

APPENDIX M

Part I: Applicant Proposed Design Features, Mitigation Measures, and Best Management Practices

Part II: Rationale ASAP Pipeline Route Refinement

Part III: Regulatory Agency Recommended Mitigation Measures

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ALASKA STAND ALONE PIPELINE - MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
	SOILS & GEOLOGY
1	GCF Module Transport to Construction Site - All SPMTs would be accompanied by a field crew to guide and aid in spill response, as well as by mechanics, where necessary, on the road for safe transport. Causeway and land roads would be surveyed for damage, erosion, and appropriate width before module movement. All maintenance would occur after snowmelt is complete.
2	Layout of Material Sites - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, material site boundaries would be shaped in such a manner as to blend with surrounding natural land patterns. Regardless of the layout of material sites, primary emphasis would be placed on prevention of soil erosion and damage to vegetation.
3	Mitigation for Frost Heave or Thaw Settlement - Frost heave could be mitigated by replacing frost susceptible soil with non-frost susceptible borrow material, by controlling the operational pipe temperature, by applying insulation to control ground freezing, and possibly by providing drainage measures to control moisture migration. Thaw settlement could be mitigated by replacing thaw unstable soils with compact structural fill, by installing thermosyphons or applying insulation to control ground thawing in localized areas, or by controlling the operational pipe temperature. During construction, ice content of soils would be collected at regular intervals to determine a suitable mounding height, as indicated in the Comparative Belowground Designs and Return of Wetlands RFI response (Appendix E, Part IV) in order to determine the appropriate crown height for expected settlement of land over the ditch.
4	<p>Monitoring would be conducted by air, ground, and on foot surveys, through ILI surveys' and through SCADA. Monitoring and maintenance surveys would be conducted during the dormant period and operational phase.</p> <p>Implement a programmatic maintenance cycle standard of "Monitor, Detect, Correct" to ensure prompt attention and correction for soil erosion and water management issues identified after construction and during operations.</p> <p>Monitoring Curvature Along the proposed pipeline through ILI surveys - The use of a high resolution inertial navigation system (INS) based geometry tool would result in the highest level of survey accuracy. An initial/baseline geometry survey of the proposed pipeline would occur as soon as practicable after construction. Survey-to-survey curvature changes could be used as a basis for estimating the rate of curvature accumulation at any areas of concern.</p> <p>Integrating Security - Effectively integrating security into SCADA requires defining and executing a comprehensive program that addresses all aspects of security, ranging from identifying objectives to day-to-day operation and ongoing auditing for compliance and improvement. Elements of this program are defined in NIST SP 800-82 as:</p> <ul style="list-style-type: none"> Obtain senior management buy-in. Build and train a cross-functional team. Define charter and scope. Define specific SCADA and control system policies and procedures. Define and inventory SCADA and control system assets. Perform a risk and vulnerability assessment. Define the mitigation controls. <p>The mitigation controls include business continuity planning, disaster recovery planning, configuration management, malicious code detection, intrusion detection system (IDS), and change management. These documented controls would be developed during design and integrated into the SCADA and automation systems.</p> <p>Provide training and raise security awareness for SCADA and control system staff.</p>
6	Permafrost Impact Mitigation - Minimize impacts to continuous permafrost through the following methods for winter construction: use of ice roads, ice pads, and snow packing; trench depth for the pipeline to at least 6 feet in permafrost; keep dormant period to two years or less during construction and testing; operate an ambient temperature pipeline, which is below-freezing and protects permafrost between MP 0 and MP 168; maintain areas with excessive ponded water in or near the filled trench; employ prompt maintenance staff, as needed. Increase efforts for maintenance during first several years after construction; stabilize permafrost through revegetation over the settled crown - includes mixtures of annuals and native seed; implement stabilization through revegetation promptly after construction in sensitive areas; allow native plant recruitment to increase over time. In non-sensitive areas, scarification outside the permanent ROW would occur, which would help to facilitate natural recolonization. After 3 years, if the reclamation standard of 30% basal cover isn't met, additional measures, such as re-seeding and fertilization, would occur. For sensitive areas vulnerable to erosion (sloped areas and Arctic Coastal Plain), re-seeding would occur immediately using the prescribed seed mix in the Revegetation Plan (Appendix E, Part I).

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7	<p>Segregation of the Surface Layer - The proposed Project would entail segregating the surface layer (a thin layer that typically consists of a combination of loose surficial herbaceous material consisting of small shrubs, vegetation, and woody debris, overlaying a thin organics layer and weak, compressible mineral soils) and replacing it as the last layer of backfill in the trench only within designated agricultural lands and in select continuous and discontinuous permafrost areas and permafrost free areas (as discussed in the AGDC planning document, Segregation of the Surface Layer [AGDC, 2017g] and in the Revegetation Plan [Appendix E, Part I]). In most locations along the pipeline trench, the surface layer would not be segregated from subsoils and a subsoil-surface layer mixture would be used as general back-fill. The surface layer would be segregated along approximately one quarter of the pipeline length. Construction in wetland areas of Alaska is commonly conducted when the soils are frozen and able to provide support for construction equipment. AGDC considers replacement of the surface layer to be impracticable when construction is done in winter, which would affect wetlands areas.</p>
8	<p>Restoration and Revegetation - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, revegetation of disturbed areas on state/federal land would be conducted as soon as practicable and, if necessary, would be repeated until revegetation is successful, unless otherwise approved by SPCS/BLM.</p> <p>Surface materials (<i>i.e.</i>, logs, trees, vegetation, boulders, and soils) taken from disturbed areas would be stockpiled and utilized during restoration unless otherwise approved by SPCS/BLM.</p> <p>Stabilization practices, as determined by the needs for specific sites, would include but shall not be limited to the placement of mat binders, soil binders, rock, or gravel blankets or structures.</p> <p>All disturbed areas of state / federal land would be left in such stabilized condition that erosion in excess of natural rates would be minimized until the practicable restoration and revegetation of the leasehold could be accomplished in a manner that is reasonably satisfactory to SPCS/BLM.</p> <p>Areas on state / federal land disturbed by AGDC would be restored by AGDC to the reasonable satisfaction of SPCS/BLM, as stated in writing.</p> <p>Vegetation, overburden, and other materials removed during clearing operations would be disposed of by AGDC. Upon completion of the restoration on state / federal land, AGDC would remove all equipment and supplies from the site.</p> <p>Installation of the pipeline would occur in winter using proven design measures, installation practices, and equipment common to other arctic pipelines to facilitate safe installation and prompt revegetation, as indicated in the Comparative Belowground Designs and Return of Wetlands RFI response (Appendix E, Part IV).</p> <p>Prompt revegetation of wetlands and uplands in arctic and interior Alaska would occur by implementing proven ADNRC Plant Materials Center revegetation practices and cover standards that have been successfully implemented for other ground disturbed areas in these regions, as indicated in the Comparative Belowground Designs and Return of Wetlands RFI response (Appendix E, Part IV).</p>
9	<p>Stabilization of Soils and the Buried Pipe - Use of thaw-stable material where possible. Re-seed, re-vegetate, and, as appropriate, fertilize in areas of continuous and discontinuous permafrost. Use of in-line inspection devices (smart pigs) to regularly detect longitudinal strain, primarily in continuous and discontinuous permafrost potentially related to slumping or heaving to facilitate prompt maintenance response.</p>
10	<p>Surveillance and Monitoring - In areas where a lease is required from SPCS or federal grant of ROW is required from BLM, a surveillance and monitoring program for the proposed pipeline would be approved by SPCS/BLM prior to start-up of the proposed pipeline. The program shall be designed at a minimum to prevent and mitigate erosion, maintain pipeline integrity, and monitor any pipeline movement that may affect integrity. BLM/SPCS lease stipulations would be used to develop similar policies for other landowners.</p>
11	<p>Trench Restoration for Buried Pipeline Mile 0 - 62 - Special techniques may be needed to reduce impacts to the ice-rich permafrost. These may include using additional backfill to account for excess settling if wet permafrost thaws after pipe installation, installing ditch plugs (blocks of tundra or other native sod, bentonite, or other appropriate material), or revegetating to aid in achieving thermal stability of the soil in the trench. In drier areas, the trench backfill may remain above the surrounding grade even after settling. In this case, the backfill may be seeded with upland species.</p>
12	<p>Water Management - Implement adequate water management during construction and maintenance phases:</p> <p>Install ditch plugs where appropriate, as determined by environmental engineers.</p> <p>Crown the ditch to allow settlement near to ground level to avoid having the filled trench slump and catch water or avoid runoff erosion.</p> <p>Contour terrain, as needed, to direct water.</p> <p>Maintain natural water flowpaths through the centerline.</p> <p>Utilize culverts, bridges or other infrastructure as determined by civil engineers.</p> <p>Implement a maintenance program to manage waterflow and ensure prompt maintenance after conditions are reported.</p>

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169	Establish a Revegetation Plan (Appendix E, Part I) with Alaska Department of Natural Resources (ADNR) Plant Materials Center; revegetate promptly after construction. Where required, re-grade construction disturbances to a condition that blends with the surrounding terrain and surface drainage patterns. Rely upon wind dispersal of seeds from plant species in the area to naturally recolonize the site. Upon completion of seedbed preparation, construction areas would be left unseeded to allow for natural revegetation/recolonization of the site. For areas that do not meet the revegetation criteria (cover and density standard) within the time standard (usually 3 years), seeds would be planted or some form of adaptive management considered.
170	Plans for construction, operation, maintenance, and termination: In areas where a lease is required from the State Pipeline Coordinator's Section (SPCS) or a federal grant of ROW is required from BLM, AGDC would submit to the SPCS /BLM for approval the following plans, each of which would cover construction, operation, maintenance, and termination activities: Pipeline trench backfill methods. Disposal of trench spoils (a mixture of surface layer and subsoil) and excess and excavated material. At the completion of operations, aboveground facilities would be removed and stabilized/revegetated to the satisfaction of the landowner. Buried pipeline would be left in the ground, which would have the least harmful impacts to the land.
171	Excavated Material - In areas where a lease is required from the SPCS or a federal grant of ROW is required from BLM, excess excavated material would be disposed of in accordance with approved construction plans during construction and as approved by the SPCS/BLM during operation, maintenance, and termination of the pipeline. Excavated materials would not be stockpiled in rivers, streams, active floodplains, or wetlands unless approved by the SPCS/BLM regulatory agencies and designated as an appropriate storage or disposal location by the terms of the lease.
WATER	
14	Pipeline Temperature - To maintain the existing thermal regime and protect the stability of water resources, the proposed pipeline would remain at or near the ambient soil temperature and would not be chilled or heated for transport.
15	Stream Flow Regimes & Profiles - Stream characteristics and riparian areas would be restored to preconstruction conditions to the maximum practicable extent. Maintain, to the maximum extent practicable, existing surface water hydrology at waterbody crossings: Prevent discharges that have the potential to adversely affect waterbodies. Stabilize cut slopes immediately when design grade is obtained. Initiate reclamation of disturbed areas as soon as is practicable. Ensure water withdrawals meet federal and state standards and guidelines. Keep construction activities within the pipeline ROW and proposed Project footprint. Perform water crossings in a manner that minimizes effects to water quality, including use of materials that do not introduce sediment or other harmful substances into waters when using isolated open cut. For culvert and bridge installation and maintenance in fish bearing streams, AGDC would be required to obtain a Fish Habitat Permit from ADF&G and would refer to ADF&G guidance documents for the design and maintenance of stream crossing structures.

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16	<p>General Pipeline Stream Crossing BMPs - Attachment 12, the Pipeline Stream Crossing Construction Mode Determination, describes 32 BMPs for pipeline stream crossings and include:</p> <p>Locate extra work areas (<i>e.g.</i>, fabrication and staging areas) at least 50 feet from water's edge when practical, and no less than 30 feet from the water's edge when approved.</p> <p>Locate fueling and fuel storage at least 100 feet from streams and waterbodies. When conditions require refueling within 100 feet of waterbodies, the Contractor must implement a preapproved spill prevention and cleanup plan.</p> <p>Limit extra work area sizes to that needed to construct the stream crossing.</p> <p>Ensure all established erosion and sediment control measures are implemented across the work area.</p> <p>Store as much instream spoil on the banks as is practical (additional temporary workspace may be required). When placing spoils in the active channel, deposit spoils in long piles oriented parallel to flow to minimize erosion, avoiding areas of highest water velocity.</p> <p>Construct berms or other sediment barriers to prevent saturated spoils on banks from flowing back into the waterbody. If working at a dry crossing, berms would not likely be required unless groundwater and saturated spoils are encountered.</p> <p>Retain a 30-foot buffer from the stream bank of undisturbed vegetation during initial clearing, except where needed, for equipment crossing. Sediment control measures would be in place prior to construction within the 30-foot vegetation buffer.</p> <p>Limit clearing of vegetation between the waterbody edge and extra work areas to the proposed Project right of way (ROW).</p>
17	<p>General Pipeline Stream Crossing BMPs - (Attachment 12 Continued):</p> <p>Salvage and store vegetation layer to aid in bank reclamation following construction.</p> <p>Grading of stream banks for trenching equipment would be limited to the trench line.</p> <p>Grading of work areas would be directed away from the waterbody to minimize runoff entering the waterbody.</p> <p>Temporary or permanent vehicle crossings may be constructed, as required.</p> <p>Maintain natural stream flow rates at all times.</p> <p>Retain undisturbed native soils (hard plugs) between the stream and overbank trench. These would remain in place during instream excavation to prevent diversion into the open trench. Trench plugs would be removed immediately prior to pipe placement and backfilled once the pipe is in place.</p> <p>Install trench breaker (soft plug) adjacent to waterbody where consolidated soils or organic materials are prone to washing out.</p> <p>If necessary, install soft plugs and dewater trench in a manner that does not cause erosion and inhibits silt-laden water from entering the waterbody.</p> <p>When performing instream blasting, implement blasting methods that minimize overall shockwave, deploy air bubble curtains to dampen shockwave, limit blasting to times of least environmental/biological impact, displace fish from blast area using approved methods, use confined explosives, and avoid using ammonium nitrate based explosives.</p> <p>Install approved instream sediment controls, such as sediment mats or geotextile blankets, as necessary.</p> <p>Complete fabrication (welding, coating, weighting) and testing of instream pipe string well in advance of completing instream trenching activities.</p> <p>Utilize "push-pull" or "float" techniques to place pipe in trench whenever conditions allow.</p> <p>Place pipe in trench and backfill immediately. Restore stream channel to approximate preconstruction profile using clean gravel or native materials for the upper 1 foot of backfill.</p> <p>In areas where a lease is required from SPCS or federal grant of ROW from BLM, no blasting would be done underwater or within one-quarter mile of streams or lakes with identified sensitive wildlife habitat without approval.</p>

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18	<p>Backfilling generally consists of replacing the excavated material, however, clean gravel may be used as backfill when excavated materials increase potential downstream sedimentation, increase scour potential, or do not provide sufficient groundwater flow around the pipe. Where surface layer material has been segregated, in the case of an armor layer overlying fine grain materials, subsurface material would be replaced in the stratified order it was removed.</p> <p>Prior to backfilling, the trench would be dewatered as necessary. The pump intake shall be suspended above the trench bottom and water discharged over a well vegetated upland area with appropriate energy dissipation; splash pup, splash plate, plastic liner, non-woven sediment filter bag, or straw bale dewatering structure. Dewatering activities would be performed such that no silt-laden water is discharged to the stream.</p> <p>Backfill from the center of the stream towards the bank to direct silt-laden water toward the plugs where it could be pumped and discharged. Lower bucket into water before releasing backfill.</p> <p>It is the Contractor's responsibility to meet the necessary water quality standards and requirements set forth by regulatory agencies.</p> <p>No backfill crown would be placed in the waterway. Ensure that the channel profile and gradient are returned to preconstruction conditions.</p> <p>Ensure backfill is well compacted on approach slopes and stream banks.</p> <p>Stabilize banks and install temporary sediment barriers within 24 hours of completing instream construction. For isolated trenching, restore channel geometry and stabilize banks prior to returning flow to the watercourse. Grade banks back to preconstruction contours when practical, or to an approved stable angle of repose.</p> <p>All instream work would comply with construction timing windows and conditions permitted by the appropriate regulatory agencies and applicable permits. Ideally, all instream work would be completed within 24 hours on minor streams and 48 hours on intermediate and major waterways when conditions allow.</p> <p>Vegetative stabilization techniques are preferred where feasible. If soil and/or flow conditions dictate use of riprap or non-native materials (<i>e.g.</i>, geogrids) for bank stabilization their placement must comply with authorizing agencies.</p> <p>Install permanent erosion and sedimentation control measures, including revegetation of riparian areas.</p> <p>Clean-up water crossing work areas immediately following backfill and erosion control installation. When winter clean-up is impacted by frozen spoils complete rough clean-up prior to breakup and final clean-up after breakup.</p>
19	<p>Restoring Stream Characteristics and Riparian Area - Following construction, stream characteristics and riparian areas would be restored to preconstruction conditions to the maximum practicable extent as described below by:</p> <ul style="list-style-type: none"> • Salvaging and storing the vegetation layer to aid in bank reclamation following construction. • Stabilizing cut slopes immediately when design grade is obtained and installing temporary sediment barriers within 24 hours of completing instream construction. • Ensuring backfill is well compacted on approach slopes and stream banks. • Using vegetative stabilization technique where feasible unless soil and/or flow conditions dictate use of riprap or non-native materials (<i>e.g.</i>, geogrids) for bank stabilization. • Immediately restoring stream channel to approximate preconstruction profile using clean gravel or native materials for the upper one foot of backfill.
20	<p>Minimize the Number of River and Stream Crossings -</p> <ul style="list-style-type: none"> • Use existing bridges where feasible. • Use horizontal directional drilling (HDD) or other trenchless technology to minimize disturbance to water bodies. • Perform water crossings in a manner that minimizes effects on water quality. • Use materials for dam construction that do not introduce sediment or other harmful substances into waters when using the open-cut isolation method. • Use materials for the flume pipe system that do not introduce sediment or other harmful substances into waters when using the open-cut isolation method. • Position flume pipe system discharges to prevent erosion or scouring. • Use temporary bridges for transportation as practicable.
21	<p>Sediment Control Measures - At waterbody crossings, AGDC would install sediment control measures prior to and during construction and maintain the exiting surface water hydrology and bank stability to the maximum extent practicable at waterbody crossings.</p>
22	<p>Waterbody Crossings - Since the publication of the 2012 FEIS (USACE, 2012a), alignment changes have been made resulting in a reduction in the total number of waterbody crossings from 515 to 430.</p>
23	<p>Chemicals - In areas where a lease is required from SPCS or where a federal grant of ROW is required from BLM, AGDC would use only non-persistent and immobile types of pesticides, herbicides, preservatives, and other chemicals. Each chemical to be used and its application constraint would be approved by SPCS or the Authorized Officer (BLM) prior to use. The use of pesticides and herbicides are regulated by ADEC's Environmental Health Division through 18 AAC 90 and may require a permit.</p>

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24	Disturbance of Natural Waters - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, all activities of AGDC in connection with the proposed pipeline that may create new lakes, drain existing lakes, significantly divert natural drainage and surface runoff, permanently alter stream or groundwater hydrology, or disturb significant areas of streambeds are prohibited unless such activities and necessary mitigation measures are approved by SPCS / BLM. The temperature of natural surface water or groundwater would not be significantly changed by the proposed pipeline or by any construction, maintenance, operation, or termination related activities so as to adversely affect the natural surface water or groundwater, unless approved by SPCS / BLM.
25	Erosion and Sedimentation - In areas where a grant is required from SPCS/BLM, erosion control measures would be maintained to limit induced and accelerated erosion, limit sediment production and transport, and lessen the possibility of forming new drainage channels during construction, operation, maintenance, and termination of the proposed pipeline.
26	Pollution Control - <ul style="list-style-type: none"> • In areas where a grant is required from SPCS/BLM, in the construction, operation, maintenance, and termination of the proposed pipeline, AGDC would perform its activities in accordance with applicable air and water quality standards and related facility siting standards and plans. Mobile ground equipment would not be operated in or on lakes, streams, or rivers on state/federal land unless approved by SPCS/BLM Authorized Officer. Refueling of excavation equipment would take place at least 100 feet from any surface waterbody as a mitigation measure. • Implement a preapproved Spill Prevention, Control, and Countermeasure (SPCC) Plan, as required by 40 CFR 112 to prevent discharges of oil to waters of the U.S. • AGDC has committed to avoiding the known contaminated site areas described in Chapter 3 and any newly discovered contamination would be reported to the ADEC in accordance with their reporting requirements and handled in a manner to avoid transport of contaminated materials.
27	Purchase of Materials - In areas where a grant is required from SPCS/BLM, gravel and other construction materials would not be taken from streambeds, riverbeds, lakeshores, or outlet of lakes, unless the taking is approved by SPCS Authorized Officer.
154	Monitoring and Maintenance - <ul style="list-style-type: none"> • The gas volume, flow, and pipe integrity would be monitored using an ILI program, block valves, and maintenance and response bases. • Water quality monitoring would be conducted, as required by the state water quality standards. Water quality and turbidity monitoring would be conducted, as required by the Alaska Pollutant Discharge Elimination System (APDES) permit.
198	Minimum required depth of cover at rivers and streams would be the greater of 5 feet or 120 percent of maximum scour.
199	AGDC would avoid construction activities in close proximity to drinking water wells and would adjust the location of construction activities within the ROW where necessary and practicable.
VEGETATION	
28	Removal of Some Aboveground Facilities - Various compressor stations, the Straddle and Offtake Facility, and the NGLEP were removed from the proposed Project as described in the 2012 EIS, eliminating vegetation and wildlife impacts from those proposed Project elements.
29	Management of Invasive Plants - AGDC would develop a framework for preventing spatial dispersal of invasive terrestrial and aquatic plants, which could result from transporting invasives through access road construction and use or bringing gear from a contaminated waterbody to another. Considerations would include seed sources, preventative measures, and monitoring and eradication procedures. Before any construction activities, any equipment brought in from outside of Alaska would be thoroughly decontaminated upon entering Alaska; any equipment stored in Alaska would be likewise decontaminated before any construction activities. Aquatic invasives would be controlled by decontaminating all equipment and gear used by personnel (including boots, waders, etc.) between watersheds to ensure invasive species are not inadvertently spread between work sites along the proposed project route. Contractors would be responsible for decontaminating their own equipment.
30	Revegetation Management - AGDC would consult with US BLM and follow Alaska Department of Natural Resources' Plant Materials Center Revegetation Manual for Alaska. The proposed Project's Revegetation Plan stipulates seed mixes for different geographic areas, seed application methods, and application rates (if any) for fertilizers.
33	Crowning - The slope over the crown is critical to stabilizing soils and directing ponding, thereby mitigating some erosion and drainage impacts. The remaining spoil material not used for backfilling and crowning would be feathered and blended across the construction corridor, creating a roughened surface to capture precipitation, decrease erosion, and provide safe sites for plant establishment.

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35	<p>Ditch Excavation - Construction scheduling is the most appropriate way of limiting thaw of open-ditch segments. To the extent possible, thaw-unstable soils would be excavated during winter seasons. In all cases, durations of open-ditch construction activities would be minimized. After trenching, pipe lowering in, and backfilling any compacted areas would be tracked to mitigate the compaction effects of the excavator and associated traffic, graded to facilitate drainage, covered with any available growth media (surface layer material), and scarified to allow natural revegetation by native plants. Fertilization and/or seeding would occur in sensitive and erosive areas immediately, other areas would be allowed to revegetate naturally. If the reclamation standard of 30% cover over a 3-year period does not occur, then additional revegetation efforts would commence, per the Revegetation Plan (Appendix E, Part I).</p>
36	<p>Dust Suppression - The proposed Project would perform dust suppression using water, if necessary. The proposed Project area would be monitored for fugitive dust generation during construction. Abatement of fugitive dust would be required on the construction areas associated with the GCF and the pipeline ROW or on access roads when a visible plume of dust with an estimated opacity exceeding 20 percent (objects partially obscured) extends more than 300 feet from the source. Proposed Project contractors would be responsible for controlling dust using measures such as applying dust suppressants (<i>e.g.</i>, water), and in some cases, reducing vehicle speeds.</p> <ul style="list-style-type: none"> • Use only proposed Project approved roads for access. Paved access roads would be kept free of mud and soil that may track onto the road surface from the construction ROW through the use of gravel access pads and/or equivalent. If soil is transported onto a public road surface or other paved area, including parking lots, by construction equipment and vehicles, it would be removed as soon as practical from the road by shoveling or sweeping, and would be transported back to a designated sediment control disposal area within the construction ROW. Road washing, if necessary, would only be allowed after the soil has been scraped from the paved road surface. • Where needed, reduce vehicle speeds on unpaved roads; speed limits may be set on unpaved roads. • Clean up track-out and/or carry-out areas at paved road access points. • Ensure that all haul truck cargo compartments are maintained so as to minimize spills and loss of materials. Cover haul loads of open body trucks where applicable. • Apply water to affected unpaved roads, unpaved haul/access roads, and staging areas when in use and when appropriate. Water for fugitive dust control purposes would be obtained as necessary through permits or purchase contracts with owners of valid existing water rights. These approvals would be acquired prior to construction. • When appropriate and as needed, apply approved dust suppressant such as a water/magnesium chloride mixture or calcium chloride. The use of magnesium chloride would be restricted in sensitive vegetative areas, where only water or alternative dust suppressants would be considered. • Apply water to active construction areas as needed. Areas should be pre-watered and soils maintained in a stabilized condition where support equipment and vehicles would operate. Water-disturbed soils would form a crust, reducing the potential for dust creation. • Control water spray so that over-spraying and pooling would be avoided to the extent possible. • Where roads are paved, no dust mitigation may be necessary.
37	<p>Earthwork/Re-contouring - Re-contouring would be done in a way to emphasize the use of existing drainage patterns and landform types to blend with and be compatible with the surrounding landscape to the extent practicable (<i>e.g.</i>, where vertical cuts or other features cannot be physically re-contoured to the original contours due to factors such as blasting or the natural angle of repose of the native fill material after it has been excavated). Re-contouring disturbed areas would be done with site complexity in mind. Generally, revegetation of disturbed areas is planned for long-term stabilization.</p>
40	<p>Site De-Compaction - In areas that have been compacted as a result of summer construction activities and require de-compaction to facilitate revegetation, the areas would be ripped to mitigate the compaction effects of the traffic, equipment use, storage, or from other construction-related activities and other use. Site de-compaction is not intended for use in areas that would be constructed during the winter (<i>i.e.</i>, on the Arctic Coastal Plain). Identified areas would be ripped to a minimum depth of 8 to 20 inches (20 to 50 cm) prior to surface soil replacement. The equipment used to rip the soil should be operated along the contours to minimize soil erosion and facilitate soil-water retention to aid revegetation. For sloped sites, ripping along the contour would intercept runoff as it flows downslope. Revegetation actions would be performed as soon as practicable after site compaction has been alleviated. Fertilization and/or seeding would occur in sensitive and erosive areas immediately, other areas would be allowed to revegetate naturally. If the reclamation standard of 30% cover over a 3-year period does not occur, then additional revegetation efforts would commence, per the Revegetation Plan.</p>

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41	<p>Workpad Construction - Granular workpads would be utilized for areas scheduled for summer construction. In wetlands overlaying thaw-unstable permafrost, the surface layer under the workpad would not be removed, as it would be detrimental to the thermal stability of the underlying permafrost. The workpad would be left in place after construction. For workpads not required for O&M, any compacted areas of the workpad would be ripped to mitigate the compaction effects of traffic, graded to facilitate drainage, covered with any available growth media (surface layer material) and scarified to allow natural revegetation by native plants. Fertilization and/or seeding would occur in sensitive and erosive areas immediately, other areas would be allowed to revegetate naturally. If the reclamation standard of 30% cover over a 3-year period does not occur, then additional revegetation efforts would commence, per the Revegetation Plan.</p>
42	<p>Timber Clearing, Salvage, and Utilization - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, prior to initiation of clearing operations on state / federal land, AGDC would provide SPCS/BLM with an estimate of the amount of merchantable timber, if any, which would be cut, remobilized, or destroyed in the construction and maintenance of the proposed pipeline, and would pay in advance of construction or maintenance activity, and would pay in advance the sum of money SPCS/BLM determines to be the full stumpage value of the timber to be cut, removed, or destroyed. AGDC would provide an opportunity for residents and local communities to utilize the salvaged timber. All debris resulting from clearing operations and construction that may block stream flow, delay fish passage, contribute to flood damage, or result in a streambed scour or erosion would be removed. Logs would not be skidded or yarded across any watercourse without approval. No log storage would be located within three hundred feet of any watercourse on state / federal land except with approval from SPCS/BLM.</p>
43	<p>Vegetation Clearing - For riparian vegetation clearing, vegetation would be cut off at ground level to leave the existing root systems in place to provide streambank stability. In riparian areas, the pulling of tree stumps and rooting for grading activities would be limited to the area directly over the trench line. Riparian vegetation would be restored with native plant species where conditions allow (<i>e.g.</i>, riparian species planting is only successful where enough water is present).</p>
172	<p>Implementation of the Revegetation Plan (Appendix E, Part I), which was developed by ADNR's PMC using the following resources:</p> <ul style="list-style-type: none"> • The Alaska Coastal Revegetation and Erosion Control Guide (Wright and Czaplá, 2010); • Interior Alaska Revegetation & Erosion Control Guide (Czaplá and Wright, 2012); • Strategic Plan for Invasive Weed and Agricultural Pest Management and Prevention In Alaska (ADNR, 2011); • Native Plant Revegetation Manual for Denali National Park and Preserve (Densmore <i>et al.</i>, 2000); and • NPS Invasive Plant Management Plan.
173	<p>Site-specific rehabilitation and revegetation measures determined in the plan:</p> <ul style="list-style-type: none"> • Soil de-compaction methods; • Erosion control and slope stabilization methods; • Seed species composition and application rates; • Seed application methods (hydroseeding, aerial distribution, or hand methods) • Fertilizer and/or mulch requirements, composition, and application rates; • Long-term vegetation maintenance and monitoring requirements; and • Identification of additional site treatment options if initial revegetation efforts are unsuccessful.
WETLANDS	
46	<p>Removal of Some Aboveground Facilities - Various compressor stations, the Straddle and Offtake Facility, and the NGLEP were omitted from the proposed Project, eliminating vegetation and wildlife impacts from those proposed Project elements.</p>

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
48	<p>Alignment Shifts to Manage Wetland Impacts -</p> <ul style="list-style-type: none"> • The route has continually been refined since the proposed Project's inception to avoid and minimize impacts to wetlands and, in particular, high-value wetlands, while targeting uplands where practicable. • A portion of the alignment was moved from Minto Flats to the upland Summer Ridge area to avoid and minimize impacts to wetlands and reduce impacts to a state game refuge. • The Fairbanks Lateral segment has shifted into rural forested ridges, away from the railroad corridor. • The alignment along the Susitna River has shifted to the west and is now closer to the floodplain than the disturbed transportation corridor. This change was made to avoid encroaching on a steep bluff and results in a slight increase in wetland impacts; • South of the Tanana River, the alignment has moved to the west of the Nenana River into undeveloped forest and away from the disturbed transportation corridor. This change was made to straighten the alignment and move onto drier terrain. The route moved onto steeper slopes but improves the crossings of streams and reduces bog crossings; and • In the Northern Ecoregion, the alignment has moved west, away from the Sagavanirktok River and the Dalton Highway transportation corridor. This change avoids several lakes, avoids higher value wetlands, and improves stream crossings.
161	<p>Wetland Permitting Regulations - Regulations regarding dredging and deposition of fill material would be followed; 40 CFR 230 Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The Section 404 of the CWA establishes protocols and policy for the discharge of fill into aquatic resources. Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences of negative impacts on the nation's water resources. Pursuant to these requirements, the district engineer would issue an individual Section 404 permit only upon a determination that the proposed discharge complies with applicable provisions of 40 CFR 230, including those which require the permit applicant to take all appropriate and practicable steps to avoid and minimize adverse impacts to waters of the U.S. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall proposed Project purposes. Compensatory mitigation for unavoidable impacts may be required to ensure that an activity requiring a Section 404 permit complies with the Section 404(b)(1) Guidelines. In accordance with 33 CFR 332 Compensatory Mitigation for Losses of Aquatic Resources, compensatory mitigation must be commensurate with the amount and type of impact that is associated with a particular Department of the Army permit.</p>
52	<p>Minimizing Ground Disturbance - Proposed pipeline construction across wetlands would be scheduled during the winter to the maximum extent practicable and existing bridges or HDD / other trenchless technology would be used, as appropriate.</p>
53	<p>Avoid and Minimize Ground-disturbing Activity in Wetlands - Limit grading wetlands to the maximum extent practicable. When possible, locate permanent facilities outside of wetlands. Maintain existing hydrologic systems. Use existing bridges or HDD / other trenchless technology where practicable. Designate areas within the proposed Project footprint that would require the use of mats; these would be identified as matted regions. Use mats or other types of mitigation during non-winter construction to prevent rutting. Rubber mats are planned for areas in which wetlands are short distances across, non-permafrost, and flat; inundated palustrine wetlands are the likely areas where mats would be used. Mats help distribute loads across a wide surface and reduce compaction of the underlying vegetation and soils. This helps to preserve non-permafrost wetlands by limiting long-term damage. Mats are helpful in preserving stream bank vegetation at some erosion-prone areas in permafrost regions.</p>
56	<p>Wetland Hydrology and Trenching - To avoid a "French-drain effect" in wetlands that are trenched for the proposed pipeline, trench breakers would be installed in the trench to stop water from flowing along the trench. In discontinuous permafrost areas, the trench breakers would be installed just outside the wetland area to keep wetland water from moving outside of the wetland. In continuous permafrost areas, the trench breakers stay in place because the bottom of the trench stays frozen, as noted in AGDC's geothermal modeling reports. The trench breakers would be water resistant and stable through the use of material designed to resist water movement (sand bags, bentonite, non-toxic spray foam, etc.) so they would not be able to be penetrated by water, eroded or moved. AGDC's thermal modeling also shows that areas near the bottom of the trench would be frozen year round, adding additional stability.</p>
160	<p>Over Excavate and Replace Thaw Unstable Material - This technique may be a viable method in some locations; the material would be excavated and removed, and foreign material imported, requiring the mining and importation of additional select fill material to backfill the removed material. This technique could be employed in areas where very high displacement strains in near surface soils are evident, such as massive ice in a near surface strata but below the active layer.</p>

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
159	Ditch Plugs and Thermosiphons - AGDC intends to institute a comprehensive monitoring program and would employ several mitigative measures to offset and minimize indirect impacts to wetlands, including a revegetation program that allows for the recolonization of the ROW by native species in non-sensitive areas and the immediate revegetation of the ROW through re-seeding in sensitive areas (AGDC, 2016e). The program would employ continual detection and field maintenance activities (AGDC, 2016b,e) and the use of thermosiphons or ditch plugs (AGDC, 2016b and AGDC, 2016c). Ditch plugs made from blocks of native sod, bentonite, or other appropriate material would be used south of MP 175 during construction. Thermosiphons would be used in select areas of discontinuous permafrost where greater permafrost stability near the surface is required; field monitoring crews observing issues such as slumping or reports of suspected thaw by in-line inspection may lead to thermosyphon placement. Thermosiphons are passive heat pipes designed for installation in select locations along the edge of the ROW to provide a thermal curtain and limit impact (AGDC 2016b,c). Thermosiphons have been used historically for areas along the TAPS ROW and for other projects, such as the Alpine horizontal directionally drilled (HDD) crossing of the Colville River. Additional ditch plugs could be used where newly identified water management efforts are required. In rare instances, where thaw or slumping are identified around permanent facilities that cannot be moved (e.g., block valves) and where a power supply is available, a stationary active refrigeration unit may be employed.
158	Re-routing within the ROW - In some cases, the field conditions encountered might be very site specific and limited. In this case, potential reroute of the ROW pad within the lateral limits of the construction ROW, could limit expected disturbance.
157	Localized Active Refrigeration and Insolation - This measure would be considered in "extraordinary and specific conditions," such as a mechanically driven equipment that would refrigerate sections of the ground around permanent facilities where a power supply is available (e.g., use of a design similar to TAPS Pump 1 brine system). Workpad insulation would also be considered.
174	Surface-leveling is one possible form of intervention/mitigation that could be employed should the ROW need to be elevated from a settlement condition during operations. New backfill material is placed in the area to be re-leveled. Care must be employed, however, to ensure that the surface characteristics are not adversely affected to further advance thaw progression. Additional revegetation measures would occur on the newly disturbed areas.
WILDLIFE	
57	Removal of Some Aboveground Facilities - Various compressor stations, the Straddle and Offtake Facility, and the NGLP were omitted from the proposed Project, eliminating vegetation and wildlife impacts from those proposed Project elements.
58	Food and Waste Storage Mitigation Measure - Store food waste and other associated waste in containers until transferred for disposal at an approved disposal site. Strictly prohibit employees from directly feeding animals, throwing food to animals, or improperly disposing of food wastes. Transfer sanitary waste from bathrooms, sewage sludge, and kitchen associated garbage on a regular basis to ensure control of attractants. Identify kitchen grease for treatment as spoilable waste.
59	Eagle and Migratory Bird Protection - Bald and golden eagles and their nests are protected under the Bald and Golden Eagle Protection Act. AGDC would work with federal and state agencies to employ appropriate mitigation measures to avoid or minimize impacts to eagles and comply with existing regulations. Clearing and grubbing would occur in accordance with the recommended times described in the USFWS' <i>Timing Recommendations for Land Disturbance & Vegetation Clearing</i> guidance and would avoid disturbance or destruction of migratory bird nests (USFWS, 2017b). AGDC would work with federal and state agencies to employ appropriate mitigation measures to avoid or minimize impacts to eagles and comply with existing regulations.
61	General Wildlife Habitat - Avoid locating pipeline facilities in sensitive wildlife habitats to the maximum extent practicable by: In areas where a lease is required from SPCS/or federal grant of ROW from BLM, the proposed pipeline would be maintained to avoid significant alteration of big-game movement patterns. SPCS/BLM may require additional measures to mitigate impacts to big-game movement. AGDC would coordinate with USFWS regarding any activity that has the potential to disturb polar bears. Prior to starting proposed pipeline activities, AGDC would obtain the locations of known brown bear dens from ADF&G to avoid both human/bear interactions and disturbance of bear dens. Develop systems or mechanisms to facilitate escape of wildlife from the pipeline trench in the event wildlife becomes trapped. Construction activities would be scheduled to avoid effects during sensitive periods in the life cycle of wildlife to the extent practicable, including scheduling excavation activities during times of the year when major movements across the ROW occur (i.e., migrations). Construction and operational activities would be avoided or minimized to the extent practicable during sensitive periods in life cycles such as moose and caribou calving, lambing season, bear denning, raptor nesting, and nesting migratory birds.
62	Human and Wildlife Interactions - Ensure construction camp operations and pipeline facility construction activities comply with measures that avoid attracting wildlife. Adopt motor vehicle and aircraft procedures that minimize disturbances to wildlife. Identify and then avoid or minimize situations where wildlife may be killed in defense of life or property.

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63	Material Sites - Avoid placement of source material sites near raptor cliff nesting habitat, or remove source material outside the breeding season when adults are not in the area. The location of material sites would be in the vicinity of existing transportation routes or utility corridors. Material sites would be permitted by the federal, state, and local government agencies, and require wildlife mitigation measures.
64	Non-native Species - Minimize the spread or introduction of non-native invasive plants through standard measures such as cleaning and inspection of equipment and revegetating all areas of ground disturbance as soon as possible after construction. Barges entering the proposed Project area as part of the sealift would be cleaned according to federal and state protocols in order to mitigate against the potential spread of non-native species.
68	Zones of Restricted Activity - In areas requiring a lease from SPCS and federal grant of ROW from BLM, during periods of wildlife breeding, nesting, lambing, or calving activity, and during major migrations of wildlife, AGDC's activities on state / federal land may be restricted by SPCS/BLM with written notice. From time to time, SPCS/BLM would furnish AGDC with a list of areas where such actions may be required, together with anticipated dates of restriction. During periods of fish spawning, rearing, and migration, AGDC's activities on state / federal land may be restricted by SPCS / BLM with written notice, and the coordinator would furnish AGDC with a list of areas where such actions may be required, together with anticipated dates of restriction.
175	Revegetate and reclaim all areas of ground disturbance as soon as possible after disturbance is complete to minimize impacts to wildlife habitat. The Revegetation Plan (Appendix E, Part I) would guide the revegetation of all areas of ground disturbance.
176	Minimize vehicle and aircraft traffic to minimize disturbances to wildlife, where possible.
	Minimize the duration of open-ditch construction activities to mitigate the risk of animal entrapment in an open ditch, and develop systems or mechanisms to facilitate escape of wildlife from the pipeline trench in the event wildlife becomes trapped.
26	Pollution Control - AGDC would perform its activities in accordance with applicable air and water quality standards and related facility siting standards and plans. In areas where a lease is required from the SPCS or a federal grant of ROW is required from BLM, mobile ground equipment would not be operated in or on lakes, streams, or rivers on state/federal land unless approved by SPCS/BLM. Refueling of excavation equipment would take place at least 100 feet from any surface waterbody. AGDC would implement a preapproved SPCC Plan, as required by 40 CFR 112 to prevent discharges of oil to waters of the U.S.
16	Locate fueling and fuel storage at least 100 feet from streams and waterbodies. When conditions require refueling within 100 feet of waterbodies, the contractor must implement a preapproved SPCC Plan.
133	Where requested by the landowner, public access to the ROW would be limited for recreation or hunting by blocking entry areas with large boulders, berms, or fencing.
177	The buried pipeline would be designed to minimize changes to the thermal stability of the surrounding soil and water, and any associated waterbodies, which would in turn protect important bird habitat.
	FISH
70	Title 16 Permits - Temporary or permanent culverts in fish streams would require when permanent access roads cross fish-bearing streams. Title 16 permits from ADF&G would be in place and are required to maintain fish passage. Ice road construction across fish-bearing rivers and streams would also require a Title 16 Permit. These permits generally require mitigation measures and the use of Best Management Practices to minimize impacts to fishery resources.
71	Blasting - ADF&G would apply Blasting Standards stipulations to both anadromous and resident fish stream crossings, as required by AS 16.
73	Fisheries Contaminant Prevention - No freeze depressants would be discharged into any streams. To the maximum extent practicable, material storage, refueling activities, fueling, and related liquid storage areas would be located at least 100 feet from the bank of a fish stream.
74	Waterbody Crossing Methods - Open-cut isolation methods using flumes would only be used in waterbodies with flows that would not exceed the capacity of the flume. Open-cut isolation crossings using pumps would only be used for stream crossings where pumps could adequately transfer streamflow volumes around the work area and there are no concerns about sensitive species passage. For open-cut isolation methods, appropriate fish screening to minimize entrapment of fishes would be used. Stream simulation culverts, at least as wide as the crossing site, would be used at all road crossings too small to feasibly construct a bridge, in accordance with ADF&G consultation.
75	Fishway Required and Protection of Fish and Game Statues - The Applicant would comply with the requirements of Alaska Statutes (AS§16.05.841, Fishway Required, and AS §16.05.871, Protection of Fish and Game) regarding proposed Project-related winter ice-bridge crossings and summer ford crossings of all anadromous and resident fish streams. If necessary for winter ice-bridge crossings, natural ice thickness could be augmented (through snow removal and water application to increase ice thickness, or other techniques) if site-specific conditions, including water depth, are suitable for a crossing that would protect fish habitat and maintain fish passage. Maintain, to the maximum extent practicable, existing temperature and stream hydrologic regimes at fish stream crossings.

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76	HDD Drilling - Stream crossings using HDD would have the entry and exit workspaces set back at least 50 feet from the waterbody to reduce the risk of drilling mud entering the stream. HDD drilling mud and slurry would be stored away from the waterbody in tanks, behind earthen berms, or by other methods that would prevent it from flowing off the work area. HDD activities would be continually monitored to immediately detect if any inadvertent release of drilling mud has occurred. After installation of the proposed pipeline, the HDD drilling mud would be disposed of according to applicable regulations
77	Docking and Ballasting Barges at Dock Head 3 - To stabilize the barges during offload at DH3, barges would be ballasted to the seafloor. This would require internal barge compartments to be filled with seawater by using portable pumps and hoses inserted into utility holes on the barge decks. Stability would be verified before the modules are offloaded.
78	Dredge Disposal - Winter disposal would coincide with winter dredging activity. Winter activities would eliminate potential impacts to or conflicts with migratory animals (birds and marine mammals), subsistence activities, and migratory fish routes. AGDC would seek and adhere to appropriate mitigation measures for polar bear and ice seals as indicated in the ASAP Biological Assessment (Appendix N, Part II) and would acquire needed permits and authorizations directed by the jurisdictional agencies.
79	Dredging and Screeding - Comply with any USACE requirements for sediment testing and disposal. Ensure that disposal sites are properly managed (<i>e.g.</i> , disposal site marking buoys, inspectors, the use of sediment capping and dredge sequencing) and monitored (<i>e.g.</i> , chemical and toxicity testing, benthic recovery) to minimize impacts associated with dredge material. Dredge the marine area through the ice during the winter to minimize sedimentation effects on water quality.
80	Erosion Control - To minimize erosion after the design grade is obtained, cut slopes would be stabilized immediately, and stream banks would be returned to as close to pre-construction conditions as possible. AGDC would collaborate with ADF&G to apply appropriate in-stream bank erosion structures to provide post-construction bank stability and minimize erosion. Bank and bed scour protection would be installed after the proposed pipeline is installed, as part of the trench backfilling. To protect stream banks and beds from scour erosion, site specific BMPs would be implemented based on scour and erosion potential at each site. Routine inspections would be used to identify areas of erosion, exposed pipeline, and nearby construction activities, to allow for early identification of bank stability problems and minimization of the potential for continuing environmental effects during pipeline operation.
81	Fish Passage - In areas where a lease is required from SPCS or federal grant of ROW from BLM, all proposed pipeline activities would be conducted as to assure free passage and movement of fish in streams designated by SPCS/BLM, in consultation with ADF&G. Temporary blockages of fish necessitated by in stream activities would be approved by ADF&G. Pump intakes would be screened to prevent harm to fish and screening specifications approved by SPCS/BLM. When abandoned, water diversion structures would be removed or plugged and stabilized unless otherwise approved by SPCS/BLM. If material sites are approved adjacent to or in certain lakes, rivers, or streams, SPCS/BLM may require AGDC to construct levees, berms, or other suitable means to protect fish and fish passage and to prevent siltation of streams or lakes.
82	Fish Spawning Beds, Rearing Areas, and Overwintering Areas - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, AGDC would protect fish spawning beds, rearing areas, and overwintering areas from sediment where soil material is expected to be suspended in water as a result of proposed pipeline activities. Settling basins or other sediment control structures would be constructed and maintained to intercept sediment before it reaches rivers, streams, or lakes. AGDC would comply with site-specific terms and conditions imposed by SPCS/BLM to protect fish spawning beds, rearing areas, and overwintering areas, and overwintering areas from the effects of proposed pipeline activities. Damage caused by AGDC's proposed pipeline activities would be repaired to the reasonable satisfaction of SPCS/BLM. AGDC would avoid disturbance to fish spawning beds, rearing areas, and overwintering areas designated by SPCS/BLM. However, where disturbances could not be avoided, proposed modifications and appropriate mitigation measures would be designed by AGDC and approved by SPCS/BLM. Consult with ADF&G to avoid disturbance and sedimentation to fish spawning beds, rearing areas, and overwintering areas.
83	GCF Module Offload - A rotational three-barge offload would be implemented to minimize the total offload time and reduce environmental impacts: as one barge is preparing to dock and offload, another would be offloading, while a third would have completed offloading and would be demobilizing to make room for the next inbound barge. Before the SPMTs are put into operation, all components would be checked for leaks and pressure-tested to the maximum operating pressure. Hoses would be wrapped in absorbent material, and drip trays would be placed under the power packs. Extra absorbent material and absorbent booms would be available for each SPMT unit used while in transit.
85	Material Extraction - One material site location was requested by ADF&G to provide a launch location for a boat ramp. Acute temporary impacts to hydrology and fish habitat would be mitigated by scalping rather than digging deep holes, unless otherwise authorized by ADF&G.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
86	<p>Material Mining - Outside of the North Slope, material sites would not be developed in riparian areas and floodplains providing habitat for EFH species, where possible. On the North Slope, the Sagavanirktok River floodplain is the only riverine material site being considered by the proposed Project. AGDC has worked with ADF&G on the possibility of developing sites on the Sagavanirktok River. There is existing access to these sites where material has been previously impacted. If allowed, development here would only occur under the strict guidance of ADF&G and ADNR; if permitted, the proposed Project would follow all mitigative measures required by these overseeing agencies to protect riparian areas and fish habitat. Material sites located in floodplains should not result in fish access habitats where entrapment and desiccation would likely occur. All floodplain material sites would be sloped and day-lighted to allow fish to leave the site. Any material removal and gravel mining from dewatered gravel bars of large river systems should avoid mining in flowing waters, active channels and hyporheic zones of these rivers. All gravel mining below the ordinary high water level of any fish bearing rivers would be coordinated with ADF&G and would comply with all ADF&G permit conditions and stipulations to protect EFH. Monitor turbidity for in water activities during critical fish life history stages and cease operations if turbidity exceeds predetermined threshold levels. Restore natural contours and use native vegetation to stabilize and restore habitat function to the extent practicable. Monitor the site for an appropriate time to evaluate performance and implement corrective measures if necessary. Minimize the aerial extent of ground disturbance (<i>e.g.</i>, through phasing of operations) and stabilize disturbed lands to reduce erosion.</p>
87	<p>Pile Installation Impact Mitigation - Vibratory and impact pile driving would both occur at West Dock. AGDC would attempt to maximize the following mitigations:</p> <ul style="list-style-type: none"> o Install pilings through the ice in the winter to minimize potential effects on water quality. o Install hollow steel piles with an impact hammer at a time of year when larval and juvenile stages of fish species with designated EFH are not present.
89	<p>Pile-driving at DH3 & Causeway - AGDC would adhere to all conditions described in permits or authorizations from the Services, including mitigations for winter activities that including pile driving, dredging, and transport of heavy equipment or dredge spoils over sea ice.</p>
90	<p>Pipeline Alignment - The pipeline alignment changes and new streams and wetlands studies have resulted in the elimination of several anadromous fish stream crossings for the revised alignment.</p>
92	<p>Stream Bank Protection - During construction, every effort should be made to minimize impacts to the active floodplain and channel, thereby reducing the level of site reclamation.</p> <ul style="list-style-type: none"> • To mitigate potential impacts to the proposed pipeline and restore local hydraulic conditions and habitat, bank restoration and protection would be required for trenching modes. • All stream banks should be restored to as near pre-construction conditions as possible. The stream bank elevation should be re-established to tie into existing grade. If practicable, stream banks would be stabilized and temporary sediment barriers installed within 24 hours of completing the pipeline crossing. • Ensure that erosion and sediment control measures are implemented and functional until long-term bank stabilization has been established. In thaw unstable soils where permafrost and ice lenses persist, incorporate thermal barriers as quickly as possible to inhibit thermal erosion and seepage into the proposed pipeline ROW. • Stream crossing design would not rely on bank armoring or river training works to maintain proposed pipeline integrity without substantive reasoning, such as impractical overbank construction, presence of adjacent facilities, or environmental concerns. • If conditions dictate (<i>e.g.</i>, excessively steep, unstable banks or excessive flow velocities), engineered bank protection may be required. All engineered bank protection should be designed by the proposed Project Engineer in consultation with a qualified fluvial geomorphologist and/or qualified fish biologist. • Natural materials, with a preference toward bio-engineered techniques would be implemented in engineered structures wherever feasible for stream bank stabilization following a stream cut.
94	<p>Construction Mitigation to Fisheries Impacts -</p> <ul style="list-style-type: none"> • Each water crossing of a fish stream would require a Fish Habitat Permit from the ADF&G. The Applicant would comply with site-specific ADF&G permit stipulations designed to protect fish and fish habitat. • In-stream pipeline construction would be completed in one-to-three days from initiation. • Necessary in-water activities would be scheduled when the fewest species/least-vulnerable life stages of federally managed species would be present.
95	<p>Vessel Operations -</p> <ul style="list-style-type: none"> • Minimize contamination from ship bilge waters, antifouling paints, shipboard accidents, shipyard work, maintenance dredging and disposal, and nonpoint source contaminants from upland facilities related to vessel operations and navigation. • Maintain the barge-bridge system in place the minimum time period needed to offload the modules each open water season.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
96	Wastewater Discharge - Wastewater discharge locations would be planned at locations that avoid waterbodies and during periods that minimize potential impacts to fishery resources. Hydrostatic testing would occur in a manner that eliminates the potential for freeze depressants to be inadvertently discharged into a fish-bearing waterbody, as none would be used.
97	Waterbody Crossing - Waterbody crossings would be accomplished using several different crossing techniques including bridges, culverts, HDD, and open trenching. For all fish bearing waterbodies, ADF&G would require a Fish Habitat Permit approving the crossing type. The permit would include stipulations specific to each individual crossing.
100	Winter Water Withdrawal - Screens would be used on withdrawal intakes to minimize fish uptake; appropriate federal and state guidelines would be followed to determine screen sizes.
102	<p>Management of Fishery Impacts -</p> <ul style="list-style-type: none"> • Activity schedules would be coordinated with ADF&G to minimize impacts to fisheries resources. • A Fish Habitat Permit from ADF&G may be required for any blasting operations that occur either in or near the banks of a fish-bearing waterbody, as determined by AS 16 jurisdiction. • To minimize potential effects on fishery resources, construction activities would comply with all ADEC water quality regulations. • ADF&G and fisheries scientists would be consulted on installation of access road culverts and bridges, West Dock impacts, and proposed pipeline stream crossings. AGDC would be required to obtain a Fish Habitat Permit from ADF&G and would refer to ADF&G guidance documents for the design and maintenance of stream crossing structures.
178	Logging near streams: Remove all debris that may block stream flow, delay fish passage, contribute to flood damage, or result in a streambed scour or erosion. Logs would not be skidded across any watercourse without approval. No log storage within 300 feet of any watercourse except with approval from the SPCS.
179	Minimize the effects of sedimentation on fish habitat. Use methods such as the construction of settling ponds and curtains to control sediment transport.
180	Avoid constructing crossings where redds (nests of fish eggs) are present; implement standard BMPs to ensure protection of any downstream habitats.
181	Timing, location and mode of stream crossings would be selected, to the degree practicable, as determined by AGDC, to minimize impacts to fish and fish habitat.
194	Site material sites with input from ADF&G, where appropriate; duration of disruption of surface water flows would be minimized
MARINE MAMMALS	
103	<p>Whale Mitigation Measures - Avoid concentrations of groups of whales by all vessels. Avoid multiple changes in direction and speed when within 300 yards (274 m) of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales would be injured. Vessels would reduce speed to below 10 knots when within 300 yards (274 m) of whales, and those vessels capable of steering around such groups would do so. Vessels would reduce speed when weather conditions require, such as when visibility drops, to avoid the likelihood of injury to marine mammals.</p> <ul style="list-style-type: none"> • If a North Pacific right whale is observed at a distance greater than 800 m (874 yards [yd]) from the vessel's intended course line, or other marine mammal is observed within 91 m (100 yd) of the vessel's intended course line, monitoring of the marine mammal(s) location will continue, and for whales, the direction of the vessel will be altered to maintain these minimum distances from the observed whale(s). Course alterations made to avoid cetacean disturbance will be made in a manner that avoids sudden changes in revolutions per minute (RPM) and cutting in front of their direction of travel. • If a North Pacific right whale is observed within 800 m (874 yd) of the vessel's intended course line, or other whale species is observed within 274 m (300 yd) of the vessel's intended course line, vessel speeds will be reduced to no greater than 5 knots, sea conditions permitting, to minimize the risk of injurious collision. While avoiding collisions with marine mammals may necessitate sudden changes in vessel RPM and heading, course alterations made to avoid marine mammal disturbance will be made in a manner that avoids sudden changes in RPM and cutting in front of their direction of travel. Vessel speed may resume to normal operating speed when North Pacific right whales are greater than 800 m (874 yd) and other whale species are greater than 274 m (300 yd) from the vessel and its intended course. • The vessel operator will avoid: i) direct approach of whales; ii) separating members of any group of whales from other members of that group; iii) causing a whale of any species to make multiple changes in direction. • If the vessel is taken out of gear, vessel crew will ensure that no whales are within 50 m of the vessel when propellers are re-engaged, thus minimizing risk of marine mammal injury.
104	Marine Mammal Subsistence - Provide USFWS with a Plan of Cooperation that ensures that activities would not interfere with polar bear subsistence hunting and that adverse effects on the availability of marine mammals are minimized. Consult with potentially affected communities and appropriate subsistence user organizations to discuss potential conflicts with subsistence marine mammal hunting caused by the location, timing, and methods of proposed operations and support activities.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
106	Marine Mammal Observer - Designate a qualified individual or individuals to observe, record, and report on the effects of proposed Project activities on polar bears and Pacific walrus and other marine mammals. Report the results of specified monitoring activities to USFWS and NMFS.
107	Marine Mammal Reporting - AGDC would consult with NMFS and USFWS regarding the need for an authorization for incidental harassment (<i>i.e.</i> , either an Incidental Harassment Authorization [IHA] or LOA under the Marine Mammal Protection Act [MMPA], depending on the duration and type of activities covered). If required, an IHA or LOA would include additional mitigation measures to reduce the potential for impacts to marine mammals due to incidental or intentional (polar bears only) harassment, as defined under the MMPA.
108	Hazardous Waste Mitigation - Transport hazardous wastes off vessel for disposal at an approved facility.
	Ice Road Mitigation Measures - Initiate construction of all ice roads and ice pads before March 1. If construction of ice roads or pads is initiated after March 1, an agency-approved method would be used to conduct surveys for ringed seal dens prior to construction work.
200	<p>AGDC vessels would adhere to several applicable marine mammal-disturbance reduction guidelines. While transiting through the region near Dutch Harbor or in North Pacific right whale critical habitat, vessel operators would either: avoid the critical habitat area or bring trained observers onboard and reduce speed to 10 knots, or reduce speed to 5 knots without trained observers onboard.</p> <ul style="list-style-type: none"> • The proposed Project activities would not approach Pacific walrus on ice or land closer than 805 m (0.5 mile). • If a polar bear is observed in the water, within 305 m (1,000 feet), vessels would reduce speed and avoid changes in direction or excessive movement. • Vessels would stay at least 100 m away from any whale seen on the ship's trackline. • Vessels would deviate around a whale encountered on the trackline by going around the whale at the rear or tail end of the animal. • If a whale approaches the vessel and if maritime conditions safely allow, the engine would be put in neutral and the whale would be allowed to pass beyond (>100 m) the vessel. • Initiate construction of all ice roads and ice pads before March 1. If construction of ice roads or pads is initiated after March 1, an agency-approved method would be used to conduct surveys for ringed seal dens prior to construction work. <p>A protected species observer (PSO), able to accurately identify and distinguish species of Alaska marine mammals, would be present before and during all in-water construction activities.</p>
201	<p>Underwater Noise -</p> <p>AGDC would implement a monitoring strategy to shut down activities if marine mammals are approaching the zones/distances to NMFS thresholds for Level A and B underwater and airborne noise:</p> <ul style="list-style-type: none"> • The distances for impact pile driving to the Level A peak thresholds are less than 5 m (16 feet) from the source. • The distances to the Level A thresholds for vibratory pile driving are approximately 1,500 m (4,921 feet) and less than 50 m (165 feet) for all non-pile driving activities. Received airborne levels would be less than 100 dB threshold at less than 50 m (165 feet) from the source. • The distance to the Level B threshold for impact pile driving is approximately 1.1 km from the source, and approximately 2.2 km (7,218 feet) for vibratory pile driving, and is less than 180 m (591 feet) for all other non-pile driving activities. • Underwater sound levels from all activities are below NMFS thresholds at a distance of 2.2 km (7,218 feet) from the source, and sound levels are likely to diminish to background levels at less than 5 km (16,404 feet or 3.1 miles) from the source. <p>Pile-driving would not be conducted when visible observation of all waters within and surrounding the exclusion zone is not possible. If crews must be working during periods of darkness or bad weather, an additional PSO would be placed further up the causeway (<i>e.g.</i>, at DH3 or STP) to ensure coverage of the entire zone and to provide a greater extent of visibility. In addition, during activities conducted at night, artificial lights directly around the observer would be kept absent or low, so that natural light reflecting off the ice or the surface of the water would allow for identification of the presence or absence of cetaceans or pinnipeds within the exclusion zone. Additional details on the observer protocols is provided in Appendix N, Part II (Biological Assessment).</p>
	BENTHIC
193	Dredged materials would be placed on top of the ice in the nearshore areas and enter the water column intermittently as nearshore ice melts in the summer.
196	Minimize contamination from ship bilge waters, antifouling paints, shipboard accidents, shipyard work, maintenance dredging and disposal, and nonpoint source contaminants from upland facilities related to vessel operations and navigation.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
	THREATENED AND ENDANGERED SPECIES
113	<p>Polar Bears - The proposed Project would include implementation of the following measures to reduce and eliminate interaction with proposed Project personnel and polar bears:</p> <ul style="list-style-type: none"> • Reduce/eliminate polar bear attractants. • Choose the harassment method that would have the least effect on the polar bear and increase the intensity of the method or use additional methods of harassment only, if necessary. • Ensure polar bear has escape route(s) prior to conducting harassment activity. Shout at the bear as a method of harassment before using a projectile. • Monitor polar bear movement after harassment. • Implement a 24-hour monitoring plan to record and observe polar bears in the area to minimize polar bear and human interactions, thereby reducing the potential for take. • Train operation and construction crews regarding polar bear awareness. • Shout at the polar bear as a method of harassment before using a projectile. • Report all observations of polar bears during any industry operation to the assigned USFWS biologist (or other applicable authority designated by USFWS).
114	<p>Polar Bear Denning Mitigation Measure - Prior to any winter route clearing or maintenance, clear the area for polar bear dens:</p> <ul style="list-style-type: none"> • Make efforts to locate occupied polar bear dens within and near proposed areas of operation, utilizing appropriate tools, such as, forward looking infrared (FLIR) imagery and/or polar bear scent-trained dogs and report polar bear dens to USFWS prior to the initiation of activities. • Cease work in the immediate area of previously unknown occupied polar bear dens and contact USFWS for guidance. • Observe a 1-mile operational exclusion zone around all known polar bear dens during the denning season (November-April) or until the female and cubs naturally leave the areas. • Use a setback for winter vibratory hammering to protect polar bear.
155	<p>Lighting - During final design stages of the proposed Project, AGDC would coordinate with USFWS with regards to birds and lighting, while taking into account the lighting safety requirements for operators.</p>
182	<p>Prioritize placement of gravel on the ACP and at West Dock during the winter months when possible to reduce impacts to birds during nesting season (<i>e.g.</i>, Steller's eider [<i>Somateria fischeri</i>] or spectacled eider [<i>Polysticta stelleri</i>]). Additionally, migrating whales are not in the area during winter dredging activities, thereby reducing potential conflicts with whaling activities. Winter sea ice also mitigates the potential of an excavation turbidity plume.</p>
	<p>Pile-driving would not be conducted when visible observation of all waters within and surrounding the exclusion zone is not possible. If crews must be working during periods of darkness or bad weather, an additional PSO would be placed further up the causeway (<i>e.g.</i>, at DH3 or STP) to ensure coverage of the entire zone and to provide a greater extent of visibility. In addition, during activities conducted at night, artificial lights directly around the observer would be kept absent or low, so that natural light reflecting off the ice or the surface of the water would allow for identification of the presence or absence of cetaceans or pinnipeds within the exclusion zone. Additional details on the observer protocols is provided in Appendix N, Part II (Biological Assessment).</p>
	<p>AGDC would have an approved SPCC Plan before construction. The SPCC Plan would be developed in accordance with all pertinent regulations and would follow BMPs. The SPCC Plan would identify material handling procedures and storage requirements and outline the actions to reduce spill potential.</p>
	<p>AGDC would consult with NMFS and USFWS regarding the need for an authorization for incidental harassment (<i>i.e.</i>, either an Incidental Harassment Authorization [IHA] or LOA under the Marine Mammal Protection Act [MMPA], depending on the duration and type of activities covered). An IHA or LOA would include additional mitigation measures to reduce the potential for impacts to marine mammals due to incidental or intentional harassment, as defined under the MMPA.</p>
	<p>Consult with potentially affected communities (PACs) and appropriate subsistence user organizations to discuss potential conflicts with subsistence marine mammal hunting caused by the location, timing, and methods of proposed operations and support activities.</p>
	<p>Hazardous Waste Mitigation - Transport hazardous wastes off vessel for disposal at an approved facility.</p>
	LAND USE
122	<p>Land Ownership - A highway use agreement would be in place prior to construction, and would be an agreement between AGDC and ADOT&PF for how impact to infrastructure caused by construction would be mitigated.</p>
123	<p>Maintenance Access - In areas where a lease is required from SPCS or federal grant of ROW is required from BLM, AGDC would provide and maintain access roads and airstrips, the number and location of which shall be approved by SPCS/BLM, to ensure that AGDC's maintenance crews and representatives would have continued access.</p>

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
124	Off Right-of-Way Traffic - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, AGDC would not operate mobile ground equipment off of the leased area, access roads, highways, or authorized areas, unless approved by SPCS/BLM or when necessary to prevent harm to any person.
125	Public Access - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, AGDC would regulate or temporarily prohibit public access and vehicular traffic on roads on public land, which are not managed or owned by the Alaska Department of Transportation and Public Facilities, as required for activities in the immediate vicinity of the proposed pipeline and related facilities. AGDC would provide appropriate warnings, flagging, barricades, and other safety measures when AGDC is regulating public areas. AGDC would make provisions for suitable permanent crossings for the public where the ROW crosses existing roads, foot trails, winter trails, easements, or other right of way, unless otherwise authorized by SPCS/BLM.
126	Public Improvements - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, AGDC would protect existing telephone and other transmission lines, roads, trails, fences, ditches, and like improvements during construction, operation, maintenance, and termination of the proposed pipeline. Any damages caused by AGDC to public utilities and/or improvements would be promptly repaired by AGDC to a condition which is reasonably satisfactory to SPCS/BLM.
127	Reduce Unintended Public Access - Where requested by the landowner, limit public access to the ROW for recreation or hunting by blocking entry areas with large boulders, berms, or fencing.
128	Surveillance and Monitoring - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, a surveillance and monitoring program for the proposed pipeline would be approved by SPCS/BLM prior to start-up of the proposed pipeline. The program shall be designed at a minimum to protect public and private property.
129	Waste Management - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, All waste generated in construction, operation, maintenance, and termination of the proposed pipeline would be removed or otherwise disposed of according to all local, state, and federal laws, and in a manner reasonably acceptable to SPCS/BLM.
130	ADEC Contaminated Sites - AGDC has committed to avoiding the known contaminated site areas described in Chapter 3 and any newly discovered contamination would be reported to the ADEC in accordance with their reporting requirements and handled in a manner to avoid transport of contaminated materials.
122	Prior to construction, AGDC would enter into a comprehensive agreement with ADOT&PF for the use of highways and other facilities under the jurisdiction of ADOT&PF.
184	Where a lease is required from SPCS or a federal grant of ROW is required form BLM, the creation of any permanent obstruction to the passage of small craft in streams is prohibited, unless otherwise approved by the SPCS/BLM.
185	After construction is complete, with the concurrence of AGDC, the SPCS/BLM may designate areas of the Leasehold to which the public shall have free and unrestricted access.
195	For road crossings where the proposed pipeline cannot be installed by HDD, a trench would be excavated. In such cases, a temporary bypass or bridge would be built to minimize the effects to traffic flow.
	RECREATION
132	Impacts on Recreation and Tourism - These measures may be related to restricting access, avoiding high-use periods and areas, and coordinating between the public and the recreation and tourism industry.
133	Reduce Unintended Public Access - Where requested by the landowner, limit public accessing to ROW for recreation or hunting by blocking entry areas with large boulders, berms, or fencing.
135	<p>Recreation Impact Mitigations - AGDC would implement the following mitigation measures that address the effects on tourism and recreations use areas:</p> <ul style="list-style-type: none"> • Retain existing public access routes and uses • Minimize activities in areas with tourist-related facilities during high use periods to the extent practicable • Minimize activities in areas with public recreation facilities during high use periods to the extent practical • Minimize creating new public vehicular access to remote areas • Minimize impacts to the existing natural landscape to the extent practicable • Schedule preconstruction work to minimize activity during peak periods of tourism and recreation • Conduct early and continuing consultation with the public, tourism, and recreation businesses • Collocate with existing and planned transportation and utility system where practicable • Explore potential for enhanced recreation opportunities such as trails with local communities and landowners
186	Cross the Yukon River via HDD, and evaluate crossing the Putuligayuk River, Susitna River, Montana Creek, and the Nenana River via existing or new bridge structures

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
	VISUAL
136	Visual Impacts to Property and Environmental Sites - Mitigation measures include; providing minimum offsets, and possibly fencing of significant environmental resources, limit or minimize the permanent ROW, but ensure adequate size to accommodate operations, maintenance, and future expansion, limit the construction ROW, application of trenchless construction methods in certain areas.
137	Visual Impact Mitigations - These measures would include: <ul style="list-style-type: none"> • Minimize the Construction of new permanent access roads by using snow-ice roads during construction • Restore the construction zone in a manner that facilitates reestablishment of the adjacent natural vegetation • Use root balls, salvaged native plant materials, and the surface layer removed from the construction footprint for redistribution on disturbed areas where feasible. The surface layer would not be segregated from subsoils in most locations. • Maintain a screening of existing natural vegetation when the proposed pipeline is offset from a highway • Use existing disturbed areas to the maximum extent practicable for temporary construction activities such as construction camps, material stockpiling, pipe jointing, and pipe bending • Minimize locating pipeline facilities, new material sites, and construction material stockpiling in places with special visual resource values that would be visible to the public • Blend the pipeline system into the natural setting to the extent practicable when crossing places with high visual resource value • Use revegetation species that are appropriate for the general area • Re-grade construction disturbances to a condition that blends with the surrounding terrain and surface drainage patterns • Monitor reclaimed, disturbed construction areas and take remedial action where expected revegetation success is not achieved
162	For temporary and permanent facilities, use the minimum lighting intensity necessary to ensure safety, use localized task lighting, and incorporate measures (such as diffusers, lenses, and shielding) to reduce nighttime glare, light radiation, and backscatter into the sky.
163	For permanent aboveground facilities, select paint colors that blend into the background, including different shades of green, brown, or grey.
	SOCIOECONOMICS
138	Socioeconomic Impact Mitigations - AGDC proposes to implement the following mitigation measures to address the effects on socioeconomics: <ul style="list-style-type: none"> • Time construction activities to minimize impacts to high-use tourist and local recreation seasons (<i>e.g.</i>, wildlife viewing, hunting, snow machining, and dogsledding) • Time construction activities to minimize impacts to local business (<i>i.e.</i>, avoid summer and fall construction in recreational and tourist areas) • Develop and implement traffic control plans to minimize negative impacts to local businesses by blocking access during construction • Identify and promote work opportunities for local residents • Develop training programs for local residents so that they could be employed during construction and O&M
164	Avoid locating construction support facilities (<i>e.g.</i> , construction camps) in places with special visual resource values that would be observable to the general public, which would reduce the visual impact of these facilities and any associated impacts on private property value (UASCE, 2012a).
	SUBSISTENCE
140	Subsistence Whaling - AGDC would coordinate with whaling groups and agencies to employ appropriate mitigation measures to avoid and minimize disturbance of noise and vessel traffic to subsistence species and activities. AGDC would work with communities to discuss additional mitigation for barge traffic during subsistence timeframes.
142	Hunting, Fishing, Trapping, and Camping - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, with respect to AGDC's agent, employees, contractors, and the contractors' employees, AGDC would prohibit hunting, trapping, shooting, and camping within the leased area. The agents, employees, contractors of AGDC would not use proposed Project equipment, including transportation to and from the job site, for the purpose of hunting, fishing, shooting, and trapping.
143	Subsistence Activity Impact Mitigations - These include: <ul style="list-style-type: none"> • Identify locations and times when subsistence activities occur, and minimize work during these times and in these areas to the maximum extent practicable • Schedule work (<i>e.g.</i>, blasting) to avoid conflict with subsistence activities when possible • Notify workers that subsistence activities are ongoing in the area and direct them to avoid activities that may affect the activities (<i>e.g.</i>, not removing trap line markers)
144	Construction Mitigation to Subsistence Impacts - Time construction activities to minimize impacts to subsistence activities where possible. AGDC would work with communities to discuss additional mitigation for barge traffic during subsistence timeframes.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
187	Biological Assessment Mitigation Measure - AGDC would consult with potentially affected communities and appropriate subsistence user organizations to discuss potential conflicts with subsistence marine mammal hunting caused by the location, timing, and methods of proposed operations and support activities (AGDC, 2017b). Additionally, the ASAP Biological Assessment is provided as Appendix N, Part II.
PUBLIC HEALTH	
145	Surveillance and Monitoring - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, a surveillance and monitoring program for the proposed pipeline would be approved by SPCS/BLM prior to start-up of the proposed pipeline. The program shall be designed at a minimum to provide for and protect public health and safety.
202	Hazards and Incidents - In areas where a lease is required from SPCS or federal grant of ROW is required from BLM, AGDC would take all measures necessary to protect the health and safety of all persons affected by its activities performed in connection with the construction, operation, maintenance, or termination of the proposed pipeline, and shall immediately abate any health or safety hazards. AGDC would immediately notify SPCS/BLM of all serious accidents which occur in connection with such activities.
165	Pesticides, Herbicides, Preservatives, and Other Chemicals - In areas where a lease is required from the SPCS or a federal grant of ROW is required from BLM, AGDC would use only non-persistent and immobile types of pesticides, herbicides, preservatives, and other chemicals. Each chemical to be used and its application constraint would be approved by the SPCS/BLM prior to use. Avoid or minimize construction and operational activities during sensitive periods in life cycles such as calving, denning, nesting, and migration. The use of pesticides and herbicides are regulated by ADEC's Environmental Health Division through 18 AAC 90 and may require a permit.
166	<p>Public Access - In areas where a lease is required from the SPCS or a federal grant of ROW is required by BLM, AGDC would regulate or temporarily prohibit public access and vehicular traffic on roads on state land, which are not managed or owned by the ADOT&PF, as required for activities in the immediate vicinity of the pipeline and related facilities. AGDC would provide appropriate warnings, flagging, barricades, and other safety measures when AGDC is regulating public areas. AGDC would make provisions for suitable permanent crossings for the public, where the leasehold or access roads cross existing roads, foot trails, winter trails, easements, or other ROW, unless otherwise authorized by the SPCS/BLM.</p> <p>Pipeline activities shall not interfere with the public's free and unrestricted access to and upon the Leasehold, except that, with the SPCS/BLM approval, regulate or prohibit access, including vehicular traffic, to and upon the Leasehold to the extent necessary to facilitate pipeline activities, maintain pipeline integrity, or to protect the public and wildlife from hazards associated with pipeline activities.</p> <p>After construction is complete, with the concurrence of AGDC, the SPCS/BLM may designate areas of the Leasehold to which the public shall have free and unrestricted access.</p>
167	Off-ROW Traffic - In areas where a lease is required from the SPCS or a federal grant of ROW is required by BLM, AGDC would not operate mobile ground equipment off of the leased area, access roads, state highways, or authorized areas, unless approved by the SPCS/BLM or when necessary to prevent harm to any person.
168	Fire Hazards - In areas where a lease is required from the SPCS or a federal grant of ROW is required by BLM, AGDC would promptly notify the SPCS of any fires on, or which may threaten any portion of the pipeline and shall take all measures necessary for the prevention and suppression of fires in accordance with applicable law. Use of open fires in connection with the pipeline activities is prohibited on state land unless approved by the SPCS/BLM and performed in accordance with state law.
AIR QUALITY, CLIMATE CHANGE, AND GHGs	
146	<p>Management of Air Quality Impacts - Include the following:</p> <ul style="list-style-type: none"> • Implement BMPs during construction activities to mitigate fugitive dust and reduce particulate matter emissions • Use best available control technology (BACT) for combustion equipment to mitigate NOx and CO emissions • Use ultra-low sulfur diesel fuel for construction equipment and non-natural gas combustion equipment (to mitigate SO2 emissions), particulate matter emissions and volatile organic compound (VOC) emissions • Operate all combustion equipment in accordance with manufacturer's specifications to mitigate NOx, CO, VOC, and particulate emissions resulting from incomplete combustion • Maintain emissions control equipment in accordance with manufacturer's specifications to mitigate emissions and maintain emission control efficiency
Implement the use of Tier 4 EPA-certified engines within the FNSB PM2.5 Nonattainment Area	

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
188	At locations where a ROW lease from SPCS or a federal grant of ROW from BLM applies, AGDC would operate all facilities and devices used in connection with the proposed pipeline so as to avoid or minimize air pollution and ice fog. Facilities and devices that cannot be prevented from producing ice fog would be located so as not to interfere with airfields, communities, or roads.
	Dust Suppression - Follow the ASAP Fugitive Dust Control Plan
	NAVIGATION
154	<p>Navigation -</p> <ul style="list-style-type: none"> • HDD proposed at major river crossings such as the Yukon River (Alternative 1 only); • Use of existing vessel shipping lanes and transit routes; • Use of existing bridges for crossing the Nenana and Susitna rivers; • Consultation with federal and state regulatory agencies would occur prior to taking gravel from new material sites located along the Sagavanirktok River; • Approval from USACE and other federal and state regulatory agencies prior to any work in rivers or streams, as required under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the CWA; and • Barges entering the proposed Project area as part of the sealift would be cleaned according to federal and state protocols in order to mitigate against the potential spread of non-native and invasive species.
	RELIABILITY & SAFETY
148	Monitoring Potential Frost Heave - During design the frost heave potential along the alignment would be evaluated using the available route alignment data combined with the line pipe capacities and advanced engineering simulation methodology to explore the potential interaction between the soil subsurface and the pipe during its operational life. To address the differential values along the route, soil displacements and resistance values would be estimated using the landform characteristics along the route derived from the proposed Project geo-database. Periodic monitoring would identify locations that are of concern with respect to the pipe structural integrity.
149	<p>Pipeline Design Mitigation Measures - For the pipeline route segments where the estimated heave potential may exceed the ability of the pipe to withstand the imposed displacement, a number of mitigation options could be employed to reduce the potential for deleterious movement including:</p> <ul style="list-style-type: none"> • Reroute within the alignment corridor to a non-frost-susceptible terrain unit, if available and investigate the subsurface of the suspect terrain segment more closely so as to reduce the conservatism inherent in the station to station approach. • Insulate the pipe ditch to reduce the heat flux through the frost-susceptible soil and increase the pipe wall thickness to increase the resistance of the pipe to ditch displacements, as well as increasing the ability of the pipe to withstand higher displacements. • Over-excavate the frost-susceptible soil beneath the buried pipeline and replace with non-frost-susceptible soils. • Excavate soils with high uplift resistance above the pipe springline and replace with soils with low uplift resistance. • Elevate the pipeline aboveground, placing it in an embankment. Elevating the pipe would reduce or eliminate the heat extracted from the ground and elevate the pipeline aboveground, placing it on overhead supports. Elevating the pipe would eliminate the heat extracted from the ground and uncouple the pipe from the soil resistance. • Heat trace the soil underneath the pipe to counteract frost penetration and emplace stand-alone heat pipes to freeze the soil quickly, reducing the ability of the frost-susceptible soil to cause large soil volume changes.
151	Fire Prevention and Suppression - In areas where a lease is required from SPCS or a federal grant of ROW is required from BLM, AGDC would promptly notify SPCS/BLM of any fires on, or which may threaten any portion of the proposed pipeline and shall take all measures necessary to appropriate for the prevention and suppression of fires in accordance with applicable law. Use of open fires in connection with pipeline activities is prohibited on public lands unless approved by SPCS / BLM and performed in accordance with state or federal law.
	NOISE
189	Schedule pipeline construction within the Denali NPP Route Variation during the late fall or winter, where possible, when there is little commercial and recreational activity to minimize noise impact on recreational visitors and travelers along the Parks Highway. Work along the highway and through the commercial area would not start until after Labor Day and would occur through late November to avoid the majority of the tourist season around the commercial area and the DNP. Summer work would take place from the Nenana crossing at Moody to the Yanert Fork crossing on the east side of the Nenana River, and on the mountainside due to avalanche danger in the winter.
190	Maintain all construction equipment in accordance with manufacturer's specifications.

Mitigation Measure ID	Applicant-Proposed Avoidance, Minimization, Mitigation Measures, and Best Management Practices
191	<p>Implement mitigation measures to minimize construction impacts on recreation and tourism. These measures include:</p> <ul style="list-style-type: none"> • Restrict access (<i>e.g.</i>, AGDC would prohibit hunting, trapping, shooting, and camping in areas where a lease is required from the SPCS); • Minimize or shut down activities in areas with tourist-related facilities during high-use periods (for the Denali NPP Commercial Area, the area would be shut down to summer tourism at the time, so work would continue 24 hours per day next to the highway to complete as soon as possible – construction noise is expected to be masked by the highway traffic noise); • Minimize activities in areas with public recreation facilities during high-use periods; • Minimize creating new public vehicular access to remote areas; • Schedule preconstruction work to minimize activity during peak periods of tourism and recreation; and • Conduct early and continuing consultation with the public, tourism, and recreation businesses.
192	Where requested by the landowner, limit public access to ROW for recreation or hunting by blocking entry areas with large boulders, berms, or fencing.
ALL RESOURCES	
153	<p>SPCS ROW Lease Stipulations/BLM Grant of ROW Stipulations (Draft) - Stipulations are applicable to locations where the proposed Project area crosses state-owned or federally-owned land (Note: the State ROW lease applies to State lands, except Mental Health Trust, University and Railroad land; the federal grant applies to federal land except Denali NPP land (not proposed) and trust land (allotments). AGDC has worked with BLM to develop the federal grant of ROW with similar draft stipulations as the SPCS ROW lease. AGDC would use these stipulations as the basis for operations processes and procedures which would be used throughout the proposed Project area.</p>

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RATIONALE ASAP PIPELINE ROUTE REFINEMENT

Name	MP	Reason	Description
Rustic Wilderness	~MP 700.5	Change in location of the Rustic Wilderness Camp based on landowner input and public comment.	The location for the Rustic Wilderness Camp has been moved from a private parcel at approximately MP 80.5 of the George Parks Highway, south, to a State owned parcel at approximately MP 77.5 of the George Parks Highway. The new camp location is adjacent to the mainline ROW instead of the original location which was off of the mainline ROW. The new camp location would also eliminate the need for access road AR-CAMP-E-697.31 (this particular access road is an existing road). This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Trapper Creek	645.80-655.08	Reroute to avoid larger number of trails on west side of Parks Highway in response to public comments. This alignment is identical to the one finalized for use on AKLNG.	The AKLNG footprint was utilized for the reroute of ASAP. It was assumed that the original engineering for AKLNG was sound and required no additional work. Where ASAP wetlands data were unavailable, AKLNG wetlands data was used. At MP 645.80, the alignment will veer east and cross the George Parks Highway. After crossing the highway, the alignment will parallel the highway on the east side and generally head south until MP 655.08, then cross back to the west side of the George Parks Highway and rejoin the alignment. The new alignment will cross the same streams as the original alignment, but at a location further downstream. The two northern most stream crossings are more incised on the new alignment than the original. The new alignment will add 5 access road segments and delete two access road segments.
Willow Pipe Storage Yard	~ MP 707	Change in location of the Willow PSY based on public comment.	The location for the existing Willow PSY is directly adjacent to a feeder for the Lucky Shot Trail. While the current location does not intersect the trail, it is directly adjacent to the trail. The new location for the Willow PSY will utilize the same parcel, but will move the PSY approximately 150' to the west, leaving a 150' vegetative buffer between the end of the PSY and the feeder trail. The access road as it currently shows in the footprint will not have to be changed with this proposed location change of the PSY. The new location meets the intent of the public comment which was to not block the feeder trail access to the Lucky Shot Trail. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Prospect Camp and Pipe Storage Yard	~ MP 278	Change in location of the Prospect Camp and PSY to reduce environmental impacts.	The current location for the Prospect Creek Camp and PSY was inadvertently placed onto a riverine wetland feature. The new location proposed for the Prospect Creek Camp and PSY is southwest of the current location by approximately 2,000 feet. The small segment of access road AR-CAMP-YD-N-277.83 has been eliminated and an additional, longer segment has been added to access road AR-CAMP-YD-N-277.82 for Camp and PSY access. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Nenana Native Allotments	~ MP 471	An HDD False Right of Way encroaches on two abutting Native Allotments.	Currently, the HDD False Right of Way for the Nenana River HDD overlaps two native allotments that abut each other. The proposed change will trim the edge of the HDD False Right of Way to not encroach on the Native Allotment Parcels. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Reroute near MP 684.5	684.19 to 684.62	Reroute to avoid larger cut/fill at corner of parcel.	The parcel owner requested that the pipeline not cross the parcel at the north west corner of the parcel. The owner also stated that the pipeline could cross the parcel further south on the parcel. The pipeline was rerouted south to the maximum extent while still allowing sufficient room from construction. The reroute also allowed a much less oblique approach to the bluff at the north end of the route revision. This reroute does not affect any new landowners.

RATIONALE ASAP PIPELINE ROUTE REFINEMENT

Name	MP	Reason	Description
Kashwitna HDD	~ MP 694	An HDD False Right of Way encroaches private parcel.	Currently, the HDD False Right of Way for the Kashwitna River covers a home on a private parcel. This parcel has a bluff on the south side, and the low area at the bottom of the bluff would be used for the HDD False ROW. The HDD False ROW for the Kashwitna River HDD has been trimmed to be coincident with the bottom of the bluff. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Titan Parcel	732.51 to 732.99	Reroute to avoid larger cut/fill at corner of parcel.	The parcel owner requested that the pipeline not cross the parcel due to planned expansion of the Titan plant. The proposed reroute turns east earlier and avoids the private parcel in question. This reroute does not affect any new landowners.
ADOT/PF Parks Hwy Above Grade Rail Crossing	~ MP 581	Alaska Department of Transportation and Public Facilities - George Parks Highway Above-Grade Rail Crossing highway alignment change.	Because of the George Parks Highway reroute at approximately MP 194, the access road AR-RS-N-580.86 is no longer required because it does not connect to the highway. The solution was to delete the access road AR-RS-N-580.86. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Fairbanks Operations and Maintenance Base	Near intersection of Parks Highway and Geist Road in Fairbanks	Comments received by AGDC have requested AGDC find a new location for the Fairbanks Operations and Maintenance Base.	The Fairbanks Operations and Maintenance Base was originally proposed to be located on University of Alaska Fairbanks property at the corner of Yankovich Road and Miller Hill Road. The new proposed location is a University of Alaska property which is available for development at the corner of Geist Road and the George Parks Highway. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
Sea Ice Access Road	West Dock (~MP 0)	NMFS requested AGDC include the sea ice access road and areas vehicles would drive (i.e., additional sea ice work pad) adjacent to the dredge and disposal sites for the West Dock work.	Additional workspace and a connecting road are required between the dredge site at West Dock, and the dredge disposal site. A sea ice road was placed between the west dock dredging site sea ice pad and the disposal site sea ice pad. This access road was added, and an existing access road was utilized for project travel to allow access to the disposal site without requiring driving to West Dock, then driving down the sea ice road to the disposal site. The intent of the sea ice road was to keep this access road on grounded sea ice as much as is practicable. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.
MP57-62 ROW Construction Mode	~ MP 57-62	Right of Way construction mode was changed from MP 57 to MP 62 to reduce Environmental Impacts. The GIS also now shows reduced permanent wetlands impact from 32 feet wide to 9 feet wide from MP0 to MP57 (and now to MP 62), in accordance with expected impacts	The Tundra Ice Workpad Typical Right of Way construction mode has been extended from MP 57 to MP 62. An additional 5 miles of ice workpad will replace Gravel Pad Typical Right of Way mode. The intent of this change is to reduce the permanent wetland impact of the pipeline in the Arctic Coastal Plain. In accordance with these changes, gravel access road AR-N-57.06 changes to ice road and gravel access road AR-BV-N-60.06 changes to ice road. In addition, the GIS now shows the 32 feet permanent impact has been reduced to 9 feet wide permanent impact to wetlands from MP0 to MP 57 (and now to MP 62), in accordance with expected impacts. This is a change only in the project footprint. The alignment for the pipeline has not been impacted by this change.

REGULATORY AGENCY RECOMMENDED MITIGATION MEASURES

Additional Measure Consideration	Agency Proposing Mitigation Measure	Agency Jurisdiction	Authority (i.e. CWA, RHA, ESA)	Affected Resources	Comment Code
The SWPPP must include a description of temporary and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. The SWPPP must document shutdown and startup activities for projects that are not completed during the winter or summer construction season. The SWPPP must also document (1) the anticipated dates of fall freeze-up and spring thaw, (2) activities leading up to and at fall freeze-up, (3) activities leading up to and at spring thaw, and (4) activities to reestablish control measures prior to and immediately after spring thaw and fall freeze up.	ADEC	EPA, ADEC	Clean Water Act (CWA)	Waters	NA
Stabilization of disturbed areas must be initiated as soon as practicable whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site or temporarily ceased on the site and will not resume for a period exceeding 14 days. Temporary Stabilization: No later than 14 days after initiating temporary stabilization, the permittee must complete all activities necessary to initially revegetate the area and/or install non-vegetative measures	ADEC	EPA, ADEC	CWA	Waters, Soils and Geology, Vegetation	NA
Final Stabilization and Terminating Construction Storm Water Authorizations: To eliminate a site or terminate authorization for construction storm water coverage under the GP AKG320000, the permittee must achieve final stabilization for the affected area of coverage. Final Stabilization includes: a) a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or b) equivalent non vegetative permanent stabilization measures have been employed including but not limited to riprap, gabions, porous backfill per ADOT&PF Specification 703-2.10, railroad ballast or sub-ballast, ditch lining per ADOT&PF Specification 610-2.01, or geotextiles, or fill material with low erodibility as determined by an engineer familiar with the site and documented in the SWPPP).	ADEC	EPA, ADEC	CWA	Waters, Soils and Geology, Vegetation	NA
Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding: Seven (7) calendar days for those areas of the state with a mean annual precipitation of forty (40) inches or greater; or Fourteen (14) calendar days for those areas of the state with a mean annual precipitation less than forty (40) inches.	ADEC	EPA, ADEC	CWA	Waters, Soils and Geology, Vegetation	NA
When new access roads/airstrips are created on public land, consult with ADF&G when considering whether to allow for possible public access for hunting, particularly in areas with underutilized wildlife populations.	ADF&G	ADF&G, BLM, ADNR	Alaska Hunting Regulations (AHR); Federal Land Policy and Management Act	Recreation, Land Use, Subsistence	WLD_22
Alternative access should be provided around temporarily blocked public access routes and at locations and periods when free and unrestricted access upon public land is temporarily restricted, particularly along RS2477 easements, section-line easements, and 17(b) easements. There should also be a clear and defined public process that addresses long-term public access beyond the pipeline construction period (i.e., temporarily prohibited access).	ADF&G	BLM, ADNR	Federal Land Policy and Management Act	Recreation, Land Use	ACC_34
In addition to temporary alternate access for 17(b) easements, alternate access should be provided at locations and periods when public use of RS2477 easements and section-line easements is temporarily restricted.	ADF&G	BLM	Federal Land Policy and Management Act	Recreation, Land Use	ACC_34
Specify the time frame of restoration rather than using open-ended language, such as "as soon as practicable."	BLM	BLM, ADNR	--	Soils and Geology, Vegetation, Wetlands	MIT_21
If clearing of vegetation occurs on BLM-managed lands within the Central Yukon Field Office during the USFWS's regional time periods for avoidance, standard BLM permit requirements necessitate a nest search within a few days prior to the clearing	BLM	USFWS	MBTA	Wildlife	MIT_23
Surveillance/monitoring parameters (i.e., which health outcomes, who monitors them, etc.) should be presented with proposed mitigations and BMPs.	DHSS	DHSS	--	Public Health	MIT_28
Include in the wetland mitigation package a monitoring and an adaptive management plan that contains corrective actions should mitigation efforts not meet success criteria.	EPA	EPA, USACE	--	Wetlands	MIT_32
Include specific fugitive dust control measures, such as speed limits and frequency of watering during non-winter months that will be implemented to achieve control limits.	EPA	EPA, ADEC	--	Vegetation, Wetlands, Fish, Public Health, Air Quality, Vegetation, Public Health, Recreation	MIT_34
Include on-site mitigation to reduce potential impacts to drinking water along the proposed pipeline route. Avoid construction in close proximity to private drinking water wells to the maximum extent practicable by making any available adjustments to trench location within the right-of-way.	EPA	USACE, EPA, ADEC	--	Water, Public Health	EFF_26
Include compensation for any unavoidable impacts to quantity or quality of drinking water (e.g., drilling a new drinking water well if needed).	EPA	EPA, ADEC, ANDR	--	Water, Public Health	MIT_33

REGULATORY AGENCY RECOMMENDED MITIGATION MEASURES

Additional Measure Consideration	Agency Proposing Mitigation Measure	Agency Jurisdiction	Authority (i.e. CWA, RHA, ESA)	Affected Resources	Comment Code
A large number of applicant-proposed design features, mitigation measures, best management practices, and project management plans listed in the Draft SEIS contain the language, "In areas where a lease is required from the State Pipeline Coordinator's Section" or a federal grant of ROW is required from BLM ... " These measures generally represent a best management approach that we recommend using to the maximum extent possible along the entire pipeline route, while acknowledging the outstanding need to complete coordination with private landowners.	EPA	--	--	Numerous	MIT_35
(1) Waterway crossings should be designed, constructed, and installed according to the Anadromous Salmonid Passage Facility Design (NMFS 2011), (2) bridges and culverts span waterways to not restrict adequate fish passage and to retain full access to spawning areas where streams are braided, and (3) all crossings should be based on site-specific information, such as anadromy, seasonal instream flows and peak discharge, and flood plain regime (50-year to 100-year flood events)	NFMS	USFWS, ADF&G	Fish and Wildlife Coordination Act, Fish and Wildlife Conservation Act, Anadromous Fish Act	Water, Fish	FISH_4
Remove and properly store the organic soil layer (e.g., tundra sod blocks and salvaging the organic layer, ~15-30 cm uppermost layer containing seeds, plant propagules, roots, organic matter, and soil microbes) before trenching to facilitate reestablishing vegetation in a more timely manner.	USFWS	USACE, EPA	--	Soils and Geology, Vegetation, Wetlands	MIT_12
Use a generally accepted timeline of five years for achieving 70% coverage in the Intermontaine Boreal and Alaska Range Transition Ecoregions.	USFWS	--	--	Soils and Geology, Vegetation, Wetlands	MIT_13
Include considering fish and wildlife habitat needs in all reclamation work and provide new beneficial habitat in areas where the original habitat type cannot be fully restored.	USFWS	USFWS, ADF&G	Multiple Authorities	Wildlife, Fish	MIT_14
Include BMPs to address potential impacts to migratory birds from marine vessels; including small fuel releases from leaking and wrecked vessels and the release of rats (and other non-native rodents)	USFWS	USFWS	MBTA	Wildlife	WLD_23
To avoid and minimize impacts to wetlands to the extent practicable, the pipeline should be elevated on vertical support members in the Arctic Tundra ecoregion, and other areas where thaw-unstable permafrost exists.	USFWS	USACE, EPA	--	Wetlands	ALT_35
The pipeline shall be buried in the meander belt of the floodplain at the same elevation as the depth under the river or stream (e.g., at least 4 feet or 120 percent of the expected maximum scour depth elevation), and include the same scour protection measures as under the stream or river bed.	USFWS	USACE, EPA	--	Water	ALT_36
Natural drainage patterns shall be maintained to the extent practicable by the installation of culverts or bridges in sufficient number and size under access roads and trails to prevent ponding, diversion, or concentrated runoff that would result in adverse impacts to adjacent wetlands and other fish and wildlife habitats.	USFWS	USACE, ADF&G ADEC	CWA, RHA	Water, Wetlands, Fish	MIT_15
The boundaries of all construction areas shall be staked or flagged prior to construction to prevent inadvertent encroachment outside the permitted construction area. No fill, equipment or construction materials shall be stockpiled or stored on wetlands that do not have authorization from the Department of the Army for those activities.	USFWS	USACE, ADEC	CWA, RHA	Wetlands	MIT_15
To minimize wildlife entanglement and plastic debris pollution, erosion and sediment control products shall be plastic-free, such as netting manufactured from 100% biodegradable, nonplastic materials like jute, sisal, or coir fiber.	USFWS	ADEC	CWA	Wildlife	MIT_15
The pipeline shall be elevated on Vertical Support Members (VSMs) from mile post 0 to at least beyond the area of extensive ice-rich, saturated soils containing a high density of oriented thaw lakes on the Arctic Coastal Plain. The VSMs should also be used to elevate the pipeline in extensive areas of thaw-unstable permafrost and in areas of continuous and discontinuous permafrost where inadvertent thermokarst could alter the natural drainage pattern along the pipeline.	USFWS	USACE	--	Soils and Geology, Vegetation, Wetlands	MIT_15
Material sites shall be reclaimed in accordance with a plan approved by the Corps of Engineers in consultation with the Service. Reclamation shall be accomplished within 3 years on any portion of the material site that has been inactive (abandoned) for 3 years, or where the material source is no longer practical or economically feasible to extract.	USFWS	USACE	--	Soils and Geology, Vegetation, Wetlands	MIT_15
If open water is created at a material site in the Intermontaine Boreal or Alaska Range Transition Ecoregion, then reclamation shall include: 1) constructing a littoral zone at least 20 feet wide (shallow underwater shelf along the bank with slopes averaging less than 10H:1V); 2) constructing an irregular shoreline with bays and spits; and 3) spreading two-to-four inches of separately stockpiled organic overburden on the littoral zone and shoreline to enhance revegetation. At least a 25 foot wide buffer of native vegetation should also be established around the excavation perimeter to help filter sediment and pollutants before they enter the water.	USFWS	BLM	--	Soils and Geology, Vegetation, Wetlands	MIT_15
If open water is created at a material site in the Arctic Tundra Ecoregion, then reclamation shall include: 1) salvaging the active organic topsoil layer (12 to 18 inches) overlaying the footprint of the cell and stockpile on an adjacent ice pad/pad; 2) removing the remaining inorganic/mineral overburden from the cell and stockpile separately from the organic topsoil on an adjacent ice pad/pad; 3) placing a berm of inorganic overburden around the outside edge of the cell as insulation to prevent thermokarsting and erosion of the cell sidewalls, and as a safety precaution; 4) instructing side slopes of the cell no steeper than 2H:1V (preferably 3H:1V); 5) placing the inorganic/mineral overburden back into the cell when mining is complete to create 3H:1V side slopes if possible; 6) using the organic topsoil to stabilize the top edges of the side slopes of the mined cell, to reclaim the adjacent tundra disturbed by mining operations, and/or to use in other reclamation sites; 7) keeping the berm surrounding the pit in place as a safety precaution until the pit has completely filled with water, at which point the berm can be removed (e.g., pushed into the water-filled pit).	USFWS	BLM	--	Soils and Geology, Vegetation, Wetlands	MIT_15

REGULATORY AGENCY RECOMMENDED MITIGATION MEASURES

Additional Measure Consideration	Agency Proposing Mitigation Measure	Agency Jurisdiction	Authority (i.e. CWA, RHA, ESA)	Affected Resources	Comment Code
All disturbed, stockpile, and fill areas shall be stabilized to prevent erosion. Increased water turbidity and accumulation of sediment in drainages, sloughs, and other wetlands shall be evidence of insufficient stabilization	USFWS	EPA, ADEC	--	Soils and Geology, Vegetation, Wetlands	MIT_15
A final mitigation plan shall be approved by the Corps of Engineers in consultation with the Service before work commences in waters of the U.S., including wetlands. Unavoidable direct, indirect, and temporal (>3 years) project impacts to wetlands shall be compensated with at least equal-functioning wetlands.	USFWS	USACE, EPA	--	Water, Wetlands	MIT_15
At least a 25 foot wide buffer of native vegetation should also be established around the excavation perimeter to help filter sediment and pollutants before they enter the water.	USFWS/ADEC	EPA, ADEC	CWA	Water, Wetlands	MIT 15
<p>NPS wishes to maintain year-round public access to NPS lands to the extent safely possible during the construction phase. Backpackers, mushers and skiers enter the eastern portion of the park from the Dalton Hwy in all seasons from a variety of locations, including the following four primary access points: Kuyuktuuvuk Creek, Trembley Creek, Nolan Road near Wiseman (Milepost 188), and Galbraith Lake (Milepost 274). See attachments 3, 4, and 5 for reference. NPS proposes the following mitigations to maintain safe public access during the construction phase:</p> <ul style="list-style-type: none"> • Plan construction activities to ensure at least some of the above primary access points from the Haul Road remain open at any one time. • Development of a good calendar, posted on a well-maintained website hosted by the project proponent, detailing where work is occurring and which access points are open/closed. • Project should be planned to assure that there will be no long-term change in access to any of the above four primary points once the line is buried. 	NPS	--	--	Recreation, Land Use	--

Notes:

- AAC = Alaska Administrative Code
- ADF&G = Alaska Department of Fish and Game
- ADEC = Alaska Department of Environmental Conservation
- ADNR = Alaska Department of Natural Resources
- AGDC = Alaska Gasline Development Corporation
- APDES = Alaska Pollution Discharge Elimination System
- BLM = Bureau of Land Management
- BMP = Best Management Practice
- CAA = Clean Air Act
- CWA = Clean Water Act
- DHSS = Alaska Department of Health and Social Services
- EPA = U.S. Environmental Protection Agency
- MBTA = Migratory Bird Treaty Act
- NMFS = National Marine Fisheries Service
- NPS = National Park Service
- RHA = Rivers and Harbors Act of 1899
- SEIS = Supplemental Environmental Impact Statement
- USACE = U.S. Army Corps of Engineers
- USFWS = U.S. Fish and Wildlife Service

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