impact the rankings associated with these resources when the entire proposed Project is considered. Figure 6.1-5 plots the potential effects listed in Table 6.1-8. Overall, the physical, biological, and socioeconomic impacts are expected to be the same as those identified under the Proposed Action.

### **6.1.3 Yukon River Crossing Options identified under the Proposed Alternative**

The AGDC has proposed three options for crossing the Yukon River: construct a new aerial suspension bridge across the Yukon River (the Applicant's Preferred Option); cross the Yukon River by attaching the pipeline to the existing E.L. Patton Bridge (Option 2); or utilize HDD to cross underneath the Yukon River at the location of the proposed new suspension bridge (Option 3). The AGDC has determined that the preferred option is the construction of a new bridge across the Yukon River. Most impacts associated with the Proposed Action are unchanged for any of these options. However, the differences associated with each option are identified below.

#### **6.1.3.1 The Applicant's Preferred Option – Construction of a New Aerial Suspension Bridge Across the Yukon River**

If a new Yukon River suspension bridge were constructed, no permanent structures, such as footings, would be installed within the Yukon River and there would be no material impact to waterways not already identified in the Proposed Action. Essentially this option entails all of the impacts (both positive and negative) of the Proposed Action as described in Tables 6.1-1 through 6.1-6 and Figures 6.1-1 through 6.1-3. When compared to the other options for crossing the Yukon, this option uses more construction and support structures. Overall, more forested habitat would be impacted from this option than Option 2. Wetland habitat impacts would be 8.6 acres more in the construction ROW and 4 acres more in the permanent ROW for the Applicant's Preferred Option than for Option 2. The new suspension bridge adds a new structure in the visual landscape. Short term impacts associated with construction could have an impact on navigation of the Yukon River but this effect is expected to be temporary. Effects that would potentially be different under this option are associated with soils and geology, navigation resources, vegetation, wetlands, wildlife habitat, and visual resources and are listed in Table 6.1-9 in the same format as that used for the Proposed Action and are shown in a matrix in Figure 6.1-6. Because the river crossing is localized, impacts associated with construction of a new suspension bridge are also localized and will not change the overall rankings of effects when compared to the Proposed Action.

### **6.1.3.2 Option 2 – Cross the Yukon by Attaching the Pipeline to the Existing E.L. Patton Bridge**

If the pipeline were attached to the existing E.L. Patton Bridge (Option 2), no surface water disturbance would occur as the proposed pipeline would be installed on a hanger pipe assembly that would be placed underneath the existing bridge deck. Navigation of the waterway may be impeded temporarily by construction activities. Utilizing the existing bridge would not result in any new impacts. Essentially this option entails all of the impacts (both positive and negative) of the Proposed Action as described in Tables 6.1-1 through 6.1-6 and Figures 6.1-1 through 6.1-3. Table 6.1-10 lists the same impacts as associated with the Applicant's Preferred Option and notes that less land area is used for this option and impacts to visual resources associated with modification of an existing structure are impacted less than for the Applicant's Preferred Option. Overall rankings of the potential effects listed in Table 6.1-10 and plotted in a matrix in Figure 6.1-7. do not change when compared to the Proposed Action.

### **6.1.3.3 Option 3 – Utilize HDD to cross underneath the Yukon River at the Location of the Proposed New Suspension Bridge Identified in the Applicant's Preferred Option**

Although the feasibility of this option is not assured because of limited information on soils and bedrock in the area of the proposed crossing, the HDD crossing would require 1 acre of work area at each end of the crossing. Overall, more forested habitat would be impacted from this option than Option 2. Wetland habitat impacts would be 8.6 acres more in the construction ROW and 4 acres more in the permanent ROW for Option 3 than for Option 2. Local permafrost near the HDD crossing might be impacted by this option. Unlike the other options, surface water would be used for HDD construction. Table 6.1-11 lists the same impacts as associated with the Applicant's Preferred Option and notes that land area required is less than the Applicant's Preferred Option, but more than Option 2 and visual resources would not be materially impacted by an HDD river crossing. The potential effects associated with this option are plotted in in a matrix in Fig 6.1-8. When considered as part of the overall proposed Project, the rankings associated with each of these impacts do not materially change the rankings associated with the Proposed Action in Tables 6.1-1 through 6.1-6 and Figures 6.1-1 through 6.1-3.

As noted above, tables in this section describing potential effects associated with the No Action Alternative, the Denali Route Variation Alternative and the three Options identified within the Proposed Action show only the potential effects that would be different under the chosen alternative or option.

**TABLE 6.1-1 Criteria for Ranking Potential Effects on Physical Resources**

	<b>High</b>	<b>Moderate</b>	<b>Low</b>
<b>Intensity</b>	The effect would alter a physical resource in a way that would degrade its value to the point that it could not be used, or would endanger human health.	The effect would indisputably alter a physical resource, but will allow the resource to be used without endangering human health.	The effect would visibly or measurably alter a physical resource without removing its value and without endangering human health.
<b>Geographic Scope</b>	The effect would occur on a statewide or national basis, or throughout the study area.	The effect would occur at a borough or community level, or on a limited portion of the study area.	The effect would be site specific or occur within a few isolated locations.
<b>Frequency and Duration</b>	The effect would occur for a duration of greater than 3 years or through operations of the project.	The effect would occur intermittently for a duration of 1 to 3 years.	The effect would occur intermittently for a duration of less than 1 year.
<b>Magnitude</b>	Evaluated based on the average of intensity, geographic scope, and frequency/duration as determined above.		
<b>Probability</b>	Probability greater than 0.6.	Probability in the 0.3 to 0.6 range.	Probability of less than 0.3.

**TABLE 6.1-2 Physical Resources Effects Summary (Proposed Action)**

<b>Potential Effect</b>	<b>Proposed Action</b>	<b>Magnitude Factors</b>			<b>Ranking</b>	
		<b>Int.</b>	<b>Geo.</b>	<b>Freq. /Dur.</b>	<b>Mag.</b>	<b>Prob.</b>
<b>Soils and Geology</b>						
Phy1: Impacts to paleontological resources	Ground disturbance during construction could create a potential for impacts to paleontological resources (any physical evidence of past life, including fossilized remains, impressions, and traces of plants and animals).	M	M	M	<b>M</b>	<b>H</b>
Phy2: Alterations to drainage patterns causing changes to local soils and geology	Short term localized drainage pattern alterations (e.g., diversions) could occur during construction to accommodate pipeline installation and equipment staging.	L	M	M	<b>M</b>	<b>H</b>
Phy3: Impacts to soils or bedrock from excavation and blasting	Excavation (stripping, ditching, or trenching of rock or borrows) for pipeline and bridge construction would alter local topography, temporarily increase erosion, and result a loss of surface vegetation. Blasting could be required to fracture high-density frozen soils or bedrock during trench excavation.	L	H	M	<b>M</b>	<b>H</b>
Phy4: Impacts to soils containing permafrost from thaw settlement	Limited impacts to soils containing permafrost would occur from thaw settlement from use of temporary ice/gravel roads, and ice/gravel pads to stage and transport materials and equipment.	L	L	L	<b>L</b>	<b>M</b>
Phy5: Impacts to soils and geology from use of material sites during construction	Impacts to soils and geology could occur from use of material sites during construction causing modifications of local topography, loss of surface vegetation, creation of landscape scars, ponding, and a temporary increase of soil erosion and siltation near the operation material sites.	M	H	M	<b>M</b>	<b>H</b>
Phy6: Development of frost heaves and thaw bulbs from operations of the buried pipeline	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 surface expression such as local subsidence or heave, or thaw bulbs.	M	M	H	<b>M</b>	<b>M</b>

**TABLE 6.1-2 Physical Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Magnitude Factors			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
<b>Water Resources</b>						
Phy7: Altered water quality from water withdrawals to support construction activities	Water would be withdrawn from permitted lakes and reservoirs to support construction activities (ice roads, ice pads, hydrostatic testing, and earthwork). Impacts from water withdrawals would include altered water quality including decreased oxygen concentrations, increased organic matter, turbidity and changes to pH.	L	M	M	M	H
Phy8: Increased sedimentation, reduced water quality, and changes to stream profile and structure from excavation activities and disturbance of ground cover	Excavation activities and disturbance of ground cover would impact surface water quality downstream due to erosion. Sedimentation would increase resulting in increased turbidity reducing water quality. Permanent impacts could include changes to the stream profile and structure (bed and hyporheic zone) at crossing locations.	M	H	M	M	H
Phy9: Increased sedimentation and contamination of ground or surface water from spills of drilling mud	HDD and horizontal bore locations could impact water resources from a spill of drilling mud or may result in increased sediment in surface waterways, or contamination of ground or surface water with toxic drilling additives (if present).	M	L	L	L	L
Phy10: Contamination of ground or surface water from heavy equipment use	Contamination may occur in the surface water or groundwater due to heavy construction equipment leaks or fueling activities.	M	L	M	M	L
Phy11: Altered thermal regime of streams creating ice dams and reducing stream flow/water quality from operation of chilled pipeline	The thermal regime of streams may become altered due to the chilled pipeline resulting in ice dams and auffs where the ground (stream bottom) over the buried pipe is cooler than the surrounding stream flow. The ice bridges and damming could reduce stream flow downstream altering water quality.	M	L	H	M	L
Phy12: Altered groundwater and surface water flow characteristics from warming of the ground temperature	A warmer pipe temperature compared to the surrounding ambient ground temperature (permafrost) and placement of aboveground facilities on permafrost could result in melting of the permafrost. Warming of the ground may alter groundwater and surface water flow characteristics.	M	L	H	M	L
Phy13: Reduction of flood storage capacity from placement of pipeline or aboveground facility in floodplain	Pipeline located in aboveground berms within a floodplain or aboveground facilities located within a floodplain may result in a reduction in flood storage capacity or restrict flow causing backwater effects upstream.	M	L	H	M	L
Phy14: Spills and leaks contaminating the surrounding surface or groundwater	Spills and leaks (including lubricants, cleaners, and fuels) could occur on the roads and aboveground facility pads, which runoff into the surface or groundwater. Regular vehicle use on roads and pads could also potentially leak lubricants and toxic substances over the long term which could contaminate the surrounding surface waters.	M	L	H	M	L
Phy15: Increased sediment loading and reduced flood storage capacity from excavation of borrow material pits	Excavation of borrow material may result in increased sediment loading of surface water due to erosion during runoff events if the borrow pit was near the water body. Storage of sand and gravel materials may result in a reduction in flood storage capacity, if located within a floodplain.	M	L	M	M	H
<b>Air Quality</b>						
Phy16: Temporary air quality effects associated with construction	Temporary air quality effects associated with construction would include emissions from fossil-fuel fired construction equipment, fugitive dust, and open burning.	M	M	M	M	H

**TABLE 6.1-2 Physical Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Magnitude Factors			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
Phy17: Long-term or permanent impacts to air quality from operation and maintenance of aboveground facilities	Operation and maintenance of aboveground facilities would result in long-term or permanent impacts to air quality at levels that would not cause or contribute to a violation of any federal, state, or local air quality standards.	L	M	H	M	H
Phy18: Impacts to the FNSB nonattainment zone from construction and operations of the Fairbanks Lateral	The Fairbanks Lateral would cross into the FNSB nonattainment boundary for PM-2.5. Emissions would occur from the construction and operation as well as use of four material sites and one construction camp and pipeline yard. Written approval of conformance with the SIP would be necessary.	M	L	H	M	H
<b>Noise</b>						
Phy19: Temporary noise effects associated with construction	Localized, intermittent, and short term noise effects associated with construction activities would occur. Depending on the distance to the receptor, noise levels could be perceived as moderately loud.	M	M	M	M	H
Phy20: Long-term or permanent noise effects from operation and maintenance of pipeline and aboveground facilities	Operation and maintenance of the pipeline and aboveground facilities would result in long-term or permanent noise effects. However, the distance between the facilities and receptors are large enough that noise impacts would be expected to be low.	L	M	H	M	H
Phy21: Noise impacts from pressure relief valves and pipeline blowdowns	Noise impacts would result from pressure relief valves and pipeline blowdowns. Depending on the distance to the receptor, noise levels could be perceived as moderately loud. However, these events are emergency scenarios only.	H	L	L	M	L
<b>Navigation Resources</b>						
Phy22: Increased navigation would increase pollution in Alaska waters from wastewater discharge	Potential impacts from increased navigation resource use for supply shipments could increase pollution in Alaskan waters from wastewater discharge.	M	L	M	M	H
Phy23: Introduction of non-native species to aquatic ecosystem from ballast water	Ballast water may introduce non-native species into aquatic ecosystems where they would not otherwise be present. Impacts could include a reduction in biodiversity of species inhabiting coastal waters from non-native species out-competing native species for food and space.	M	L	M	M	L
Phy24: Impeding navigability while conducting open-cut stream crossing method during construction	Navigability along waterways using open-cut methods would be temporarily impeded by construction materials and equipment during the pipeline construction process.	H	M	L	M	H
Phy25: Unintended release of drilling fluids while conducting HDD stream crossing method during construction	Unintended release of drilling fluids may occur while conducting the HDD stream crossing method during construction.	M	L	L	L	L
Phy26: Impeding navigability during construction of Yukon River crossing.	For the Yukon River Crossing, if the preferred suspension bridge option is selected, large vessels would likely be required in the Yukon River during the construction season until the new pipeline suspension bridge is fully built. These vessels would likely impede other local vessel traffic during the construction phase of the proposed Project. Construction on the existing bridge may also impact vessel movements. An HDD crossing would likely have no effect on navigation.	H	L	L	M	H

**TABLE 6.1-2 Physical Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Magnitude Factors			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
<b>Reliability and Safety</b>						
Phy27: Increased risk to nearby public from operation of the pipeline	The operation of the proposed Project would increase risk to the nearby public based on available data of significant incidents (corrosion, excavation, pipeline material/weld/equipment failure, natural force damage, outside force, incorrect operation, or other causes).	H	L	L	M	L
Phy28: Terrorism and security risk with operation of the pipeline	Operation of the pipeline may cause concern for terrorism and security risks.	H	L	L	M	L
Phy29: Pipeline movement from hazards	Washouts, floods, unstable soil, landslides, frost heaves, or other hazards may cause the pipeline to move or to sustain abnormal loads.	M	L	L	L	L
Phy30: Pipeline rupture causing spill of NGLs	Pipeline may rupture causing an accidental spill of NGLs. Fire and/or explosion of NGL vapors may subsequently occur.	H	L	L	M	L

**FIGURE 6.1-1 Ranking Matrix of Potential Effects on Physical Resources (Proposed Action)**

		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	No effects listed
	Moderate	Phy10: Contamination of ground or surface water from heavy equipment use Phy11: Altered thermal regime of streams creating ice dams and reducing stream flow/water quality from operation of chilled pipeline Phy12: Altered groundwater and surface water flow characteristics from warming of the ground temperature Phy13: Reduction of flood storage capacity from placement of pipeline or aboveground facility in floodplain Phy14: Spills and leaks contaminating the surrounding surface or groundwater Phy21: Noise impacts from pressure relief valves and pipeline blowdowns Phy23: Introduction of non-native species to aquatic ecosystem from ballast water Phy27: Increased risk to nearby public from operation of the pipeline Phy28: Terrorism and security risk with operation of the pipeline Phy30: Pipeline rupture causing spill of NGLs	Phy6: Impacts to soils and geology from frost heaves and thaw bulbs from operations of the buried pipeline	Phy1: Impacts to paleontological resources Phy2: Alterations to drainage patterns causing changes to local soils and geology Phy3: Impacts to soils or bedrock from excavation and blasting Phy5: Impacts to soils and geology from use of material sites during construction Phy7: Altered water quality from water withdrawals to support construction activities Phy8: Increased sedimentation, reduced water quality, and changes to stream profile and structure from excavation activities and disturbance of ground cover Phy15: Increased sediment loading and reduced flood storage capacity from excavation of borrow material pits Phy16: Temporary air quality effects associated with construction Phy17: Long-term or permanent impacts to air quality from operation and maintenance of aboveground facilities Phy18: Impacts to the FNSB nonattainment zone from construction and operations of the Fairbanks Lateral Phy19: Temporary noise effects associated with construction Phy20: Long-term or permanent noise effects from operation and maintenance of pipeline and aboveground facilities Phy22: Increased navigation would increase pollution in Alaska waters from wastewater discharge Phy24: Impeding navigability while conducting open-cut stream crossing method during construction Phy26: Impeding navigability during construction of Yukon River crossing.
	Low	Phy9: Increased sedimentation and contamination of ground or surface water from spills of drilling mud Phy25: Unintended release of drilling fluids while conducting HDD stream crossing method during construction Phy29: Pipeline movement from hazards	Phy4: Impacts to soils containing permafrost from thaw settlement	No effects listed

**TABLE 6.1-3 Criteria for Ranking Potential Effects on Biological Resources**

	<b>High</b>	<b>Moderate</b>	<b>Low</b>
<b>Intensity</b>	The effect would substantially change the population size or range of the species, including the distribution of plant communities.	The effect would have a measurable change in the range or size of a population.	The effect would impact a few individuals in a population and would not affect the range or population size of a species or plant community.
<b>Geographic Scope</b>	The effect would occur on a statewide or national basis, or throughout the study area.	The effect would occur at a borough or community level, or on a limited portion of the study area.	The effect would be site specific or occur within a few isolated locations.
<b>Frequency and Duration</b>	The effect would occur for a duration of greater than 3 years or through operations of the proposed Project.	The effect would occur intermittently for a duration of 1 to 3 years.	The effect would occur intermittently for a duration of less than 1 year.
<b>Magnitude</b>	Evaluated based on the average of intensity, geographic scope, and frequency/duration as determined above.		
<b>Probability</b>	Probability greater than 0.6.	Probability in the 0.3 to 0.6 range.	Probability of less than 0.3.

**TABLE 6.1-4 Biological Resources Effects Summary (Proposed Action)**

<b>Potential Effect</b>	<b>Proposed Action</b>	<b>Criteria considered to develop magnitude ranking</b>			<b>Ranking</b>	
		<b>Int.</b>	<b>Geo.</b>	<b>Freq. /Dur.</b>	<b>Mag.</b>	<b>Prob.</b>
<b>Vegetation</b>						
Bio1: Impacts from clearing, grubbing, grading in the ROW	Temporary erosion and sedimentation impacts and destruction of plant root stock delaying vegetation recovery.	L	M	L	L	H
Bio2: Impacts from equipment use in ROW during construction	Propagation of invasive and non-native plants would outcompete and displace native plants reducing biological diversity and community composition.	L	M	L	L	M
Bio3: Impacts from trenching in the ROW	Rehabilitative success of the vegetation would be low if the topsoil and subsoil strata were not preserved.	L	M	L	L	H
Bio4: Impacts from blasting in the ROW	Additional disturbance to vegetation.	L	L	L	L	M
Bio5: Fragmentation of vegetation along the ROW	Long recovery time for vegetation outside of the permanent ROW.	L	L	M	L	H
Bio6: Impacts from backfilling in the ROW	Seed germination and root establishment may be inhibited, and reduced water infiltration if natural soil strata are not maintained for vegetation reestablishment.	L	M	M	M	M
Bio7: Impacts from dust deposition from road use for construction	Particulate matter from road dust landing on surrounding plants which would interfere with plant photosynthesis and respiration. When compared to Bio19 under Wetlands, this effect includes all vegetation so the magnitude is ranked as Moderate.	M	M	L	M	H
Bio8: Impact of TEWS upon vegetation	Additional disturbance to vegetation from temporary extra work space.	L	L	L	L	H
Bio9: Impacts from mowing during operations	Mowing forested vegetation regularly in the permanent ROW.	L	M	H	M	H
Bio10: Impacts from aboveground facilities development	Permanent loss of vegetation for facility development.	M	M	H	M	H
Bio11: Impacts from access road development	Vegetation loss, dust deposition, non-native invasive plant dispersal, fragmentation.	M	M	H	M	H

**TABLE 6.1-4 Biological Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
<b>Wetlands</b>						
Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils	Disturbance to subsoil, topsoil and surface hydrology.	L	M	L	L	H
Bio13: Fragmentation impacts from grading and trenching over the centerline primarily in frozen soils	Fragmentation has to potential to divide wetland systems, disrupting or altering vegetation, subsoil and hydrology.	L	L	L	L	M
Bio14: Disturbance from equipment use in ROW during construction on ice pads and ice roads	Temporary disturbance to subsurface soil, topsoil vegetation, and surface hydrology from heavy equipment use and excavation.	L	M	L	L	H
Bio15: Invasive species from equipment used during construction	Propagation of invasive and non-native plants would outcompete and displace native plants reducing biological diversity and community composition.	L	M	L	L	M
Bio16: Soil change associated with equipment use in ROW during construction on ice pads and ice roads	Construction activities result in temporary erosion and soil compaction.	L	M	L	L	L
Bio17: Impacts from backfilling	Seed germination and root establishment may be inhibited, and reduced water infiltration if natural soil strata are not maintained for vegetation reestablishment.	L	M	L	L	L
Bio18: Impacts from rehabilitation of vegetation	Propagation of invasive and non-native plants would outcompete and displace native plants reducing biological diversity and community composition.	L	M	L	L	M
Bio19: Impact of dust deposition from road use for construction	Particulate matter from road dust landing on surrounding plants which would interfere with plant photosynthesis and respiration. When compared to Bio7 under Vegetation, there are fewer roads planned in and around wetlands so the magnitude is ranked as Low.	L	M	L	L	M
Bio20: Impacts from mowing during operations	Only non-forested wetland classes would exist in the permanent ROW.	L	M	H	M	H
Bio21: Impacts from aboveground facilities development	Permanent loss of wetlands for facility development.	L	L	H	M	H
Bio22: Loss of wetlands from access road development	Permanent loss of wetlands from road development.	L	L	H	M	H
Bio23: Dust deposition impacts from access road development	Dust deposition into surrounding wetlands altering water and soil chemistry, and hydrologic disturbance.	L	L	H	M	H
Bio24: Impacts on plants from access road development	Non-native and invasive plant dispersal.	L	L	H	M	M
Bio25: Wetland fragmentation from access road development	Fragmentation of wetland areas.	L	L	H	M	H
Bio26: Thermokarst from access road development	Potential for thermokarst development.	L	L	H	M	M

**TABLE 6.1-4 Biological Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
<b>Wildlife</b>						
Bio27: Impacts from disturbance associated with noise from construction activities	Construction machinery noise disturbs animal activities.	L	L	M	L	M
Bio28: Impacts from construction activities on wildlife habitat	Construction activities will create a temporary disturbance to wildlife habitat.	L	L	M	L	M
Bio29: Impacts from construction activities on wildlife mortality	Increased wildlife mortality due to an increase in vehicle and train traffic during proposed Project construction.	L	L	M	L	M
Bio30: Impacts from maintenance of the permanent ROW (mowing forested vegetation)	Permanent disturbance to wildlife habitat - leaving the habitat unsuitable for some wildlife species.	L	M	H	M	H
Bio31: Impacts related to ease of access from access road development	Access roads facilitate hunter access to remote areas increasing wildlife harvests.	L	L	H	M	M
Bio32: Impact upon habitat fragmentation from access road development	Access roads will increase fragmentation of habitat.	L	L	H	M	H
Bio33: Impacts from access road use during operations phase	Increased wildlife mortality due to vehicle and train traffic during the operations phase.	L	L	H	M	M
Bio34: Impacts from aerial and ground based inspections of the pipeline	ROW surveillance activities will temporarily disturb wildlife.	L	L	H	M	M
Bio35: Impacts from maintenance of permanent access roads	Maintenance activities include spreading salt on roads in winter and may increase wildlife mortality due to wildlife attraction to salt licking on road.	L	L	H	M	L
Bio36: Delayed wildlife movement from development of aboveground facilities	Development of aboveground facilities will delay movement of wildlife during construction.	L	L	M	L	M
Bio37: Displacement of wildlife from development of aboveground facilities	Development of aboveground facilities will displace wildlife due to noise and human activity during construction.	L	L	M	L	M
Bio38: Impact on predator/prey relationship from operations of aboveground facilities	Increase subsidized predator populations and may affect prey abundance, distribution, and demography.	L	L	H	M	L
Bio39: Dust deposition impact from road use during operations	Fugitive dust landing along roadsides in the winter exposing vegetation faster than non-dusted areas.	L	L	H	M	H
Bio40: Loss of habitat associated with operations of aboveground facilities	Operations of aboveground facilities will result in loss of nesting habitat, breeding territories and cover.	L	L	H	M	M
<b>Fisheries</b>						
Bio41: Impact on fish habitat from water withdrawal for proposed Project use	Water withdrawal from lakes for road and pad construction and work camp use Lowers dissolved oxygen concentration which may stress or kill fish.	L	L	L	L	L
Bio42: Impact on fish behavior from water withdrawal for proposed Project use	Water withdrawal from lakes for road and pad construction and work camp use causes water level fluctuation which may cause a change in fish behavior, distribution and growth.	L	L	L	L	L

**TABLE 6.1-4 Biological Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
Bio43: Impact on fish mortality from water withdrawal for proposed Project use	Water withdrawal from lakes for road and pad construction and work camp use may kill or injure fish or invertebrates from mechanical stress, entrainment in withdrawn waters, and impingement on intake structures.	L	L	L	L	L
Bio44: Impact on invertebrate population from water withdrawal for proposed Project use	Water withdrawal from lakes for road and pad construction and work camp use can reduce the invertebrate population due to fluctuating water levels that reduce macrovegetation availability as food, shelter and for egg deposition.	M	L	L	L	L
Bio45: Impacts from of delayed melting from ice road development across drainages	Ice bridging across streams could alter fish movement, behavior, and productivity due to delayed melting of the bridged ice.	L	L	L	L	M
Bio46: Impacts of flooding from ice road development across drainages	Grounding of ice results in flooding which could alter riparian habitat, stream flow and in stream habitat temporarily which could affect survival, behavior and productivity of fish.	L	L	L	L	M
Bio47: Impacts from all identified stream crossing methods	Temporary in stream habitat alteration and channel profile causing gill irritation from increased sedimentation.	L	L	L	L	M
Bio48: Impact from open cut crossing method	Temporary increase in sedimentation and erosion along the stream bank, loss of riparian vegetation, altered channel morphology.	L	L	L	L	M
Bio49: Impact from open cut isolation crossing method	Injury may occur to certain fish species and life stages which may be more susceptible when diverting water around the construction area.	L	L	L	L	M
Bio50: Impact of blasting on fish habitat	Blasting causes increased sedimentation, noise, vibration and altered channel morphology adversely impacting fish behavior and health.	L	L	L	L	M
Bio51: Impacts of blasting on fish mortality	Blasting may injure or kill fish from rupture of the swim bladder.	L	L	L	L	L
Bio52: Impact of blasting and stunning fish	Blasting may temporarily stun fish and increase susceptibility to predation.	L	L	L	L	M
Bio53: Impacts from HDD	HDD drilling fluids unintentionally released into surface waters inhibit fish and invertebrate respiration due to fouled gills resulting in a lack of oxygen.	L	L	L	L	L
Bio54: Impacts from mowing the ROW including riparian areas	Instability of stream banks, reduced water quality, and reduced cover.	L	M	H	M	M
Bio55: Impacts from aboveground facilities	Contaminants run off into drainages altering water quality fouling gills reducing oxygen absorption.	L	L	H	M	M
Bio56: Impacts from access road development	Contaminants run off into drainages altering water quality fouling gills reducing oxygen absorption for fish.	L	L	H	M	M
Bio57: Impacts from culvert installation during access road development	Temporary in stream habitat loss to fish from water diversion.	L	L	H	M	H
Bio58: Impacts from culvert installation	Loss of rearing, foraging and spawning habitat in reach of stream where culvert is placed.	L	L	H	M	H
Bio59: Impacts from bridge placement	Loss of riparian habitat at bridge location reducing habitat for fish.	L	L	H	M	H
Bio60: Impacts from road use associated with bridge placement	Increased sedimentation in stream from road use (dust and grading) affecting health of fish.	L	L	H	M	H

**TABLE 6.1-4 Biological Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
<b>Marine Mammals</b>						
Bio61: Impacts from vessel use related to noise	Vessel noise from engine causes temporary avoidance behavior of marine mammals.	L	M	M	M	M
Bio62: Impacts from vessel use related to masking natural sounds	Vessel noise causes temporary inability for marine mammals to hear natural sounds (masking) for communication, locating predators and prey, and navigation.	L	M	M	M	L
Bio63: Impacts from vessel movement	Vessel movement offers the potential for collision with a marine mammal.	L	M	M	M	L
Bio64: Impacts from vessel use related to invasive species	Vessel use increases risk of unintentional transport of invasive species reducing habitat quality for marine mammals.	L	L	M	L	L
Bio65: Impacts of vessel use related to hazardous material spills	Vessel use leads to small leaks of fuel and lubricants and subsequent exposure for marine mammals.	L	L	M	L	M
<b>Threatened and Endangered (T&amp;E) Species</b>						
Bio66: Impact to T&E marine mammals from vessel use regarding avoidance behavior	Temporary avoidance behavior of T&E marine mammals from vessel noise created from their engines.	L	M	M	M	M
Bio67: Impacts upon T&E marine mammals from vessel use with regard to masking natural sounds	Temporary inability for T&E marine mammals to hear natural sounds (masking) for communication, locating predators and prey, and navigation.	L	M	M	M	L
Bio68: Impacts from vessel movement on T&E marine mammals	A potential collision with a vessel and a T&E marine mammal.	L	M	M	M	L
Bio69: Impacts from vessel use related to invasive species on T&E marine mammals	Unintentional transport of invasive species reducing habitat quality for T&E marine mammals.	L	L	M	L	L
Bio70: Impacts from construction activity of the GCF and pipeline on the North Slope	Collision between migrating T&E birds and vessel traffic or GCF development on the North Slope.	L	L	L	L	L
Bio71: Impacts from vessel use related to hazardous material spills and T&E species	Vessel use leads to small leaks of fuel and lubricants and subsequent exposure.	L	L	M	L	M
Bio72: Impacts from construction activity of the GCF and pipeline on the North Slope on polar bears	Construction disturbs a few polar bears and temporarily alters bear behavior and that of their prey.	L	L	L	L	L
Bio73: Impacts from construction activity of the GCF and pipeline on the North Slope on T&E birds	Construction creates a disturbance to bird breeding/nesting habitat.	L	M	L	L	L
Bio74: Impacts from road and facility development on T&E species	Development results in an increase in predator populations.	L	M	H	M	M

**FIGURE 6.1-2 Ranking Matrix of Potential Effects on Biological Resources (Proposed Action)**

		PROBABILITY		
		Low	Moderate	High
<b>MAGNITUDE</b>	<b>High</b>	No effects listed	No effects listed	No effects listed
	<b>Moderate</b>	<p>Bio35: Impacts from maintenance of permanent access roads</p> <p>Bio38: Impact on predator/prey relationship from operations of aboveground facilities</p> <p>Bio62: Impacts from vessel use related to masking natural sounds</p> <p>Bio63: Impacts from vessel movement</p> <p>Bio67: Impacts upon T&amp;E marine mammals from vessel use with regard to masking natural sounds</p> <p>Bio68: Impacts from vessel movement on T&amp;E marine mammals</p>	<p>Bio6: Impacts from backfilling in the ROW</p> <p>Bio24: Impacts on plants from access road development</p> <p>Bio26: Thermokarst from access road development</p> <p>Bio31: Impacts related to ease of access from access road development</p> <p>Bio33: Impacts from access road use during operations phase</p> <p>Bio34: Impacts from aerial and ground based inspections of the pipeline</p> <p>Bio40: Loss of habitat associated with operations of aboveground facilities</p> <p>Bio54: Impacts from mowing the ROW including riparian areas</p> <p>Bio55: Impacts from aboveground facilities</p> <p>Bio56: Impacts from access road development</p> <p>Bio61: Impacts from vessel use related to noise</p> <p>Bio66: Impact to T&amp;E marine mammals from vessel use regarding avoidance behavior</p> <p>Bio74: Impacts from road and facility development on T&amp;E species</p>	<p>Bio7: Impacts from dust deposition from road use for construction</p> <p>Bio9: Impacts from mowing during operations</p> <p>Bio10: Impacts from aboveground facilities development</p> <p>Bio11: Impacts from access road development</p> <p>Bio20: Impacts from mowing during operations</p> <p>Bio21: Impacts from aboveground facilities development</p> <p>Bio22: Loss of wetlands from access road development</p> <p>Bio23: Dust deposition impacts from access road development</p> <p>Bio25: Wetland fragmentation from access road development</p> <p>Bio30: Impacts from maintenance of the permanent ROW (mowing forested vegetation)</p> <p>Bio32: Impact upon habitat fragmentation from access road development</p> <p>Bio39: Dust deposition impact from road use during operations</p> <p>Bio57: Impacts from culvert installation during access road development</p> <p>Bio58: impacts from culvert installation</p> <p>Bio59: Impacts from bridge placement</p> <p>Bio60: Impacts from road use associated with bridge placement</p>
	<b>Low</b>	<p>Bio16: Soil change associated with equipment use in ROW during construction on ice pads and ice roads</p> <p>Bio17: Impacts from backfilling</p> <p>Bio41: Impact on fish habitat from water withdrawal for proposed Project use</p> <p>Bio42: Impact on fish behavior from water withdrawal for proposed Project use</p> <p>Bio43: Impact on fish mortality from water withdrawal for proposed Project use</p> <p>Bio44: Impact on invertebrate population from water withdrawal for proposed Project use</p> <p>Bio51: Impacts of blasting on fish mortality</p> <p>Bio53: Impacts from HDD</p> <p>Bio64: Impact of vessel use related to invasive species</p> <p>Bio69: Impacts from vessel use related to invasive species on T&amp;E marine mammals</p> <p>Bio70: Impacts from construction activity of the GCF and pipeline on the North Slope</p> <p>Bio72: Impacts from construction activity of the GCF and pipeline on the North Slope on polar bears</p> <p>Bio73: Impacts from construction activity of the GCF and pipeline on the North Slope on T&amp;E birds</p>	<p>Bio2: Impacts from equipment use in ROW during construction</p> <p>Bio4: Impacts from blasting in the ROW</p> <p>Bio13: Fragmentation impacts from grading and trenching over the centerline primarily in frozen soils</p> <p>Bio15: Invasive species from equipment used during construction</p> <p>Bio18: Impacts from rehabilitation of vegetation</p> <p>Bio19: Impacts of dust deposition from road use for construction</p> <p>Bio27: Impacts from disturbance associated with noise from construction activities</p> <p>Bio28: Impacts from construction activities on wildlife habitat</p> <p>Bio29: Impacts from construction activities on wildlife mortality</p> <p>Bio36: Delayed wildlife movement from development of aboveground facilities</p> <p>Bio37: Displacement of wildlife from development of aboveground facilities</p> <p>Bio45: Impacts from of delayed melting from ice road development across drainages</p> <p>Bio46: Impacts of flooding from ice road development across drainages</p> <p>Bio47: Impacts from all identified stream crossing methods</p> <p>Bio48: Impact from open cut crossing method</p> <p>Bio49: Impact from open cut isolation crossing method</p> <p>Bio50: Impact of blasting on fish habitat</p> <p>Bio52: Impact of blasting and stunning fish</p> <p>Bio65: Impacts of vessel use related to hazardous material spills</p> <p>Bio71: Impacts from vessel use related to hazardous material spills and T&amp;E species</p>	<p>Bio1: Impacts from clearing, grubbing, grading in the ROW</p> <p>Bio3: Impacts from trenching in the ROW</p> <p>Bio5: Fragmentation of vegetation along the ROW</p> <p>Bio8: Impacts from TEWS upon vegetation</p> <p>Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils</p> <p>Bio14: Disturbance from equipment use in ROW during construction on ice pads and ice roads</p>

**TABLE 6.1-5 Criteria for Ranking Potential Effects on Socioeconomic Resources**

		<b>High</b>	<b>Moderate</b>	<b>Low</b>
<b>Intensity (by resource group)</b>	<b>Land Use</b>	Effects on land use are termed high if these entail an irretrievable (or at least long term) commitment of resources inconsistent with other possible uses, require legislative action to permit use, or would adversely impact special use lands.	Effects on land use are termed moderate if these entail an irretrievable (or at least long term) commitment of resources, but are not large in extent or not novel.	Effects on land use are termed low if they do not reach the threshold for moderate.
	<b>Recreation &amp; Visual Resources</b>	Recreation & Visual Resource effects are termed high if degraded to a point that resources could no longer be used for recreational purposes and/or the visible landscape(s) were altered for many years.	Recreation & Visual Resource effects are termed moderate if the affected areas could still be used for the intended purposes, albeit with some loss of value(s).	Recreation & Visual Resource effects are termed low if these do not attain the threshold for moderate.
	<b>Socioeconomics</b>	Effects on socioeconomics are termed high if these entail a long term change in socioeconomic conditions.	Effects on socioeconomics are termed moderate if these entail a long term change in socioeconomic conditions but are not large in extent or not novel.	Effects on socioeconomics are termed low if they do not reach the threshold for moderate.
	<b>Subsistence</b>	Cause acute or highly observable changes in user access or subsistence harvests of key resources with no viable alternative to engage in these activities or harvest these resources elsewhere.	Cause observable changes in user access or subsistence harvests of key resources with limited alternatives to engage in these activities or harvest these resources elsewhere.	Cause observable changes in user access or subsistence harvests of resources with multiple alternatives to engage in these activities or harvest these resources elsewhere.
<b>Geographic Scope</b>		The extent of the effect would occur at the national and/or state level.	The extent of the effect would occur primarily within one of the major study areas (Alaska North Slope, Central, or Anchorage-Cook Inlet area).	The extent would be site-specific at a few locations.
<b>Frequency and Duration</b>		The effect would occur for a duration of greater than 3 years or through operations of the project.	The effect would occur intermittently for a duration of less than 3 years.	The effect would occur intermittently for a duration of less than 1 year.
<b>Magnitude</b>		Evaluated based on the average of intensity, geographic scope, and frequency/duration as determined above.		
<b>Probability</b>		Probability greater than 0.6.	Probability in the 0.3 to 0.6 range.	Probability of less than 0.3.

**TABLE 6.1-6 Socioeconomic Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. / Dur.	Mag.	Prob.
<b>Land Use and Related</b>						
Soc1: Land used during construction	10,902 acres used during construction (Table 5.9-2).	M	H	M	<b>M</b>	<b>H</b>
Soc2: Impact of temporary access roads during construction	648 acres used during construction (Table 5.9-6(a)).	L	L	M	<b>L</b>	<b>H</b>
Soc3: Forest types cleared for construction activities	4,501 acres of various forest types cleared for construction (Table 5.9-8). Geographic scope is judged to be moderate because although the ROW spans the middle of the state, only some areas are forested and the overall footprint is small.	H	M	M	<b>M</b>	<b>H</b>
Soc4: Farmland of local importance affected by construction	845 acres affected during construction activities (Table 5.9-11).	L	L	M	<b>L</b>	<b>H</b>
Soc5: Denali National Park Route Variation construction impacts	185 acres affected during construction (Table 5.9-2), Federal legislation required.	H	L	M	<b>M</b>	<b>H</b>
Soc6: Impact of solid waste associated with construction camps	Waste disposed in ADEC-approved disposal sites, construction camps located on existing permitted construction sites (5.9-14).	L	L	M	<b>L</b>	<b>H</b>
Soc7: Impact of permanent access roads during operations phase	628 acres used during operations (Table 5.9-6a).	H	L	H	<b>M</b>	<b>H</b>
Soc8: Impact of permanent ROW throughout operations phase	3,439.6 acres included in permanent ROW (Table 5.9-5a).	M	M	H	<b>M</b>	<b>H</b>
Soc9: Forest affected by the permanent ROW during operations	1,339.5 acres of forest affected by permanent ROW (Table 5.9-5a).	L	M	H	<b>M</b>	<b>H</b>
Soc10: Farmland of local importance affected by operations	223.3 acres affected during construction activities (Table 5.9-11).	L	L	H	<b>M</b>	<b>H</b>
Soc11: Operational footprint of aboveground facilities	81.4 acres occupied by aboveground facilities (Table 5.9-5(b)). Aboveground facilities during the operations phase are widely dispersed across the state but the relatively small footprint of the separate facilities suggests a 'low' ranking for the magnitude of the geographic extent for these facilities.	L	L	H	<b>M</b>	<b>H</b>
Soc12: Impact associated with Denali National Park Route Variation during operations	60.6 acres affected by the permanent ROW (Table 5.9-5(a)).	L	L	H	<b>M</b>	<b>H</b>
Soc13: Solid waste generated during operations	Waste disposed in ADEC-approved disposal sites (5.9-14)	L	L	H	<b>M</b>	<b>H</b>
<b>Recreation</b>						
Soc14: Disruption of recreational activities and access along the pipeline route during construction	Possible impact on recreational experience of cruise ship passengers.	L	L	M	<b>L</b>	<b>L</b>

**TABLE 6.1-6 Socioeconomic Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. / Dur.	Mag.	Prob.
Soc15: Disruption of recreational activities and access along roads during construction	Use of public roads to transport pipe, heavy equipment, and personnel could result in potential impacts due to traffic congestion.	M	M	M	M	M
Soc16: Impacts of construction activity due to construction materials and noise generation	Particular concern with construction near isolated recreation areas, such as designated wilderness areas.	M	L	M	M	M
Soc 17: Impacts to water dependent recreation due to stream crossings	Proposed Project construction in and near water bodies could result in water quality impacts, generate noise and visual impacts, and restrict access to water bodies.	M	M	L	M	L
Soc18: Impact of influx of construction workers on recreation	Possible competition for recreational facilities (e.g., campgrounds, access to fishing or hunting areas).	M	L	M	M	M
Soc19: Impact of construction of above ground facilities on recreation	Temporary restrictions and delays accessing nearby recreation sites.	L	L	L	L	H
Soc20: Impact on recreation from construction camps, pipeline yards, and material sites	Could result in temporary restrictions and delays in accessing nearby recreation sites. There could also be some impact associated with construction noise.	L	L	L	L	L
Soc21: Recreation impacts of ROW during operations phase	Minor restrictions to access. Self-contained underground facility minimizes impacts.	L	L	H	M	L
Soc22: Recreation impact associated with Denali National Park Route Variation during operations	Minor restrictions to access in the Park. Self-contained underground facility minimizes impacts.	M	L	H	M	H
Soc23: Impact of operation of facilities associated with the pipeline and recreation.	Long-term operations and maintenance assimilated into industrial character of the region.	L	L	H	M	H
<b>Visual Resources</b>						
Soc24: Visual contrast <sup>6</sup> during mainline proposed Project construction	Effects limited in duration because localized construction activity is short.	L	L	L	L	L
Soc25: Visual contrast during construction of Fairbanks Lateral	Limited impacts.	L	L	L	L	L
Soc26: Visual impact of construction of aboveground facilities	Limited impacts.	L	L	L	L	L
Soc27: Impacts of construction on visual resources associated with the Denali National Park Route Variation	Denali NPP has high seasonal recreation and tourist use and such users have high sensitivity. During the visitor season, short-term moderate to high visual impacts are expected.	H	L	L	M	H
Soc28: Impact on visual resources during operations	Pipeline buried for most of its length. Right of way visible in several areas—visual contrast greatest in areas requiring hill cuts and new bridge crossings.	L	L	H	M	L

<sup>6</sup> The effect on visual resources associated with earthwork, exposure of bare soils, and presence of construction workers and equipment.

**TABLE 6.1-6 Socioeconomic Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. / Dur.	Mag.	Prob.
Soc29: Impacts of operating aboveground facilities on visual resources	Long-term operations and maintenance assimilated into industrial character of the region.	L	L	H	M	L
Soc30: Impacts of operations on visual resources associated with Denali National Park Route Variation	Long-term impacts limited and weak because most of pipeline is buried and ROW re-vegetated.	L	L	H	M	L
<b>Socioeconomics</b>						
Soc31: Employment during the construction phase	Increased employment for duration of construction period (Table 5.12-12).	M	M	M	M	H
Soc32: Population and housing during construction	Non-resident construction workers would temporarily increase population in study areas (See Table 5.12-13 for AGDC work camp housing estimates).	M	M	M	M	H
Soc33: Tax revenues during construction	Expected to increase local tax revenues in the Mat-Su, Denali, and FNS Boroughs.	L	M	M	M	H
Soc34: Impact on quality of life during construction	Impacted by changes in traffic density, changes in natural resources or environmental quality, access restrictions, alterations to visual resources, and increased hunter effort, costs, and risks.	L	M	M	M	L
Soc35: Environmental Justice during the construction phase	Analysis identifies both positive and negative impacts, but concludes net effects would be minor.	L	M	L	L	H
Soc36: Construction of Denali National Park Route Variation	Analysis concludes that impacts to socioeconomics would be negligible.	L	L	M	L	H
Soc37: Employment during operations phase	Some long-term jobs created.	L	L	H	M	H
Soc38: Housing during operations phase	Operations personnel would require housing.	L	L	H	M	H
Soc39: Tax revenues during operations phase	Estimated \$168 million local and state property tax revenues in year 1. (Table 5.12-19) Additionally it is estimated that a total of \$358.6 million annually revenues would accrue from royalties, production, and corporate taxes. (Table 5.12-16).	H	H	H	H	H
Soc40: Quality of life during operations phase	Overall impact expected to be negligible to minor.	L	L	H	M	H
Soc41: Environmental Justice during operations phase	Minor or no environmental impacts foreseen.	L	L	H	M	H
Soc42: Denali National Park Route Variation during operations phase	Analysis concludes that impacts to socioeconomics would be negligible. Some positive impacts arising from production taxes, royalties, and corporate taxes (total \$5.2 million annually).	L	L	H	M	H
<b>Subsistence</b>						
Soc43: Impacts to subsistence resource availability from construction	Construction of the ROW and temporary and permanent access roads impacts local subsistence resources for users.	M	H	L	M	H
Soc44: Impacts to subsistence user access from construction	Construction of the ROW and temporary and permanent access roads changes access to subsistence resources for users.	M	H	L	M	M
Soc45: Impacts to subsistence loss of use area from construction	Construction of the ROW and temporary and permanent access roads removes lands available for subsistence use.	M	L	M	M	H

**TABLE 6.1-6 Socioeconomic Resources Effects Summary (Proposed Action)**

Potential Effect	Proposed Action	Criteria considered to develop magnitude ranking			Ranking	
		Int.	Geo.	Freq. / Dur.	Mag.	Prob.
Soc46: Impacts to subsistence associated with contamination concerns from construction	Construction impacts include concerns regarding resource contamination from dust and smoke, burning wastes, spills and fire.	L	H	M	M	L
Soc47: Hunter avoidance of subsistence resources from influx of construction workers	Changes in resource location and availability cause subsistence users to access new areas (hunter avoidance).	M	L	M	M	M
Soc48: Increased competition for subsistence resources from influx of construction workers	Increased competition for local resource puts pressure on subsistence users to seek other resources.	M	H	M	M	M
Soc49: Noise impact on subsistence resource availability during construction	Construction noise can influence subsistence resource availability.	M	H	L	M	H
Soc50: Noise impact on subsistence resource avoidance behavior during construction	Construction noise can influence subsistence resource users' choice of hunting grounds (hunter avoidance).	M	M	L	M	M
Soc51: Impacts to subsistence resource availability from operations along ROW and roads	Activities associated with operating the pipeline can decrease subsistence resource availability.	L	H	H	M	M
Soc52: Impacts to subsistence resource access from operations along ROW and roads	Some areas may have increased access and alter access to subsistence users.	L	H	H	M	M
Soc53: Impacts to subsistence resource competition from operations along ROW and roads	New roads could increase competition for subsistence resources.	L	H	H	M	M
Soc54: Impacts to subsistence resource availability from maintenance and operations activities	Maintenance and operations along the ROW may impact subsistence resource availability.	L	L	H	M	H
Soc55: Impacts on subsistence user avoidance from maintenance and operations activities	Maintenance and operations activities can influence subsistence resource users' choice of hunting and harvesting grounds.	L	L	H	M	M
Soc56: Impacts on subsistence competition from local workforce population	Increase in local workforce can lead to increased competition for subsistence resources.	L	H	H	M	H
Soc57: Potential for contamination of subsistence resources for pipeline operations	Operations contribute to concerns regarding resource contamination from dust and smoke, burning wastes, spills and fire.	L	L	H	M	L
Soc58: Impact of aboveground facilities on subsistence user avoidance	Loss of lands for new facilities will influence subsistence users' choice of lands for hunting and harvesting. The proposed compressor station near Minto Flats Game Refuge could introduce additional noise, emissions, and activity and disrupt subsistence users and resources.	L	L	H	M	M
Soc59: Impact of aboveground facilities on subsistence user access	Permanent facilities and roads may restrict subsistence user access.	L	L	H	M	M

**FIGURE 6.1-3 Ranking Matrix of Potential Effects on Socioeconomic Resources (Proposed Action)**

		PROBABILITY		
		Low	Moderate	High
<b>MAGNITUDE</b>	<b>High</b>	No effects listed	No effects listed	Soc39: Tax revenues during operations phase
	<b>Moderate</b>	<p>Soc 17: Impacts to water dependent recreation due to stream crossings</p> <p>Soc21: Recreation impacts of ROW during operations phase</p> <p>Soc28: Impact on visual resources during operations</p> <p>Soc30: Impacts of operations on visual resources associated with Denali National Park Route Variation</p> <p>Soc34: Impact on quality of life during construction</p> <p>Soc46: Impacts to subsistence associated with contamination concerns from construction</p> <p>Soc57: Potential for contamination of subsistence resources for pipeline operations</p>	<p>Soc15: Disruption of recreational activities and access along roads during construction</p> <p>Soc16: Impacts of construction activity due to construction materials and noise generation</p> <p>Soc18: Impact of influx of construction workers on recreation</p> <p>Soc44: Impacts to subsistence user access from construction</p> <p>Soc47: Hunter avoidance of subsistence resources from influx of construction workers</p> <p>Soc48: Increased competition for subsistence resources from influx of construction workers</p> <p>Soc50: Noise impact on subsistence resource avoidance behavior during construction</p> <p>Soc51: Impacts to subsistence resource availability from operations along ROW and roads</p> <p>Soc52: Impacts to subsistence resource access from operations along ROW and roads</p> <p>Soc53: Impacts to subsistence resource competition from operations along ROW and roads</p> <p>Soc55: Impacts on subsistence user avoidance from maintenance and operations activities</p> <p>Soc58: Impact of aboveground facilities on subsistence user avoidance</p> <p>Soc59: Impact of aboveground facilities on subsistence user access</p>	<p>Soc1: Land used during construction</p> <p>Soc3: Forest types cleared for construction activities</p> <p>Soc5: Denali National Park Route Variation construction impacts</p> <p>Soc7: Impact of permanent access roads during operations phase</p> <p>Soc8: impact of permanent ROW throughout operations phase</p> <p>Soc9: Forest affected by the permanent ROW during operations</p> <p>Soc10: Farmland of local importance affected by operations</p> <p>Soc11: Operational footprint of aboveground facilities</p> <p>Soc12: Impact associated with Denali National Park Route Variation during operations</p> <p>Soc13: Solid waste generated during operations</p> <p>Soc22: Recreation impact associated with Denali National Park Route Variation during operations</p> <p>Soc23: Impact of operation of facilities associated with the pipeline and recreation</p> <p>Soc27: Impacts of construction on visual resources associated with the Denali National Park Route Variation</p> <p>Soc31: Employment during the construction phase</p> <p>Soc32: Population and housing during construction</p> <p>Soc33: Tax revenues during construction</p> <p>Soc37: Employment during operations phase</p> <p>Soc38: Housing during operations phase</p> <p>Soc40: Quality of life during operations phase</p> <p>Soc41: Environmental Justice during operations phase</p> <p>Soc42: Denali National Park Route Variation during operations phase</p> <p>Soc43: Impacts to subsistence resource availability from construction</p> <p>Soc45: Impacts to subsistence loss of use area from construction</p> <p>Soc49: Noise impact on subsistence resource availability during construction</p> <p>Soc54: Impacts to subsistence resource availability from maintenance and operations activities</p> <p>Soc56: Impacts on subsistence competition from local workforce population</p>
	<b>Low</b>	<p>Soc14: Disruption of recreational activities and access along the pipeline route during construction</p> <p>Soc20: Impact on recreation from construction camps, pipeline yards, and material sites</p> <p>Soc24: Visual contrast during mainline proposed Project construction</p> <p>Soc25: Visual contrast during construction of Fairbanks Lateral</p> <p>Soc26: Visual impact of construction of aboveground facilities</p> <p>Soc29: Impacts of operating aboveground facilities on visual resources</p>	No effects listed	<p>Soc2: Impact of temporary access roads during construction</p> <p>Soc4: Farmland of local importance affected by construction</p> <p>Soc6: Impact of solid waste associated with construction camps</p> <p>Soc19: Impact of construction of above ground facilities on recreation</p> <p>Soc35: Environmental Justice during the construction phase</p> <p>Soc36: Construction of Denali National Park Route Variation</p> <p>Soc37: Employment during operations phase</p> <p>Soc38: Housing during operations phase</p>

**TABLE 6.1-7 Impacts of the No Action Alternative.**

Potential Effect	No Action Alternative	Magnitude Factors			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
<b>Physical Resources</b>						
Phy1 – 30 (except Phy18 noted below)	These impacts would not occur therefore they cannot be ranked.	-	-	-	-	-
Phy18: Impacts to the FNSB nonattainment zone from construction and operations of the Fairbanks Lateral	The No Action Alternative foregoes the expected improvement to air quality in the Fairbanks North Star Borough region. This option also foregoes the effects positive cumulative effects on public associated with improved air quality from the use of cleaner fuels in the Fairbanks North Star Borough region.	M	L	H	M	H
<b>Biological Resources</b>						
Bio1 - 74	These impacts would not occur therefore they cannot be ranked.	-	-	-	-	-
<b>Socioeconomic Resources</b>						
Soc 1 – 59 (except Soc31, 33, 37 & 39 noted below)	These impacts would not occur therefore they cannot be ranked.	-	-	-	-	-
Soc31: Employment during the construction phase	The No Action Alternative foregoes increased employment for duration of construction period (Table 5.12-12).	M	M	M	M	H
Soc33: Tax revenues during construction	Under the No Action Alternative, expected increase in local tax revenues in the Mat-Su, Denali, and FNS Boroughs does not occur.	L	M	M	M	H
Soc37: Employment during operations phase	The No Action Alternative foregoes the creation of long-term jobs during the operations and maintenance phase.	L	L	H	M	H
Soc39: Tax revenues during operations phase	Under the No Action Alternative, an estimated \$168 million local and state property tax revenues in year 1 are not realized (Table 5.12-19). The state would not receive an additional estimated total of \$358.6 million annually in revenues from royalties, production, and corporate taxes (Table 5.12-16).	H	H	H	H	H

**FIGURE 6.1-4 Ranking Matrix of Potential Effects on All Resources (No Action Alternative)**

		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	Soc39: Tax revenues during operations phase
	Moderate	No effects listed	No effects listed	Phy18: Impacts to the FNSB nonattainment zone from construction and operations of the Fairbanks Lateral Soc31: Employment during the construction phase Soc33: Tax revenues during construction Soc37: Employment during operations phase
	Low	No effects listed	No effects listed	No effects listed

**TABLE 6.1-8 Impacts Associated with the Denali Route Variation Alternative that are Different from the Proposed Action**

Potential Effect	Denali Route Variation Alternative	Magnitude Factors			Ranking	
		Int.	Geo.	Freq./Dur.	Mag.	Prob.
<b>Physical Resources</b>						
Phy8: Increased sedimentation, reduced water quality, and changes to stream profile and structure from excavation activities and disturbance of ground cover	Four fewer stream crossings associated with this alternative reduce direct effect overall. Excavation activities and disturbance of ground cover would impact surface water quality downstream due to erosion. Sedimentation would increase resulting in increased turbidity reducing water quality. Permanent impacts could include changes to the stream profile and structure (bed and hyporheic zone) at crossing locations.	M	H	M	M	H
Phy24: Impeding navigability while conducting open-cut stream crossing method during construction	The Nenana River is crossed two more times than for the proposed action. Navigability along waterways using open-cut methods would be temporarily impeded by construction materials and equipment during the pipeline construction process.	H	M	L	M	H
Phy25: Unintended release of drilling fluids while conducting HDD stream crossing method during construction	With this Alternative, the Nenana River is crossed two more times than for the proposed action. Unintended release of drilling fluids may occur while conducting the HDD stream crossing method during construction.	M	L	L	L	L
<b>Biological Resources</b>						
Bio47: Impacts from all identified stream crossing methods	Four fewer stream crossings associated with this alternative reduce direct effect overall. Temporary in stream habitat alteration and channel profile causing gill irritation from increased sedimentation.	L	L	L	L	M
Bio48: Impact from open cut crossing method	Four fewer stream crossings associated with this alternative reduce direct effect overall. Temporary increase in sedimentation and erosion along the stream bank, loss of riparian vegetation, altered channel morphology.	L	L	L	L	M
Bio49: Impact from open cut isolation crossing method	Four fewer stream crossings associated with this alternative reduce direct effect overall. Injury may occur to certain fish species and life stages which may be more susceptible when diverting water around the construction area.	L	L	L	L	M
<b>Socioeconomic Resources</b>						
Soc 17: Impacts to water dependent recreation due to stream crossings	Four fewer stream crossings associated with this alternative reduce direct effect overall. Proposed Project construction in and near water bodies could result in water quality impacts, generate noise and visual impacts, and restrict access to water bodies.	M	M	L	M	L
Soc22: Recreation impact associated with Denali National Park Route Variation during operations	Minor restrictions to access. Self-contained underground facility minimizes impacts.	M	L	H	M	H
Soc27: Impacts of construction on visual resources associated with the Denali National Park Route Variation	Denali NPP has high seasonal recreation and tourist use and such users have high sensitivity. During the visitor season, short-term moderate to high visual impacts are expected.	H	L	L	M	H
Soc30: Impacts of operations on visual resources associated with Denali National Park Route Variation	Long-term impacts limited and weak because most of pipeline is buried and ROW re-vegetated.	L	L	H	M	L
Soc42: Denali National Park Route Variation	Analysis concludes that impacts to socioeconomics would be negligible. Some positive impacts arising from production taxes, royalties, and corporate taxed (total \$5.2 million annually).	L	L	H	M	H

FIGURE 6.1-5 Ranking Matrix of Impacts Associated with the Denali Route Variation Alternative that are Different from the Proposed Action <sup>7</sup>				
		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	No effects listed
	Moderate	Soc 17: Impacts to water dependent recreation due to stream crossings Soc30: Impacts of operations on visual resources associated with Denali National Park Route Variation	No effects listed	Phy8: Increased sedimentation, reduced water quality, and changes to stream profile and structure from excavation activities and disturbance of ground cover Phy24: Impeding navigability while conducting open-cut stream crossing method during construction Soc22: Recreation impact associated with Denali National Park Route Variation during operations Soc27: Impacts of construction on visual resources associated with the Denali National Park Route Variation Soc42: Denali National Park Route Variation
	Low	Phy25: Unintended release of drilling fluids while conducting HDD stream crossing	Bio47: Impacts from all identified stream crossing methods Bio48: Impact from open cut crossing method Bio49: Impact from open cut isolation crossing method	No effects listed

<sup>7</sup> The potential impacts shown in Figure 6.1-5 are ranked the same as they were ranked under the proposed action because the impacts associated with the Denali Route Variation are not significantly different than those of the entire proposed Project.

**TABLE 6.1-9 Potential Effects of the Applicant’s Preferred Option that are Different than the Proposed Action**

Potential Effect	Applicant Preferred Yukon River Crossing Option: New Suspension Bridge	Magnitude Factors			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
<b>Soils and Geology</b>						
Phy1: Impacts to paleontological resources	A new suspension bridge across the Yukon could encounter unknown paleontological resources (any physical evidence of past life, including fossilized remains, impressions, and traces of plants and animals).	M	M	M	M	H
Phy3: Impacts to soils or bedrock from excavation and blasting	Construction of the new suspension bridge will have greater impact on soils and bedrock than Option 2.	L	H	M	M	H
Phy4: Impacts to soils containing permafrost from thaw settlement	The new suspension bridge may impact permafrost in the local area of the crossing when compared with Option 2. Otherwise, for the rest of the pipeline, limited impacts to soils containing permafrost would occur from thaw settlement from use of temporary ice/gravel roads, and ice/gravel pads to stage and transport materials and equipment.	L	L	L	L	M
<b>Navigation Resources</b>						
Phy26: Impeding navigability during construction of Yukon River crossing.	For the Yukon River Crossing, if the new bridge option is selected (the preferred option), large vessels would likely be required in the Yukon River during the construction season until the new pipeline suspension bridge is fully built. These vessels would likely impede other local vessel traffic during the construction phase of the proposed Project. In addition other pipeline construction activities may impact navigation in other navigable waters.	H	L	L	M	H
<b>Vegetation</b>						
Bio1: Impacts from clearing, grubbing, grading in the ROW	The Applicant’s Preferred Option involves slightly more land than would be used for Option 2 and could have a slightly larger effect on temporary erosion and sedimentation impacts and destruction of plant root stock delaying vegetation recovery.	L	M	L	L	H
<b>Wetlands</b>						
Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils	The Applicant’s Preferred Option involves slightly more land than would be used for Option 2 and could have a slightly larger effect on subsoil, topsoil and surface hydrology.	L	M	L	L	H
<b>Wildlife</b>						
Bio28: Impacts from construction activities on wildlife habitat	The Applicant’s Preferred Option involves slightly more land than would be used for Option 2 and could have a slightly larger effect on the temporary disturbance to wildlife habitat during construction.	L	L	M	L	M
<b>Visual Resources</b>						
Soc26: Visual impact of construction of aboveground facilities	The Applicant’s Preferred Option requires construction of a new suspension bridge crossing the Yukon River. Limited impacts overall during the construction phase.	L	L	L	L	L
Soc28: Impact on visual resources during operations	The new suspension bridge adds a visual element to the existing scenery. However, the pipeline is buried for most of its length. Pipeline right of way visible in several areas—visual contrast greatest in areas requiring hill cuts and new bridge crossings. Over the entire pipeline ROW, the addition of one bridge crossing does not materially impact visual resources.	L	L	H	M	L

**FIGURE 6.1-6 Ranking Matrix of Impacts of the Applicant's Preferred Option that are Different than the Proposed Action**

		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	No effects listed
	Moderate	Soc28: Impact on visual resources during operations	No effects listed	Phy1: Impacts to paleontological resources Phy3: Impacts to soils or bedrock from excavation and blasting Phy26: Impeding navigability during construction of Yukon River crossing.
	Low	Soc26: Visual impact of construction of aboveground facilities	Phy4: Impacts to soils containing permafrost from thaw settlement Bio28: Impacts from construction activities on wildlife habitat	Bio1: Impacts from clearing, grubbing, grading in the ROW Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils

**TABLE 6.1-10 Potential Effects of Option 2 that are Different than the Proposed Action**

Potential Effect	Yukon River Crossing Option 2: Use of Existing E. L. Patton Bridge	Magnitude Factors			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
<b>Soils and Geology</b>						
Phy1: Impacts to paleontological resources	Option 2 has no impact on unknown paleontological resources because existing structures are utilized for the Yukon crossing. For the rest of the pipeline route, the possibility of encountering unknown resources is higher.	M	M	M	M	H
Phy3: Impacts to soils or bedrock from excavation and blasting	Option 2 has minimal construction impacts activities relative to soils and bedrock.	L	H	M	M	H
Phy4: Impacts to soils containing permafrost from thaw settlement	Option 2 uses existing structures. Otherwise, for the rest of the pipeline, limited impacts to soils containing permafrost would occur from thaw settlement from use of temporary ice/gravel roads, and ice/gravel pads to stage and transport materials and equipment.	L	L	L	L	M
<b>Navigation Resources</b>						
Phy26: Impeding navigability during construction of Yukon River crossing.	During construction on the existing bridge, some interruptions in navigation are possible and other pipeline construction activities may impact navigation in other navigable waters.	H	L	L	M	H
<b>Vegetation</b>						
Bio1: Impacts from clearing, grubbing, grading in the ROW	Option 2 involves less land than would be used for the Applicant's Preferred Option and could have a slightly lesser effect on temporary erosion and sedimentation impacts and destruction of plant root stock delaying vegetation recovery.	L	M	L	L	H
<b>Wetlands</b>						
Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils	Option 2 involves less land than would be used for the Applicant's Preferred Option and could have a slightly lesser effect on subsoil, topsoil and surface hydrology.	L	M	L	L	H
<b>Wildlife</b>						
Bio28: Impacts from construction activities on wildlife habitat	Option 2 involves less land than would be used for the Applicant's Preferred Option and could have a slightly lesser effect on the temporary disturbance to wildlife habitat during construction.	L	L	M	L	M
<b>Visual Resources</b>						
Soc26: Visual impact of construction of aboveground facilities	Option 2 adds equipment to an existing bridge and minimizes visual impact. Limited impacts overall during the construction phase.	L	L	L	L	L
Soc28: Impact on visual resources during operations	Option 2 adds equipment to an existing bridge and minimizes visual impact. However, the pipeline is buried for most of its length. Pipeline right of way visible in several areas—visual contrast greatest in areas requiring hill cuts and new bridge crossings. Over the entire pipeline ROW, the use of an existing bridge crossing does not materially impact visual resources.	L	L	H	M	L

**FIGURE 6.1-7 Ranking Matrix of Impacts of Option 2 that are Different than the Proposed Action**

		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	No effects listed
	Moderate	Soc28: Impact on visual resources during operations	No effects listed	Phy1: Impacts to paleontological resources Phy3: Impacts to soils or bedrock from excavation and blasting Phy26: Impeding navigability during construction of Yukon River crossing.
	Low	Soc26: Visual impact of construction of aboveground facilities	Phy4: Impacts to soils containing permafrost from thaw settlement Bio28: Impacts from construction activities on wildlife habitat	Bio1: Impacts from clearing, grubbing, grading in the ROW Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils

**TABLE 6.1-11 Potential Effects of Option 3 that are Different than the Proposed Action**

Potential Effect	Yukon River Crossing Option 3: HDD	Magnitude Factors			Ranking	
		Int.	Geo.	Freq. /Dur.	Mag.	Prob.
<b>Soils and Geology</b>						
Phy1: Impacts to paleontological resources	Option 3 has a smaller footprint than the Applicant's Preferred Option and would have less impact on paleontological resources in the local area when compared with the Applicant's Preferred Option. For the rest of the pipeline route, the possibility of encountering unknown resources is higher.	M	M	M	M	H
Phy3: Impacts to soils or bedrock from excavation and blasting	HDD construction of a Yukon River crossing will have greater impact on soils and bedrock than Option 2.	L	H	M	M	H
Phy4: Impacts to soils containing permafrost from thaw settlement	HDD drilling may impact permafrost in the area of the crossing. Otherwise, for the rest of the pipeline, limited impacts to soils containing permafrost would occur from thaw settlement from use of temporary ice/gravel roads, and ice/gravel pads to stage and transport materials and equipment.	L	L	L	L	M
<b>Navigation Resources</b>						
Phy26: Impeding navigability during construction of Yukon River crossing.	HDD construction will not have adverse impacts on navigation. However, other pipeline construction activities may still impact navigation in other navigable waters.	H	L	L	M	H
<b>Vegetation</b>						
Bio1: Impacts from clearing, grubbing, grading in the ROW	Option 3 requires less land area than the Applicant's Preferred Option and more land area than Option 2, placing the potential effects as intermediate between the other options with regard to temporary erosion and sedimentation impacts and destruction of plant root stock delaying vegetation recovery.	L	M	L	L	H
<b>Wetlands</b>						
Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils	Option 3 requires less land area than the Applicant's Preferred Option and more land area than Option 2, placing the potential effects as intermediate between the other options with regard to subsoil, topsoil and surface hydrology.	L	M	L	L	H
<b>Wildlife</b>						
Bio28: Impacts from construction activities on wildlife habitat	Option 3 requires less land area than the Applicant's Preferred Option and more land area than Option 2, placing the potential effects as intermediate between the other options with regard to temporary disturbance to wildlife habitat during construction.	L	L	M	L	M
<b>Visual Resources</b>						
Soc26: Visual impact of construction of aboveground facilities	Option 3 reduces impacts to visual resources by eliminating a possible new suspension bridge or equipment attached to an existing bridge. Limited impacts overall during the construction phase.	L	L	L	L	L
Soc28: Impact on visual resources during operations	Option 3 reduces impacts to visual resources by eliminating a possible new suspension bridge or equipment attached to an existing bridge. The pipeline is buried for most of its length. Pipeline right of way visible in several areas—visual contrast greatest in areas requiring hill cuts and new bridge crossings. Over the entire pipeline ROW, the elimination of one bridge crossing does not materially impact visual resources.	L	L	H	M	L

FIGURE 6.1-8 Ranking Matrix of Impacts of Option 3 that are Different than the Proposed Action				
		PROBABILITY		
		Low	Moderate	High
MAGNITUDE	High	No effects listed	No effects listed	No effects listed
	Moderate	Soc28: Impact on visual resources during operations	No effects listed	Phy1: Impacts to paleontological resources Phy3: Impacts to soils or bedrock from excavation and blasting Phy26: Impeding navigability during construction of Yukon River crossing.
	Low	Soc26: Visual impact of construction of aboveground facilities	Phy4: Impacts to soils containing permafrost from thaw settlement Bio28: Impacts from construction activities on wildlife habitat	Bio1: Impacts from clearing, grubbing, grading in the ROW Bio12: Disturbance impacts from grading and trenching over the centerline primarily in frozen soils