DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, AK 99506-0898

Regulatory Division

POA-1995-120

Re: Release of the Donlin Gold Project Final Environmental Impact Statement

Dear Reader:

Enclosed is the Donlin Gold Project Final Environmental Impact Statement (Final EIS). This document has been developed in accordance with the National Environmental Policy Act of 1969. The U.S. Army Corps of Engineers (Corps) prepared this Final EIS to analyze the impacts of the proposed open pit, hardrock gold mine 10 miles north of the village of Crooked Creek on the Kuskokwim River in southwest Alaska. In addition to the proposed mine, the project would:

- Construct a 316 mile natural gas pipeline from Cook Inlet through the Alaska Range to the mine site;
- Construct a new port at Angyaruaq (Jungjuk) on the Kuskokwim River and a 30 mile access road to the proposed mine site;
- Require expansion of the Bethel Yard Dock and fuel terminals in Dutch Harbor as connected actions; and
- Supply equipment, cargo and diesel fuel using barges operated on the Kuskokwim River.

The Corps is the lead federal agency for this EIS. The Bureau of Land Management; U.S. Fish and Wildlife Service, Pipeline and Hazardous Materials Safety Administration; U.S. Environmental Protection Agency; the State of Alaska; and the federally recognized Tribal governments of Akiak/Kuskokwim River Watershed Council, Crooked Creek, Chuathbaluk, Knik, Aniak and Napaimute serve as cooperating agencies in developing the EIS.

The Final EIS documents the impact analysis of Donlin Gold's Proposed Action and alternatives. The public was provided a scoping period at the beginning of the EIS process to identify potential issues and concerns associated with the Proposed Action. The EIS scoping period began December 14, 2012 and ended March 29, 2013. Scoping comments were then used to help develop alternatives to the Proposed Action, to guide the analysis of potential effects, and to identify potential mitigations for inclusion in the Draft EIS.

The Draft EIS was intended to fully disclose known or anticipated impacts and to offer the public, tribes, and governmental agencies a chance to comment on draft conclusions. The public comment period began when the Draft EIS was released, November 27, 2015, and remained open through May 31, 2016. Relevant comments, as defined by NEPA, and information submitted was summarized and addressed in the Final EIS. Relevant comments are comments that, with reasonable basis, question the accuracy of the information in the Draft EIS, the adequacy of, methodology for, or assumptions used for the environmental analysis; present new information relevant to the analysis; present reasonable alternatives other than those analyzed; and cause changes or revision in one or more of the alternatives.

On April 27, 2018, a Notice of Availability (NOA) for the Final EIS was published in the Federal Register. The Final EIS provides agency decision makers with the scientific basis for their permitting decisions.

Where and how to access the document

You may access the document on the internet at www.DonlinGoldEIS.com and requests for a CD of the Final EIS can be made to Jamie Hyslop, Project Manager, U.S. Army Corps of Engineers, Alaska District, CEPOA-RD-Hyslop, P.O. Box 6898, JBER, AK, 99506-0898.

FOR FURTHER INFORMATION CONTACT: Jamie Hyslop, Project Manager, U.S. Army Corps of Engineers, Alaska District, CEPOA-RD-Hyslop, P.O. Box 6898, JBER, AK, 99506-0898; via email at POA.donlingoldeis@usace.army.mil or; at 907-753-2670.

Donlin Gold Project

Final Environmental Impact Statement

Executive Summary

U.S. Army Corps of Engineers

CEPOA-RD

P.O. Box 6898

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April 2018

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Donlin Gold Project Executive Summary

Donlin Gold, LLC proposes to produce gold from ore reserves owned by the Calista Corporation, under surface lands owned by The Kuskokwim Corporation, in remote southwestern Alaska (Figure 1). The proposed Donlin Gold Project would build mining and ore processing facilities at the mine site, transportation facilities, and a buried natural gas pipeline from Cook Inlet to the mine site to support electrical generation.

Chapter 1: Purpose and Need

1.1. Lead and Cooperating Agencies and Authorities

In July 2012, Donlin Gold submitted an application to the U.S. Army Corps of Engineers (Corps) for a permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 (RHA) and Section 404 of the Clean Water Act (CWA). The Corps is the lead federal agency and issued a Notice of Intent to prepare an Environmental Impact Statement (EIS) to comply with the requirements of the National Environmental Policy Act (NEPA).

For the proposed natural gas pipeline component crossing federal lands, Donlin Gold filed a right-of-way (ROW) lease application with the Bureau of Land Management (BLM) consistent with the requirements of Section 28 of the Mineral Leasing Act of 1920 (MLA) as amended. Donlin Gold also filed an application with the Pipeline and Hazardous Materials Safety Administration (PHMSA) for a Special Permit to allow use of strain-based design for all or part of the pipeline in accordance with 49 CFR 190.341.

Five federal and state agencies and six tribal governments are acting as cooperating agencies with the Corps in developing the Donlin Gold Project EIS (Table 1). Acting as cooperating agencies precludes the need for BLM and PHMSA to prepare separate EIS documents to support their agency decisions. Cooperating agencies have jurisdiction over some part of the project by law or have special expertise in potential environmental effects addressed in the EIS. Cooperating agency Tribes also bring traditional ecological knowledge (TEK, also referred to as indigenous knowledge) regarding lands and resources.

The responsibilities of cooperating agencies include assisting the Corps in identifying agency-specific regulatory requirements, issues for analysis in the EIS, and relevant sources of data. The cooperating agencies met regularly to provide comments on proposed strategies for each EIS milestone and to review comments on draft technical documents and the Draft EIS.

As a non-federal agency, the State of Alaska (State) does not have a NEPA obligation when issuing permits, as the State has a separate process for environmental review and leasing decisions. The State has provided technical expertise to the EIS and will use information from the EIS in its decisions.

Table 1: Cooperating Agencies

State of Alaska
Federal Agencies
Bureau of Land Management (BLM)
Pipeline and Hazardous Materials Safety Administration (PHMSA)
U.S. Environmental Protection Agency (EPA)
U.S. Fish and Wildlife Service (USFWS)
Tribal Governments
Akiak Native Community assisted by the Kuskokwim River Watershed Council
Knik Tribal Council
Native Village of Chuathbaluk assisted by the Center for Science in Public Participation (CSP2)
Native Village of Napaimute
Native Village of Aniak
Village of Crooked Creek

Figure 1: Project Location Map

Russia
Alaska
Canada
PROJECT SITE
Poorman
Lake Minchumina
Telida
Medfra
Takotna
McGrath
Nikolai
Denali National Park and Preserve
Denali State Park
PROPOSED NATURAL GAS PIPELINE
Farewell
Alaska Range
Petersville
Talkeetna
NORTH OPTION NATURAL GAS PIPELINE
Kroto & Moose Creek Recreation River
Lake Creek Recreation River
Skwentna
Willow
Sutton
Houston
Palmer
Talachulitna Recreation River
Big Lake
Wasilla
Susitna
Settlers Bay
Eklutna
Knik
Lime Village
Susitna Flats State Game Refuge
Chugach State Park
Point MacKenzie
Anchorage
Beluga
Tyonek
Trading Bay State Game Refuge
Hope
Redoubt Bay Critical Habitat Area
Nikiski
Salamatof
Lake Clark National Park and Preserve
Kenai
Cooper Landing
Moose Pass
Soldotna
Kasilof
Kenai National Wildlife Refuge
Cook Inlet
Clam Gulch
Port Alsworth
Seward
Ninilchik
Nondalton
Kenai Fjords National Park
Nikolaevsk
Pedro Bay
Anchor Point
Iliamna
Newhalen
Homer
Kachemak
Iliamna Lake
Kokhanok
Seldovia
Igiugig
Nanwalek
Port Graham
Portlock
Miles
0
25
50

1.2. Background

Small-scale placer mining activity has been ongoing at and in the vicinity of the proposed Donlin Gold Project Area (Project Area) since the early 1900s. Placer gold was first discovered at Snow Gulch, a tributary of Donlin Creek, by miners from the Iditarod-Flat District in 1909 during a rush to the George River. Small-scale mining occurred in the area from 1910 to 1940. The Calista Corporation (Calista) identified mineral potential in the region in 1975 and undertook prospecting and limited exploration activities from 1984 to 1987. The first substantial hard rock gold exploration drilling program was initiated by WestGold in 1988 and 1989. Placer Dome US explored the vicinity from 1995 to 2000 and constructed a 75-person camp, 17 miles of roads, and a 5,000-foot-long airstrip to support advanced exploration and other programs. The camp used during the exploration and baseline studies leading to the Donlin Gold permit applications remains in place.

In December 2007, Donlin Creek LLC was formed with 50/50 ownership by Barrick Gold US Inc. and NOVAGOLD Resources Alaska, Inc. In 2011, the company's name was changed to Donlin Gold, LLC (Donlin Gold). Activities associated with the Donlin Gold Project are managed by Donlin Gold, which oversees all aspects of development with input from both partners. Donlin Gold operates under agreements with two Alaska Native Claims Settlement Act (ANCSA) landowners, Calista (for the mining lease), and The Kuskokwim Corporation (TKC) (for the surface use agreement).

1.3. Project Overview

Donlin Gold proposes to develop an open-pit, hard rock gold mine in the Kuskokwim River watershed, 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the community of Crooked Creek (Figure 1). The proposed project would require approximately 3 to 4 years for construction with a projected mine life of approximately 27 years. The project would take place in three phases, including construction (Construction Phase or Construction), the operations and maintenance phase (Operations Phase or Operations) and the closure, reclamation, monitoring, and post-closure phase (Closure Phase or Closure). The project consists of three main components: the Mine Site, the

Project Summary

Reserves: Over 33 million ounces of gold (about 500 M tons ore)

Mine Life: Approximately 27 years

Production: Over 1 million ounces of gold annually

Operation: Open pit, conventional

Ore Processing: 59,000 tons/day: sulfide flotation, pressure oxidation (POX) and Carbon-in-Leach (CIL) recovery

Strip Ratio: About 5.5:1 = about 3 billion tons waste rock

Tailings: Fully lined tailings storage facility (TSF)

Power/Pipeline: ~227 MW on-site gas-fired power plant, supplied by a 316-mile, 14-inch, buried natural gas pipeline

Transportation and Logistics: Supplied by Kuskokwim River transportation system, river barge traffic, barge landing at Angyaruaq (Jungjuk), 30-mile mine access road, 5,000-foot airstrip, and transportation facilities.

Transportation Corridor, and the Pipeline (described below). At the end of operations, facilities would be closed and reclaimed in compliance with permit conditions. Above-ground facilities associated with the pipeline would be decommissioned and removed, while below-ground portions of the pipeline would be purged, plugged, and left underground.

1.4. Issues Selected for Analysis

The Corps and cooperating agencies selected substantive impact issues identified during public and agency scoping for further analysis and eliminated non-substantive issues from evaluation. Selected issues are listed in Table 2 and documented as statements of concern in the Scoping Report (Appendix B).

After the public scoping period, the Corps compiled comments into a Scoping Report (Appendix B) and guided the technical analysis to address these issues in the Draft EIS, which was released for review in November 2015. Public meetings were held to receive public comments that were then incorporated into the document. As part of its permit review, the Corps issued a public notice for the permit application and will evaluate comments received on the notice. Following the publication of the Final EIS, the Corps will prepare a Record of Decision (ROD) to describe the Corps' evaluation of the permit application and convey whether the permit is issued, issued with conditions, or denied. The ROD will also identify the preferred alternative. BLM and PHMSA will issue separate RODs.

Table 2: Issues Identified During Scoping Brought Forward For Analysis

Issue Topic or Resource	Concerns or Potential Effects
Air Quality	Effects from dust/particles and suspended heavy metals; contribution to greenhouse gas (GHG) emissions and climate change.
Floodplains	Increased risk of hazardous spills, erosion and sedimentation, and potential effects on water quality, river geomorphology, fish, wildlife, habitat, and subsistence activities and resources.
Geology	Effects of construction and operations including soil, permafrost, topography, and landform alteration, and effects on paleontological resources; surface disturbance resulting in erosion and sedimentation; geological hazard (particularly seismic events) effects on vulnerable project components.
Groundwater	Effects on groundwater systems and aquifers from potential contamination; potential for mine operations to reduce water table and flow in Crooked Creek.
Hazardous Materials and Waste Management	Effects from mercury and cyanide handling and detoxification; mobility, toxicity, and management of naturally occurring arsenic; and risk and response to chemical and fuel spills and accidents.
Hydrology	Effects on streams and local water bodies, and disruption of local water patterns. Barge traffic effects to riverine systems, including wave-induced erosion to shorelines.
Water Quality	Effects from construction, operations, and closure activities; and long-term storage of tailings and waste rock including acid rock drainage, metal leaching, erosion, turbidity, temperature changes, and fuel and chemical spills.
Migratory Birds	Effects on migratory birds, waterfowl, and shorebird population abundance, diversity, and migratory patterns.
Bald and Golden Eagles	Effects of construction and operations activities on bald and golden eagles and habitat resulting in removal of nests, loss of habitat, and disturbance of birds.

Issue Topic or Resource	Concerns or Potential Effects
Fish and Aquatic Organisms	Effects on salmon, resident fish, and Essential Fish Habitat (EFH) from barge traffic, water diversion, noise and vibration disturbance, changes in temperature regime and water quality, and displacement in streambeds. Pipeline construction and operation could affect salmon spawning beds and passage.
Marine Mammals	Effects from increased marine barge traffic and the potential for spills.
Terrestrial Wildlife	Effects of construction and operations activities causing disturbance, potential loss of habitat, permanent and long-term alteration of habitat, and obstruction of migratory patterns. Effects of disturbance from increased recreational use; and changes in hunting and trapping pressure due to changes in access.
Threatened and Endangered Species	Effects from increased barge traffic on birds or marine mammals listed under the Endangered Species Act (ESA).
Vegetation	Potential for fragmentation of wetlands, changes in surface and groundwater hydrology, increased disturbance from human activities, and introduction and spread of nonnative invasive species (NNIS).
Wetlands and Aquatic Communities	Effects of construction activities that would require filling of wetlands and the placement of fill, culverts, and associated structures in streams.
Archaeological/Cultural Resources	Effects on cultural resources and historic properties, particularly during construction activities.
Environmental Justice	All federal agencies must identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.
Iditarod National Historic Trail (INHT)	Effects from construction and operations activities along the pipeline corridor affecting the physical trail, uses of the trail, the viewshed along the trail, the recreational experience of individuals, and commercial recreational activity in the trail vicinity.
Land Ownership, Management, and Use	Effects from an increase in legal and non-legal access; use incompatibility with land management objectives; and effects on scenic, wildlife, visual characteristics, opportunities for solitude and primitive recreation, and existing trail usage.
Recreation	Effects to recreation, tourism, recreational hunting and recreation usage near the mine, along river systems, and in the pipeline corridor during construction and operations activities.
Socioeconomics	Effects on socioeconomic environment on a local and regional scale, including demographics (population trends with in-migration and out-migration), employment (direct and indirect), household income, housing, and public infrastructure.
Subsistence and Traditional Way of Life	Effects of habitat loss or disturbance and disruption of movement patterns of certain fish, terrestrial mammals, and birds; disruption of access to subsistence hunting and fishing during construction activities; increased competition for subsistence resources through improved access.
Transportation	Effects of construction and operations activities to regional and local transportation systems including airports, roads, and rivers (barge traffic).

Issue Topic or Resource	Concerns or Potential Effects
Visual Resources	Effects of vegetation clearing, mine site development, river crossings, and overall increased activity in areas considered visually sensitive; decreases in the quality of visual landscape during construction, operations, and closure activities.
Wilderness Characteristics	Effects on wilderness characteristics related to project activities.

1.5. Project Purpose and Need

NEPA regulations for an EIS (40 CFR § 1502) direct that "The [purpose and need] statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." This statement is developed through consideration of the purpose and need stated by the applicant (Donlin Gold). To develop the EIS purpose and need statement, the Corps focused on Donlin Gold's statement, exercising independent judgment in defining purpose and need for the project from both Donlin Gold and the public perspective. The Corps and cooperating agencies are neither proponents nor opponents of the proposed project.

The proposed project's purpose, as determined by the Corps and cooperating agencies, is to produce gold from ore reserves from the Donlin deposit using mining processes, infrastructure, logistics, and energy supplies that are economical and feasible for application in remote western Alaska. The applicant's stated need for the project is to provide economic benefits to Donlin Gold, Calista, and TKC shareholders; and to produce gold to meet worldwide demand.

The Corps, BLM, and PHMSA will rely on this EIS for ROW authorization and permitting purposes, so their regulatory requirements must be followed. Specific project purpose and need statements based on individual agency requirements are provided in Chapter 1, Purpose and Need.

Alternatives Development Process

Step 1: Identify scoping issues and related project components;

Step 2: Develop screening criteria;

Step 3: Identify options to address concerns for each component & subcomponent;

Step 4: Apply screening criteria to all options; develop options to carry forward and carefully document option disposition; and

Step 5: Package options into action Alternatives (which may include options within them).

Chapter 2: Alternatives

NEPA requires consideration of a reasonable range of alternatives that can accomplish the purpose and need of the proposed action. For this project, alternatives were developed to evaluate different engineering designs, siting choices, technologies, and operational procedures that would reduce impacts to some or many resources, while meeting the proposed project purpose and need. Over 300 options for the project components were identified based on scoping comments, early design options evaluated by Donlin Gold, and options proposed by the Corps and the cooperating agencies (Appendix C).

Based on comments received on the Draft EIS, additional options were identified and included in Alternatives 2 and 3B. These options were screened on the basis of NEPA requirements, the Corps' Public Interest Review (33 CFR 320.4(a)), and the requirements of the CWA 404(b)(1) guidelines. The stepwise approach (see Alternatives Development Process box) provides the basis for determination of the Least Environmentally Damaging Practicable Alternative (LEDPA) in the Corps' CWA 404(b)(1) permit decision process. Seven alternatives are evaluated in the Final EIS (Table 3).

Table 3: Donlin Gold Project Alternatives

Alternative 1 – No Action
Alternative 2 – Donlin Gold's Proposed Action *Includes One Option:* **North Option**
Alternative 3A – Reduced Diesel Barging: Liquefied Natural Gas Powered Haul Trucks
Alternative 3B – Reduced Diesel Barging: Diesel Pipeline *Includes Two Options:* **Port MacKenzie Option** **Collocated Natural Gas and Diesel Pipeline Option (Collocated Pipeline Option)**
Alternative 4 – Birch Tree Crossing (BTC) Port
Alternative 5A – Dry Stack Tailings *Include Two Options:* **Unlined Option** **Lined Option**
Alternative 6A – Modified Natural Gas Pipeline Alignment: Dalzell Gorge Route

2.1. Alternative 1 – No Action

The No Action Alternative means that no permits would be issued, and the proposed project would not be implemented. There would be no mine site development, no new transportation facilities, and no pipeline. The future of the existing camp, airstrip, and related facilities would be decided at the discretion of the landowners, Calista, and TKC. The No Action Alternative represents a baseline for comparison of effects between the Proposed Action (Alternative 2) and the other action alternatives. Current non-project ocean and river barging traffic would be expected to continue at similar levels.

2.2. Alternative 2 – Donlin Gold's Proposed Action

Donlin Gold's Proposed Action would establish an open-pit, hard rock gold mine in southwestern Alaska, 10 miles north of the village of Crooked Creek (Figure 1), on land leased from Calista. Chapter 2, Alternatives, contains a detailed description of the proposed action. TKC has granted surface use rights to Donlin Gold. Donlin Gold also has legal control of approximately 13 acres in the Snow Gulch area per a lease agreement with Lyman Resources in Alaska, Inc. The proposed project would require 3 to 4 years to construct, followed by an active mine life of approximately 27 years. After the end of the Operations Phase, the mine site facilities, port facilities, and the pipeline would be closed and reclaimed as required by permit conditions. The three main project components include:

Mine Site

This component would include the pits, processing facility, Waste Rock Facility (WRF), Tailings Storage Facility (TSF), and power plant.

Transportation Corridor

This component would include a third-party to transport fuel and other supplies to the project site from Dutch Harbor or other locations outside Alaska, a dedicated new fleet of river barges and tugs, the Angyaruaq (Jungjuk) Port, a 30-mile access road, and a 5,000-foot dedicated airstrip. Improvements to the Bethel Yard Dock and in Dutch Harbor are expected to be proposed for construction and operations by an independent party, and as such are not part of Donlin Gold's Proposed Action. Because those improvements are expected to occur only as the Proposed Action moves forward, they are being considered and evaluated as a connected action in this EIS pursuant to NEPA (40 CFR 1508.25).

Pipeline

This component would include a 316-mile, 14-inch, buried natural gas pipeline to support power generation at the Mine Site, built from Cook Inlet to the Mine Site.

Based on comments on the Draft EIS from agencies and the public, one route option has been included in Alternative 2 to address concerns due to pipeline crossings of the Iditarod National Historic Trail (INHT):

North Option

The MP 84.8 to 112 North Option would realign this segment of the natural gas pipeline crossing to the north of the INHT before the Happy River crossing and remain on the north side of the Happy River Valley before rejoining the alignment near MP-112 where it enters the

Three Mile Valley. The North Option alignment would be 26.5 miles in length, compared to the 27.2 mile length of the mainline Alternative 2 alignment it would replace, with one crossing of the INHT and only 0.1 mile that would be physically located in the INHT right-of-way (ROW). The average separation distance from the INHT would be 1 mile.

2.2.1. Mine Site

The Mine Site component includes: two open pits (that would merge into one), a WRF, ore processing facilities, a TSF, water treatment plants, facilities to house the workforce, equipment to transport ore from the open pit to the processing plant, hydrologic control features (freshwater diversion dams, contact water dams, and a freshwater reservoir), and a power plant (see Figure 2, the General Mine Site layout). Prior to Operations, crews would establish a construction camp for approximately 2,560 temporary workers at the Mine Site, participate in safety and environmental training, install erosion and sediment controls, construct access and haul roads, and clear and grub (clear the area of all vegetation prior to site work) the area to be mined. The TSF, WRF, and processing facilities would be constructed during the 3-4 year Construction Phase.

2.2.1.1. Mining and Processing

Gold-bearing rock within the Donlin deposit is found in two adjacent areas, the ACMA and Lewis deposits (see Figure 2). The ACMA pit would be approximately 1,850 feet deep from the high wall, and the Lewis pit would be approximately 1,653 feet deep from the high wall. The two pits would merge at the surface into one roughly oval, open pit, about 2.2 miles long by 1 mile wide (subsequently, the pit) near the end of the Operations Phase.

Open-pit mining operations would use hydraulic shovels, wheel loaders, drills, large-capacity haul trucks, and auxiliary equipment, including track dozers, wheel dozers, water trucks, graders, excavators, small wheel loaders, blasting product trucks, service trucks, transport vehicles, cranes, and trailer-mounted light plants.

The mine would operate year-round using conventional truck-and-shovel mining methods employing both bulk and selective mining techniques. The mining operations would blast and remove an average of 422,000 tons per day (tpd). Total waste rock material is estimated at slightly over 3 billion tons, most of which would be placed in the WRF. Later in the mine life, a portion of waste rock would be backfilled in the mine pit.

Daily blasting during the Construction and Operations phases would fracture and loosen rock prior to excavation. Blasting agents would include emulsion and ammonium nitrate and fuel oil explosives. Ore would be mechanically broken down into fine particles by crushing and grinding in the processing facilities after transport from the pit. Flotation would then separate the gold-bearing sulfide minerals. Flotation would be followed by pressure oxidation, cyanidation, and refining to produce doré bars. (see the Ore Processing Terminology Definitions box). The remaining material (tailings) would be placed in the TSF for permanent storage.

Gold-bearing ore would be transported to the mill and processing plant at an average production rate of 59,000 tons per day. After processing, an end product of gold doré bars would be shipped to a custom refinery for further processing. Tailings storage would encompass an area of 2,351 acres with a total capacity of approximately 335,000 acre-feet of mill and processing plant tailings, decant water, and stormwater in a fully lined facility.

Contact Water Definition

Contact water is surface water or groundwater that has contacted mining infrastructure. This includes "mine drainage" defined in 40 CFR 440.132(h) as "any water drained, pumped, or siphoned from a mine, as well as stormwater runoff and seepage from infrastructure."

It would include seepage from the waste rock facility, seepage from stockpiles (except ore), and water from horizontal drains that accumulates in the pit. It would not include groundwater from the pit dewatering wells.

Ore Processing Terminology Definitions

Flotation: the process of using water and minute amounts of chemicals and agitation to separate gold-bearing sulfide minerals from ore by inducing them to gather in and on the surface of a froth layer within a flotation cell. This process recovers the sulfide minerals containing the gold, which are then skimmed off the top of the flotation cells. Spent ore (tailings) is sent to the TSF.

Pressure oxidation (POX): The process of pre-treating ore using elevated temperatures, pressure, and oxygen to oxidize sulfide materials to expose the valuable minerals encapsulated within the sulfides.

Autoclave: The equipment used to oxidize sulfide minerals.

Cyanidation: Use of dilute cyanide-containing solutions and oxygen to selectively solubilize (leach) gold or other precious metals from the ore or concentrate, making these metals available for separation.

Activated carbon: Carbon manufactured to enhance surface characteristics that attract and promote gold adsorption, removing gold from solution.

Carbon-in-Leach (CIL): The process of leaching gold and other precious metals in agitated tanks in the presence of activated carbon particles. The gold-loaded carbon is then physically separated for further processing to recover the adsorbed gold.

Stripping: The separated carbon is treated by changing solution chemistry to remove (strip) the gold from carbon and concentrate the soluble gold in solution.

Refining: Plated gold is transferred to a separate area and treated by melting the gold. Impurities are removed in this process.

Doré: Bars of semi-pure gold that contain residual quantities of impurities.

Mercury would not be used for ore processing and would not be shipped to the Mine Site. Mercury is a naturally occurring element found within the Donlin deposit as the mineral cinnabar (mercuric sulfide or HgS). Some of this naturally occurring mercury would be released when ore containing mercury is processed. During ore processing, volatilized mercury would be separated, recovered, collected, and transported away from the Mine Site. Mercury abatement would occur at all mercury emission sources in the processing facility. All mercury would be transported in specially designed and marked mercury containers that would be managed in accordance with the project's mercury management plan and state and federal requirements. Donlin Gold estimates that mercury collection would remove approximately 34,600 pounds per year of mercury from the gaseous waste streams.

2.2.1.2. Mine Site Water Management

Mine operations would require water which would be provided by dewatering wells, contact water collected on site (see the Contact Water Definition box), and surface water captured in the fresh water dam. The mine would be expected to operate with an annual water surplus; make-up water would not be needed from another source.

Diversion structures would be built to direct stormwater away from facilities to limit storage volumes, erosion potential, and the amount of mine contact water requiring management, including treatment and discharge. Sufficient water storage capacity would cover drought years as well as manage water during wet years. The components of the water management system at the Mine Site include pit dewatering wells, the water treatment plant (WTP), contact water dams (CWDs), and fresh water storage and diversion, including fresh water diversion dams (FWDDs).

2.2.1.3. Tailings Storage Facility (TSF)

The 2,351-acre TSF would be built in the Anaconda Creek Valley immediately south of the WRF (see Figure 2). The facility would have the capacity to store 568 million tons, or 335,000 acre-feet, of tailings. Constructed in phases and on bedrock using the downstream method, the height of the tailings dam at completion would be 471 feet. The tailings impoundment footprint and upstream face of the dam would be lined with a 60-mil (0.06-inch) textured linear low density polyethylene (LLDPE) liner.

2.2.1.4. Waste Rock Facility (WRF)

An estimated 3.1 billion tons of waste rock would be excavated from the mine pit with 2.5 billion tons placed in the WRF and the remainder backfilled to the pit or used to construct the TSF. The 2,514-acre WRF would be immediately east of the pit in the American Creek Valley (see Figure 2). The WRF would be unlined; drainage control would be provided using engineered rock drains and secondary rock (finger) drains. All seepage and runoff would be captured.

Waste rock is classified as either non-acid-generating (NAG) or as potentially acid-generating (PAG). The waste rock would be classified again during mining operations as it is being generated. Approximately 93 percent of the waste rock would be NAG; the PAG waste rock would be isolated in the WRF to reduce contact with water and minimize the acidification potential, or backfilled to the pit.

2.2.1.5. Power, Utilities, Services, and Infrastructure

Electric power would be generated on site from a dual-fueled (natural gas as primary with ultra-low sulfur diesel backup) power plant. The total planned generating capacity for the Mine Site and permanent accommodation camp is 227 megawatts (MW), including redundancy (duplication of critical components or functions of a system to increase reliability of the system). The average running load is designed to be 153 MW. Electric grinding mill motors at the ore processing plant would use most of the power generated.

Electrical generation system components include:

Power Plant and Transmission Lines

A dual-fueled (natural gas and diesel) multi-engine power plant with a steam turbine that would utilize waste heat recovered from the engines, would generate power for the Mine Site. The primary power plant fuel source would be natural gas transferred via a 316-mile long pipeline (see Section 2.3.2.4), but diesel could also be used as a backup fuel. Power would be distributed to the main process areas of the mine by power cables and overhead transmission/distribution lines.

Fuel Storage and Distribution

A lined and bermed fuel storage facility would have a total storage capacity of 37.5 million gallons (Mgal). Mine site fuel storage tanks would be designed to contain a 10-month supply plus one month of contingency for the mine vehicles and equipment fleet.

Services and Infrastructure Components

These include camp buildings and facilities, solid waste management and disposal, waste water management and disposal, and hazardous waste management. There will be no permanent on-site hazardous waste storage. The permanent camp would be located approximately 2 miles west of the Mine Site, on the west side of Crooked Creek. The camp would be capable of housing up to 638 workers during the Operations Phase. Workers would travel to the site by aircraft using the 5,000-foot gravel airstrip for rotational shift changeover.

2.2.1.6. Closure

The overall purpose of reclamation is to stabilize disturbed areas by returning to vegetated conditions to facilitate an approved reclamation plan. Concurrent reclamation would be performed during the Operations Phase whenever possible in areas that are no longer being actively mined. After reclamation, monitoring would remain in place until each specific facility is physically and chemically stabilized to ensure successful implementation of the reclamation plan. Closure is planned with the "design for closure," concept in which mine design and operations minimize the time and effort required to close and reclaim each project component. The Closure Phase and reclamation components include the following facilities:

Pit

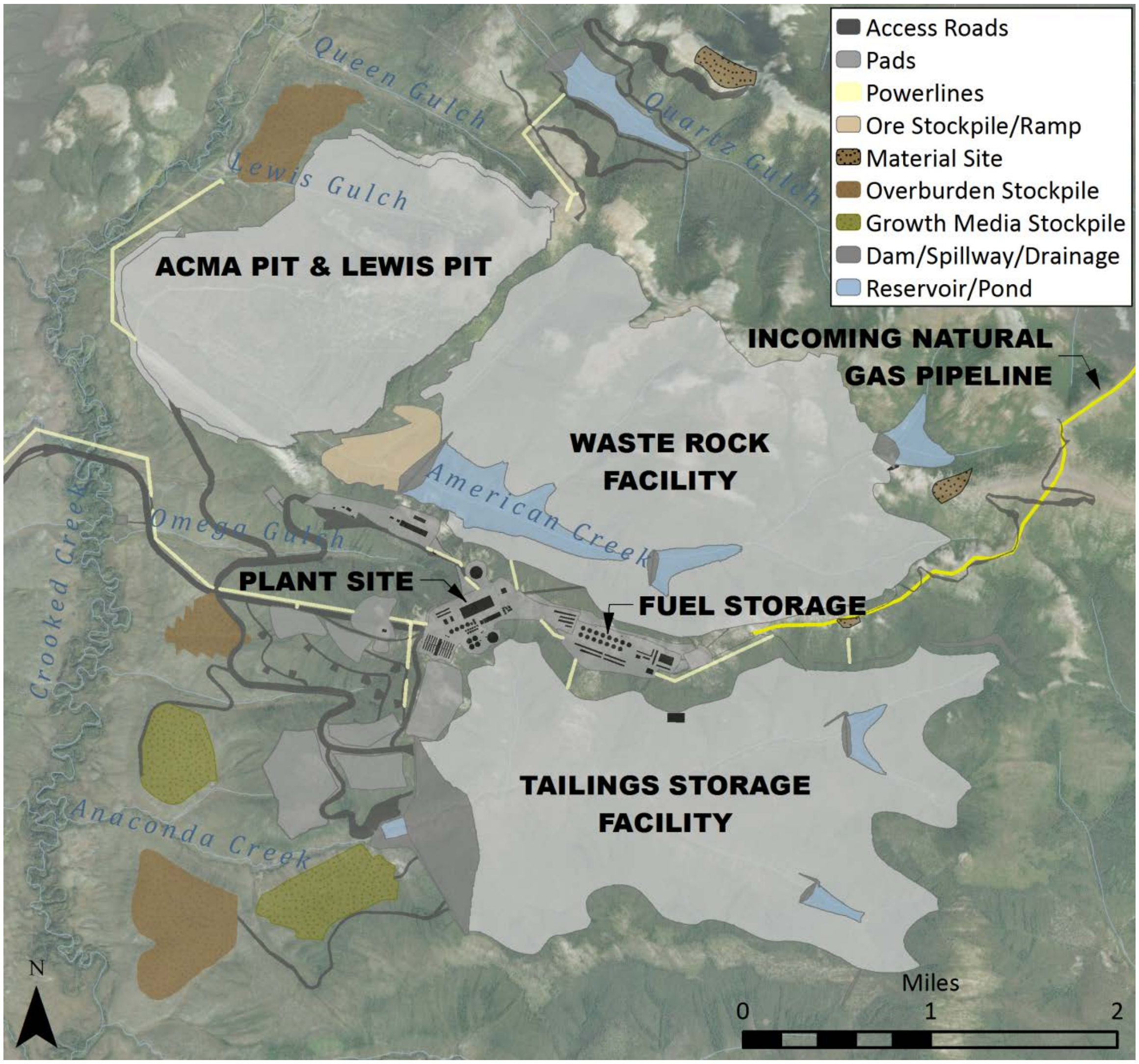
Upon final mine closure, the haul roads in and around the pit would be smoothed to eliminate all berms except those necessary for erosion control and public safety. The pit would gradually fill over the next 50 to 55 years with groundwater recharge, water from surface runoff, WRF seepage, and water pumped from the TSF.

TSF

In the first year of reclamation, TSF water would be pumped back into the pit. During the next four years, one-quarter of the tailings surface would be progressively reclaimed each year.

During the Closure Phase and post-Closure periods, seepage from the TSF would be monitored for quality.

Figure 2: General Mine Site Layout



WRF
The WRF would be progressively reclaimed during the Operations Phase by contouring the underlying waste rock to provide natural drainage and placing a cover designed to minimize infiltration and support vegetation growth. Runoff and seepage from the reclaimed WRF would be pumped to the pit.

Buildings, Equipment, and Piping
Buildings, equipment, and piping at the Mine Site not needed for reclamation and post-Closure monitoring activities would be reused at another mine, sold or salvaged, or disposed on site in an approved manner. Sites would then be graded for proper drainage, ripped and scarified, revegetated, seeded, or mulched to follow reclamation plans.

Electrical Power Facilities
The power plant, substations, overhead power lines, and associated facilities would be removed from the site, unless otherwise agreed to by the landowner.

Mobile Equipment and Vehicles
Mobile equipment and vehicles without a reuse purpose would be buried in the WRF in the Closure Phase. To prevent degradation of water resources or other contaminant mobilization, all fluids would be drained and batteries removed.

Roads and Airstrips
On-site roads not required for post-Closure long-term monitoring, berms, side-cast material, and road drainage ditches would be ripped to eliminate compaction, re-contoured to blend with the surrounding topography, covered with a layer of growth media, and reseeded or revegetated to follow reclamation plans.

2.2.2. Transportation Corridor

General cargo for the Construction and Operations phases would be transported to Bethel by marine barge from terminals in Seattle, Washington; Vancouver, British Columbia; or Dutch Harbor, Alaska. Cargo would be transferred to the Bethel Yard Dock facility, and then loaded onto river barges for transport up the Kuskokwim River to a port constructed at Angyaruaq (Jungjuk) Creek. A 30-mile all-season access road would be constructed from the Angyaruaq (Jungjuk) Port to the Mine Site. Public use of the road would not be allowed; however, crossing the road in pursuit of local subsistence activities would be accommodated. Fuel would be transported to Dutch Harbor by tanker, then to Bethel by marine barge by a third-party. At Bethel, fuel would be transferred to double-hull river barges for transport to Angyaruaq (Jungjuk) Port and then delivered to the mine site fuel storage facility by tanker trucks. The mine access road would be 30 miles and cross approximately 51 streams; there would be six bridges and 45 culverts.

A new 5,000-foot by 150-foot gravel airstrip would be constructed 9 miles west of the Mine Site for use transporting equipment and personnel during the Construction and Operations phases. Figure 3 provides an overview of the distances between primary transportation facilities.

2.2.3. Natural Gas Pipeline

A 14-inch diameter steel pipeline would be constructed to transport natural gas approximately 316 miles from an existing gas pipeline tie-in near Beluga, Alaska, to the Mine Site power plant. Storage and treatment of natural gas prior to input would be accomplished with existing Cook Inlet infrastructure. Except for two above-ground sections constructed over faults (each approximately 1,300 feet long), the pipeline would be buried within a 51-foot wide ROW on BLM-managed lands, and a 50-foot ROW width elsewhere. Horizontal Directional Drilling (HDD) methods or winter trenching would be used to bury the pipeline at several waterway crossings.

2.2.3.1 Pipeline and Ancillary Facilities

Donlin Gold has applied for authorization of an ROW to install the natural gas pipeline and fiber optic cable within the Pipeline component. Estimated total acreage on federal, state, and ANCSA corporation lands for the 300-foot-wide planning corridor is 11,471 acres (Table 4). Ancillary facilities such as airstrips (supporting construction), construction camps, and storage yards for pipe and equipment would require 2,565 acres. Planned above-ground ancillary facilities include a compressor station, a pig launcher and receiver stations, metering stations, and main line valves (MLVs).

2.2.3.2. Temporary Work Areas

Temporary work areas would be cleared during construction as necessary outside of the authorized 150-foot construction corridor. These would include:

- Stream and river crossings;
- High banks at ravines where earth cuts are required;
- HDD method pipe installation areas, to accommodate extra equipment;
- Sidebends;
- Beginnings/ends of construction spreads for mobilization and demobilization;
- Stringing truck turnaround areas;
- Extra space where spoil storage and construction activities are needed;
- Sideslopes areas where grade cuts of extra width are required to create a level work surface across the width of the ROW;
- Areas where a high water table would undermine trench walls, creating an extra-wide trench and larger spoil piles (for instance, in a gravel floodplain);
- On steep grades or for shoofly access roads (temporary bypass roads); and
- Pipe laydown areas.

Figure 3: Transportation Corridor Overview

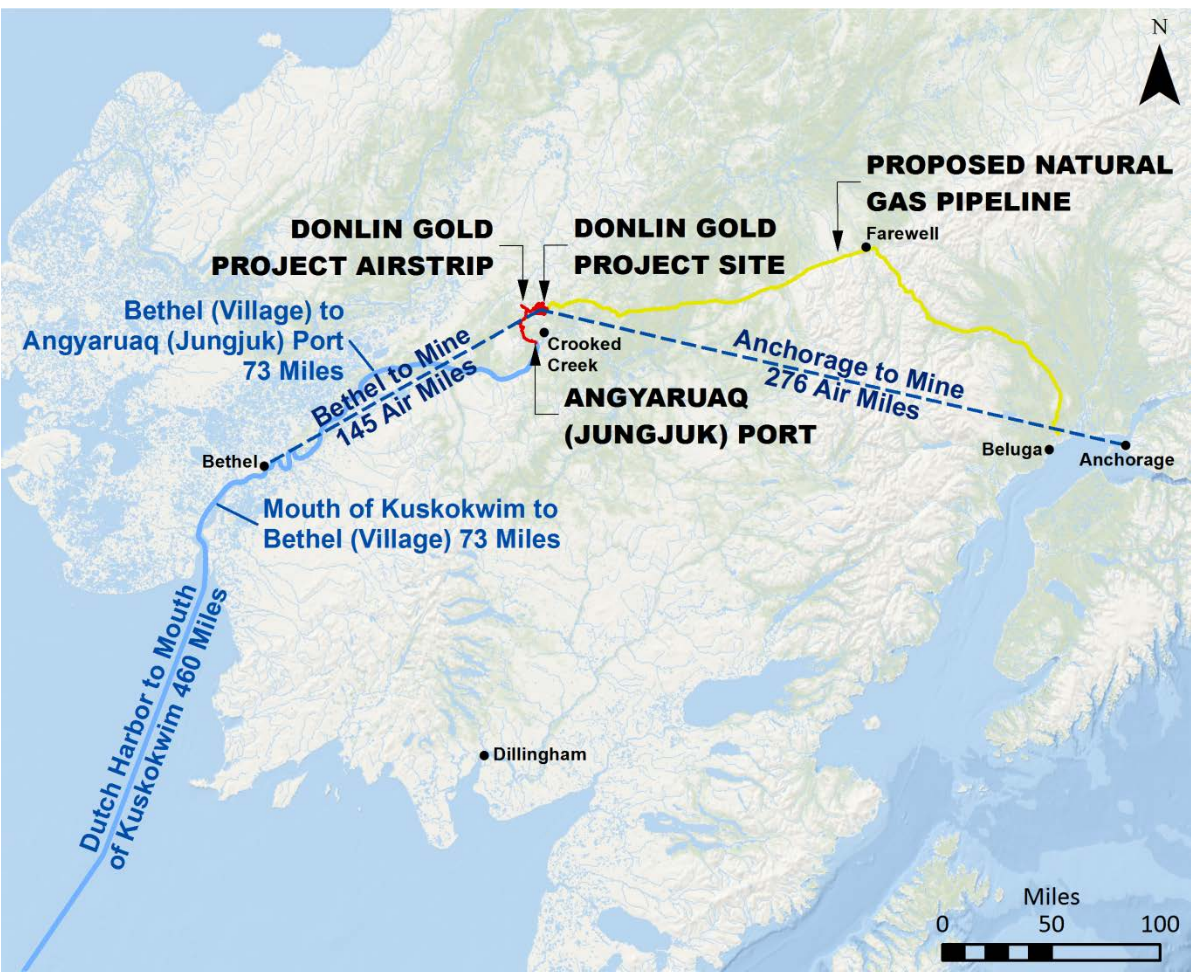


Table 4: Land Requirements for the Natural Gas Pipeline

Landowner	300-foot Planning Corridor (acres)	Ancillary Facilities* (acres)	Approximate Length (miles)
BLM	3,537	709	97
State	7,509	1,781**	207
ANCSA Corporation	425	73	12
Total	**11,471**	**2,563**	**316**

Notes:

*Includes access and shoofly roads (temporary bypass roads), work pads, pipe storage yards, HDD workspace, water extraction sites, airstrips, material sites, and camps. Includes entire footprint, including vegetation clearing areas. Estimated acres may be overestimated due to overlapping components.

**Includes one acre for compressor station at MP 0.4.

2.2.3.3. Temporary Access Roads

Temporary access roads required during construction include a winter access corridor (ice road) and gravel temporary and shoofly roads. These include:

Winter Access Corridor

An approximately 46- to 50-mile, 30-foot-wide winter access corridor would be constructed to transport equipment and supplies from the George Parks Highway via Petersville Road, or at Willow via the Willow Creek Parkway. The majority of either route has previously been utilized as commercial/industrial winter trails, and they share a corridor for the final 12 miles approaching the Pipeline Corridor at its Skwentna River crossing.

Temporary Access Roads and Shoofly Roads

Temporary site access and shoofly roads (short temporary roads) would be required to construct or improve airstrips, borrow sites, water withdrawal sites, and other authorized temporary use areas such as pipeline storage yards (PSYs).

Water Use and Water Extraction Sites

Water would be needed for Construction and Operations activities such as dust control, reclamation, hydrostatic testing, and for HDD crossings. Water withdrawal procedures would comply with appropriate State permits and authorizations.

2.2.3.4. Pipeline Construction Material Delivery

Materials and equipment delivered on ocean-capable barges would be temporarily offloaded to the storage yard in Bethel for transfer to shallow-draft barges capable of transporting loads up the Kuskokwim River to the material storage sites on each bank of the river (Kuskokwim East and West) and to the Angyaruaq (Jungjuk) Port. Pipe would also be delivered to the Port of Anchorage and barged to a storage yard at Beluga or sent overland to Oil Well Road. Pipe and other materials would be transported by truck on the existing Beluga area road system to the beginning of the ROW and then to endpoints of delivery along the route. For construction, pipe would be delivered by truck to the intermediate PSYs. For smaller PSYs, which may not be accessible by standard trucks, a tracked carrier may also be used.

2.2.3.5. General Pipeline Construction Methods

Pipeline construction would be divided into two spreads (crew and equipment) over 3 to 4 years. The pipeline construction workforce is expected to peak at approximately 650 workers during the two winter construction seasons. Most of the pipeline would be constructed using conventional open-cut methods and would occur as a moving assembly line with a construction spread proceeding along the construction ROW in continuous operation. A trench would remain open during construction at any given location along the route for 1 to 3 days. Total construction efforts at any single point, from ROW surveying and clearing, to backfill and finish grading, would require 3 to 4 months.

2.2.3.6. Construction Procedures for Specific Site Conditions

Winter construction is planned for the pipeline to protect wetlands to the extent possible. Frost packing would be done in winter where soils must be frozen to support construction equipment. Timber corduroy or mats may be necessary due to terrain or weather conditions to support the pipe and/or equipment. Summer wetland construction would use temporary work pads from imported fill and/or trench spoils or timber mats.

2.2.3.6.1. Water Body/Wetland Crossings and Permafrost

Water body (including wetlands) crossing construction methods may include HDD, open-cut, dry flume, open-cut dam and pump, flowing water open-cut, and non-flowing water open-cut. Construction effects on fish and habitat would be minimized by selecting techniques and timing that provide appropriate protection for the specific habitat sensitivity. HDD drainage-crossing techniques used to protect fish and fish habitats by isolating the in-water work area from the flowing water are proposed for 6 of the 42 major water body crossings. Figure 4 illustrates a cross-section of a typical HDD crossing.

Wetlands underlain by permafrost would be crossed using an ice or snow pad. Wetlands without permafrost would be frost-packed to depths of 3 to 5 feet to drive frost into deeper soils. The pipeline route crosses more than 100 miles of discontinuous permafrost from approximately MP 100 to MP 205 (Figure 5). Gravel work pads or snow and ice pads would be used in areas of thaw-unstable permafrost or over soft soils that would be unable to support construction equipment, and in areas where removal of the organic layer could allow the permafrost to thaw. Gravel work pads would be left in place after construction, leaving the organic layer beneath intact.

Figure 4: Cross-Section View of a Typical HDD Crossing

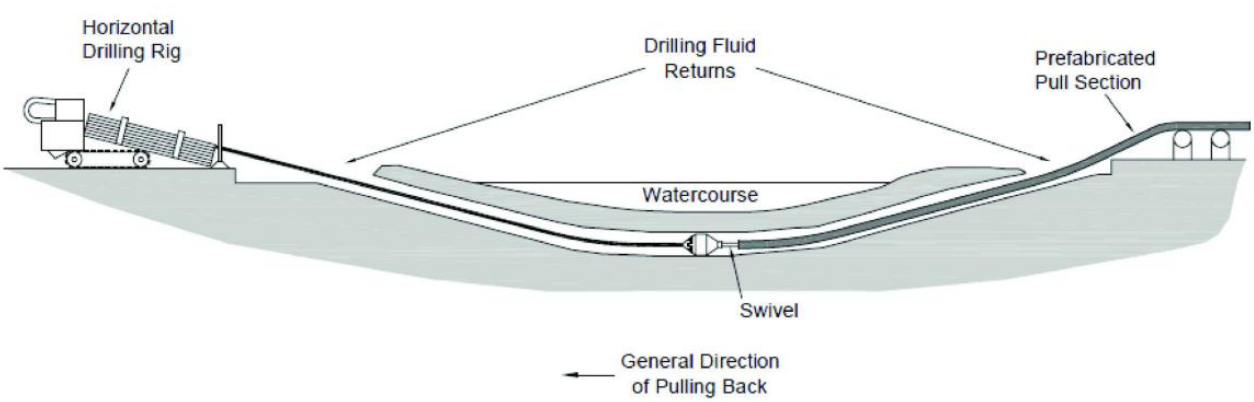
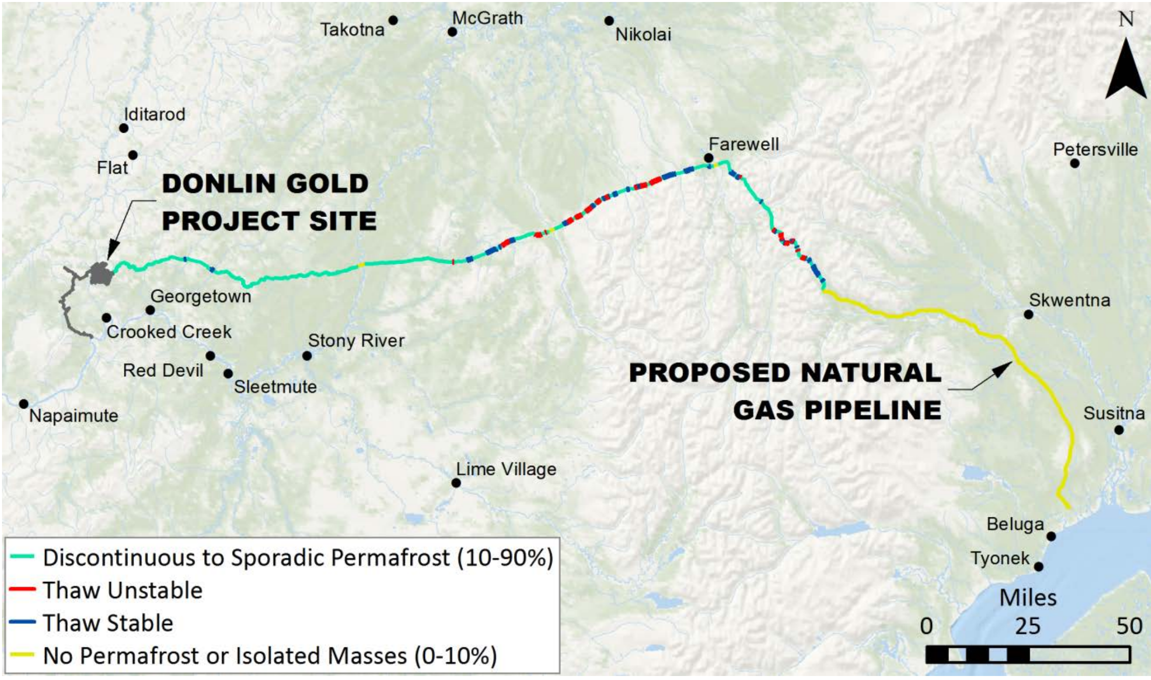


Figure 5: Pipeline Permafrost Locations



2.2.3.6.2. Active Fault Crossings

The pipeline would cross two active faults: the Denali-Farewell Fault (MP 148.5), and the Castle Mountain Fault (MP 7.5). Results of a preliminary fault-crossing stress analysis conducted for both crossings led to a recommended above-grade design with the pipeline in a "Z" configuration at each end of the potential movement zone to ensure flexibility.

2.2.3.7. Pipeline Pressure Testing and Commissioning

The entire pipeline would be pressure tested according to USDOT regulations (49 CFR 192) before being placed into service to verify pipe integrity and ability to withstand maximum allowable operating pressures. A detailed Pressure Test Plan would be developed during final design to address all aspects of pressure testing. The pipeline would be pressure tested using water (hydrostatic testing or "hydrotesting"). Testing using water would most likely be in the summer to avoid the need for antifreeze.

After pressure testing, any necessary tie-ins would be made. The welds on the tie-ins would be inspected and the pipeline dried (if required) before commissioning begins. Commissioning would include testing of controls and communication systems before pipeline operation.

2.2.3.8. Pipeline Decommissioning, Abandonment, and Reclamation

The State of Alaska has not determined the future of the pipeline after Closure. If decommissioning is required, pipes would be purged and cleaned. All above-ground facilities would be removed, including compressor stations, piping, equipment, buildings, fencing, above-ground river crossing structures, access road culverts, and tanks. Above-ground pipelines would be removed to one foot below grade and underground pipelines would be capped and abandoned in place. Monitoring of the abandoned in-place pipeline would not take place unless required by regulations effective at the time of abandonment. After removal of facilities, cleared land would be contoured as necessary to minimize erosion and revegetated.

2.3. Alternative 3A – Reduced Diesel Barging: LNG-Powered Haul Trucks

Alternative 3A would use primarily LNG to fuel the large (300 plus-ton payload) trucks that would move waste rock and ore from the open pits. These large trucks would account for approximately 75 percent of the total annual diesel consumption under Alternative 2. Trucks hauling cargo and fuel on the mine access road from Angyaruaq (Jungjuk) Port would not be converted to LNG.

The primary differences between Alternative 3A and Alternative 2 would be the addition of a 220,000 gallon per day LNG plant and storage tanks near the processing plant, reduced consumption of diesel, reduced barge trips, reduced on-site diesel storage, and increased natural gas consumption.

At present, LNG-powered haul trucks are not in full commercial production. The technology to use natural gas products (such as LNG or compressed natural gas) in other industrial applications is proven and equipment manufacturers are actively developing dual-fuel (diesel and natural gas) options for the mining industry.

2.4. Alternative 3B – Reduced Diesel Barging: Diesel Pipeline

Under Alternative 3B, an 18-inch-diameter diesel pipeline would be constructed from Cook Inlet to the Mine Site to virtually eliminate the need for project-related diesel barging on the Kuskokwim River during Operations, and reduce the overall number of barge trips. The natural gas pipeline proposed for Alternative 2 would not be constructed; natural gas would not be used. The power plant would be fueled only with diesel.

The diesel pipeline would traverse 334 miles and would be buried within the same corridor proposed for the natural gas pipeline described under Alternative 2 (See Section 2.2.3). This design would require an additional segment between the Tyonek North Foreland Facility and the natural gas pipeline corridor start. This additional segment would cross the Beluga River using HDD. There would be improvements to the existing Tyonek North Foreland Barge Facility and transportation of diesel fuel in Cook Inlet. The pipeline alignment crossing the Castle Mountain and Denali-Farewell faults would be constructed above grade similar to the natural gas pipeline in Alternative 2.

Two options to Alternative 3B have been added based on Draft EIS comments from agencies and the public (Figure 6):

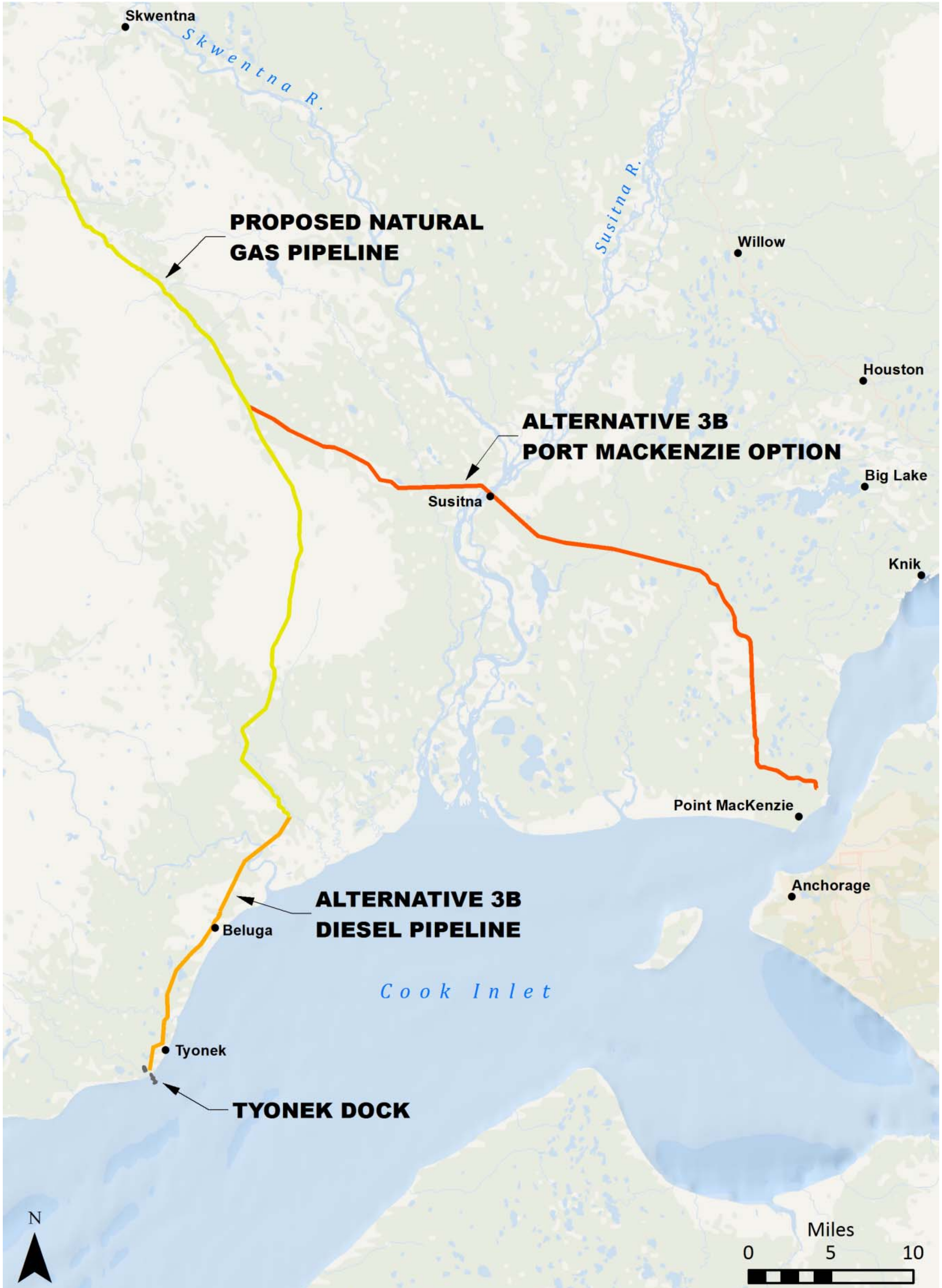
Port MacKenzie Option

The Port MacKenzie Option would utilize the existing Port MacKenzie facility to receive and unload diesel tankers instead of the Tyonek facility considered under Alternative 3B. A pumping station and tank farm of similar size to the Tyonek conceptual design would be provided at Port MacKenzie. A pipeline would extend northwest from Port MacKenzie, route around the Susitna Flats State Game Refuge, cross the Little Susitna and Susitna rivers, and connect with the Alternative 3B alignment at approximately MP 28. In this option, there would be no improvements to the existing Tyonek dock; a pumping station and tank farm would not be constructed near Tyonek; and the pipeline from the Tyonek tank farm considered under Alternative 3B to MP 28 would not be constructed.

Collocated Natural Gas and Diesel Pipeline Option

The Collocated Natural Gas and Diesel Pipeline Option (Collocated Pipeline Option) would add the 14-inch-diameter natural gas pipeline proposed under Alternative 2 to Alternative 3B. Under this option, the power plant would operate primarily on natural gas instead of diesel as proposed under Alternative 3B. The diesel pipeline would deliver the diesel that would be supplied using river barges under Alternative 2 and because it would not be supplying the power plant, could be reduced to an 8-inch-diameter pipeline. The two pipelines would be constructed in a single trench that would be slightly wider than proposed under either Alternative 2 or Alternative 3B and the work space would be five feet wider. The permanent pipeline ROW would be approximately two feet wider. This option could be configured with either the Tyonek or Port MacKenzie dock options (Figure 6).

Figure 6: Alternative 3B and Options Transportation Corridor Overview



2.5. Alternative 4 – Birch Tree Crossing Port

Alternative 4 would move the port site to Birch Tree Crossing (BTC), about 75 river miles below the Angyaruaq (Jungjuk) Port site and 124 river miles upstream from Bethel, reducing the barge distance for freight and diesel to the Mine Site. The same volume of cargo and diesel fuel would be transported by barge as in Alternative 2, and there would be no other substantive changes to other project components.

The 65-acre BTC Port site would be situated on the Kuskokwim River (Figure 7) consisting of an onshore pad with areas for general storage, fuel storage, a warehouse truck shop, and living accommodations, and a filled area on the riverbank to allow container barges to dock. An approximately 76-mile, 30-foot-wide, all-season gravel access road (46 miles longer than the mine access road in Alternative 2) would link the BTC Port to the Mine Site (Figure 8) to transport fuel and cargo.

The road would cross lands owned by TKC and the villages of Aniak, Chuathbaluk, and Crooked Creek. Public use of the road would not be allowed; however, crossing the road in pursuit of local subsistence activities would be accommodated. Fifty material sites would be used to provide road construction material. The BTC road would cross 40 waterbodies, four of which are anadromous (Crooked Creek, Iditarod River, Cobalt Creek, and Owhat River). Eight stream crossings would require bridges and there would be 32 culverts.

The number of barge and truck trips overall would be the same as in Alternative 2. Positioning the upriver port site at BTC rather than at the Angyaruaq (Jungjuk) site would not substantially change the total volume of cargo and fuel shipped to Bethel and to the Mine Site. The estimated annual ocean and river barge trip numbers would be the same as in Alternative 2.

Figure 7: Alternative 4 BTC Port Site Layout

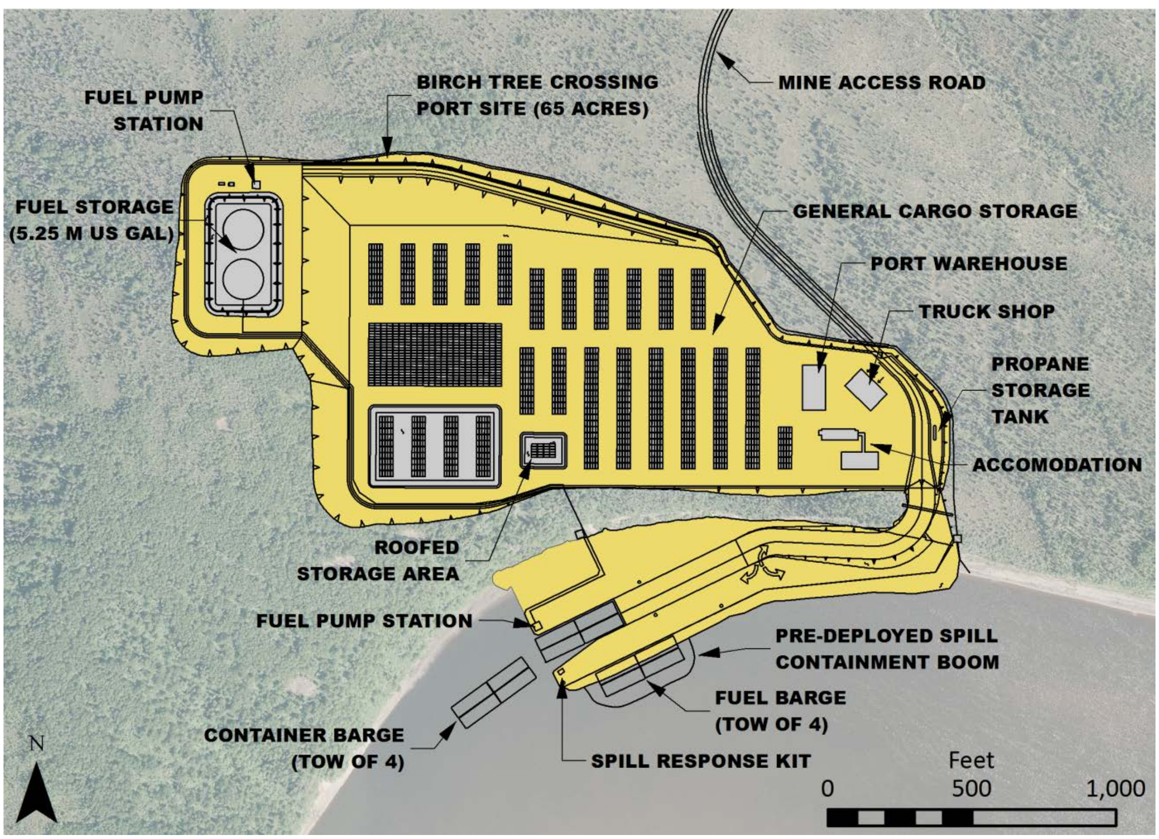
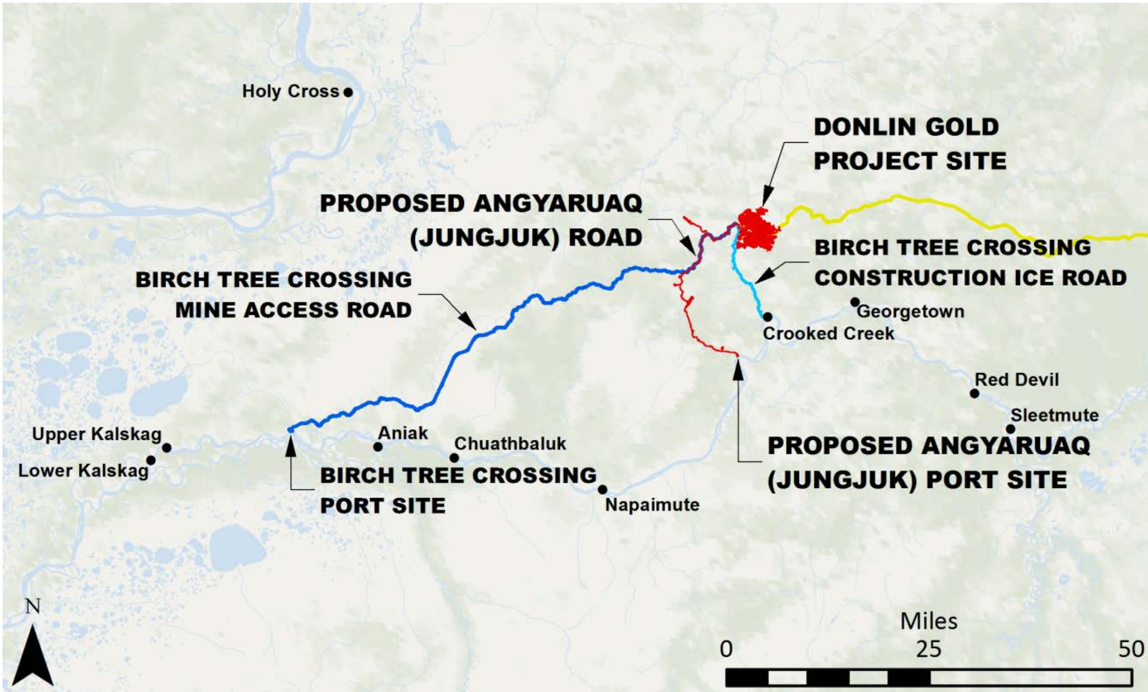


Figure 8: Alternative 4 Mine Access Road Overview



2.6. Alternative 5A – Dry Stack Tailings

Alternative 5A would use the dry stack tailings (DST) method instead of the subaqueous tailings method that would be used under Alternative 2. This alternative was developed to avoid the potential for accidental releases from the tailings dam proposed under Alternative 2.

Under Alternative 5A, tailings would be dewatered in a filter plant using specialized equipment to produce a partially saturated, compactable filter cake. This material would be delivered to the TSF by truck, then spread and compacted in thin layers using bulldozers. Residual process water removed from the tailings would be transported to an operating pond via pipeline, and reclaimed water from the pond would be pumped back to the processing plant for reuse (Figure 9). The main dam, upper dams, and operating pond would be fully lined with a 60-mil (1.5-mm) LLDPE liner.

This alternative includes two options:

Unlined Option

The TSF would not be lined with an LLDPE liner. The area would be cleared and grubbed and an underdrain system placed in the major tributaries under the TSF and operating pond to intercept groundwater base flows and infiltration through the DST and convey it to a Seepage Recovery System (SRS). Water collecting in the SRS pond would be pumped to the operating pond, lower CWD, or directly to the processing plant for use in process.

Lined Option

The DST would be underlain by a pumped overdrain layer throughout the footprint, with an impermeable LLDPE liner below. The rock underdrain and foundation preparation would be completed in the same manner as the Unlined Option.

During Closure, the DST would be covered with soil, an LLDPE cover, and vegetated. The operating pond water and any residual solids would be pumped to the open pit. The operating pond and main dam liners would be removed, the dam walls would be breached and graded back into the footprint, and the footprint reclaimed. 2.7. Alternative 6A - Modified

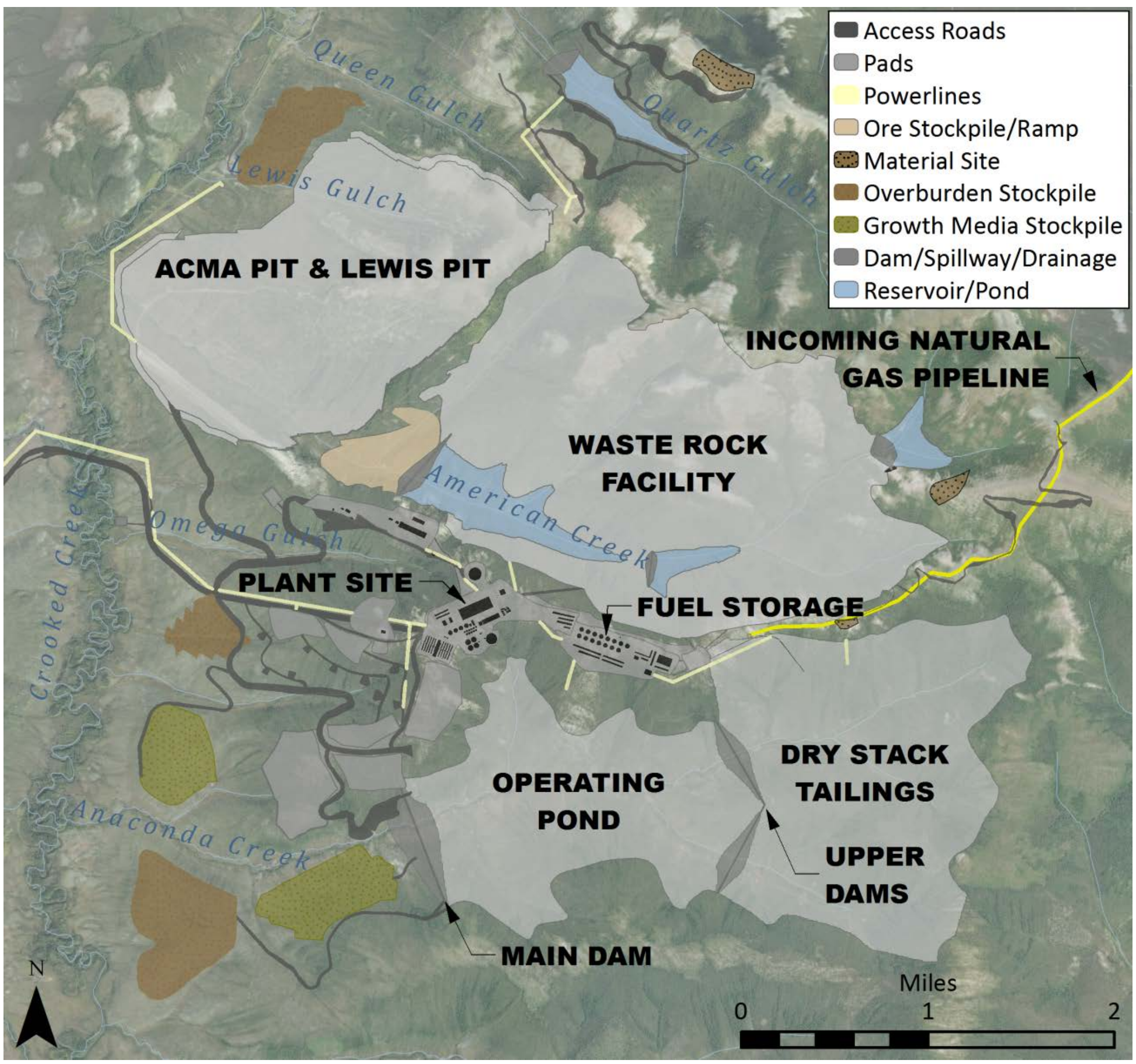
Natural Gas Pipeline Alignment: Dalzell Gorge Route

Alternative 6A would realign the natural gas pipeline west between MP 106.5 to 152.7, traversing Dalzell Gorge. This alternative route is carried forward for analysis because it is feasible and allows comparison of environmental impacts to Alternative 2. The route would deviate from the Alternative 2 alignment at approximately MP 106.5, trend west, and parallel the Happy River for approximately 5 miles before trending northwest at Pass Creek and through Rainy Pass and Dalzell Gorge.

The terrain through the gorge is steep; the route through Rainy Pass starts at an elevation of 2,500 feet above mean sea level (MSL) and climbs to 3,327 feet MSL over about 6 miles. Approximately 34 miles of this route would be located in the immediate vicinity of, or cross, the INHT.

Alternative 6A would have mainline valves at approximately MP 119 and 138, 11 material sites, and 7 access roads ranging in length from 0.03 mile to nearly 3 miles. New gravel airstrips would be constructed at Pass Creek and Tatina. This alignment would cross the Happy River and the South Fork of the Kuskokwim River using HDD, which may also be used to cross an area of slope instability in Dalzell Gorge.

Figure 9: Alternative 5A Mine Site Layout



Chapter 3: Environmental Analysis

The environmental impacts of the project alternatives on 23 resources plus spills, pipeline safety and reliability, and climate change were analyzed by first describing existing conditions and then analyzing potential effects that could occur as a result of the proposed alternatives. Chapter 3, Environmental Analysis, presents details of the existing conditions and effects determined for each resource by section. Three types of effects were considered:

Direct Effects

Effects caused by the action and occur at the same time and place (40 CFR 1508.8);

Indirect Effects

Effects caused by the action but occur later in time or at a removed distance, but are still reasonably likely to occur (40 CFR 1508.8); and

Cumulative Effects

Additive or interactive effects that could result from the incremental effect(s) of actions when added to other past, present, and reasonably foreseeable future actions (RFFAs). RFFAs are those that are external to the project and likely (or reasonably certain) to occur in the next 30 years. Cumulative actions may increase or decrease the net level of effects.

Direct and indirect effects, as defined above, could be associated with all three project phases for all three project components. The direct and indirect effects for each resource or resource use are analyzed on the basis of the factors of intensity (magnitude), duration, extent (scope), and context of the impact (40 CFR 1508.27). Definitions and general scales for these four factors are provided below. Criteria were developed based on federal NEPA guidance and other recent NEPA analyses. This framework is used throughout the EIS and is adapted as necessary for each resource. The four factors include:

Intensity (Magnitude)

A measure of change in a resource condition that would be expected to occur. Change is described by how perceptible the change is, and to what degree the change impacts the resource's function in the ecosystem or cultural context.

Duration

A measure of length of time that impacts would be expected to occur, which may range from temporary to permanent.

Extent (Scope)

A geographic measure of where impacts would be expected to occur, which may range from impacts to discrete portions of the EIS Analysis Area to larger areas.

Context

A measure of the role the resource fills within the particular analysis framework for that resource. Several resource sections have refined descriptions for the context criteria. Resource-specific definitions are presented in the respective sections, as applicable.

Seven resources (surface water hydrology, groundwater hydrology, water quality, air quality, fish and aquatic resources, socioeconomics, and subsistence) and two issue topics (spills and climate change) were identified as those of highest importance during scoping, and are discussed in detail within this Executive Summary (refer back to Table 2 for the complete list of issues brought forward for analysis). Comparison of main differences for the seven resources and two issue topics by alternative is given in Table 5.

3.1. Surface Water Hydrology

Chapter 3, Section 3.5

Surface water resources are water bodies with surface water flow and movement (as opposed to groundwater or water vapor), such as rivers, streams, lakes, and wetlands. Construction and Operations activities have the potential to affect surface water hydrology, or the movement and distribution of surface water. Most water use would be recycled from the tailings pond, but some would be drawn from surface water resources.

Existing Conditions Summary

The Mine Site is within the Crooked Creek drainage, a tributary of the Kuskokwim River. Seventeen drainages feed Crooked Creek. Placer mining activities have occurred in several streams in the Crooked Creek drainage. Streamflow monitoring has been ongoing in several locations to collect baseline data.

Expected Effects of Alternatives

Alternative 1 (No Action)

There would be no new impacts to surface water hydrology.

Alternative 2 (Donlin Gold's Proposed Action)

Surface water hydrology would be most affected within the Mine Site. Under this alternative, surface water amount and flow would be altered during each project phase in six tributaries of Crooked Creek. Impacts to Crooked Creek would range in intensity depending on the type of activity. For example, vegetation removal, soil compaction, and installation of drainage structures at stream crossings would result in maintained surface water flow systems and changes in water quantity that are likely within the limits of historic seasonal variation. However, decreased runoff contribution from American Creek and Anaconda Creek to Crooked Creek would result in substantial flow diversions and changes in flow systems that are likely to affect nearby uses or environments (or the surface water flow system design is not likely to adequately protect nearby uses or environments for the expected range of conditions). The magnitude of the mine's impact on streamflow would also vary depending on bedrock conductivity (K). If the hydraulic conductivity of the bedrock aquifer is higher than anticipated (i.e., high K condition), the variation in Crooked Creek streamflow may exceed the magnitude of seasonal variations and may have a longer duration than seasonal variations. The intensity of some streamflow effects would be reduced during Closure. For the Pipeline, the North Option would have additional stream crossings, and one additional HDD crossing over Alternative 2.

The duration of impacts could range from ROW runoff effects lasting during the Construction Phase, to indefinite Crooked Creek flow reductions due to pit lake water level maintenance. Approximately 4.7 miles of fish-supporting stream habitat and 5.6 miles of non-fish-supporting stream habitat would be lost. Affected drainages account for about 8 percent of the Crooked Creek watershed. The extent or scope of impacts would range from the immediate vicinity of project facilities, to potentially affecting hydraulically connected waters beyond the Project Area. Flow reductions in Crooked Creek adjacent to the Mine Site could range from 45 to 100 percent in winter, depending on bedrock and precipitation conditions. Flow in Crooked Creek below the Mine Site near Crevice Creek would be reduced by 20 percent in winter and 26 percent in dry conditions in later mine life. The effects of flow reductions in lower Crooked Creek would be less pronounced, with the greatest flow reduction near the mouth of Crooked Creek projected to be 4 to 10 percent and occurring later in the mine life.

Reshaped topography would permanently alter surface flow at the Mine Site. Permanent flow diversion and treatment would begin around year 50 to 55 after Closure. The pit lake would be almost full at year 50, when water would be directed through the WTP plant prior to discharge to Crooked Creek. The extent or scope of impacts would range from the immediate vicinity of project facilities, to potentially affecting hydraulically connected waters beyond the Project Area. In terms of context, impacts would affect an abundant but shared resource, and one that is governed by regulation.

Along the Kuskokwim River, barge-induced bank erosion could increase overall bank erosion above natural erosion rates; however, studies indicate that the increase due to project barge traffic is likely to be small.

Other Alternatives

The effects of other action alternatives on surface water hydrology would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would have fewer barge trips, therefore reducing barging impacts to surface water hydrology in the Kuskokwim River compared to Alternative 2. The potential for barge-induced bank erosion would decrease, and the scour potential from propeller wash would decrease under Alternative 3A. These differences would not alter the intensity, duration, extent, and context of impacts compared to Alternative 2.

Alternative 3B (Diesel Pipeline)

This alternative has similar differences in effects to those of Alternative 3A. Some additional impacts would occur during construction of the Tyonek-to-Beluga portion of the diesel pipeline. The Port MacKenzie Option would have fewer stream crossings than Alternative 2, and the Tyonek Option slightly more than Alternative 2. Intensity of effects would be reduced, but other differences would not alter the, duration, extent, and context of impacts compared to Alternative 2.

Alternative 4 (BTC Port)

This alternative would have fewer shallow sections of river needing to be traversed, leading to reduced potential for impacts to surface water hydrology from barging. Overall, the intensity of effects would be reduced due to fewer stream crossings and a shorter river section potentially affected.

Alternative 5A (Dry Stack Tailings)

This alternative would alter the flow of surface water at the Mine Site similar to Alternative 2, with the exception that the wet tailings design would be exchanged for a dry stack with an operating pond. More contact water would be stored and used in ore processing, resulting in a roughly 25 percent increase in discharge of treated water to Crooked Creek during Operations. Post-Closure, water flow in the reclaimed Mine Site would be different from Alternative 2, but the downstream effects would be the same. Approximately 6 percent increase in barge traffic would be necessary resulting in a slight increase in potential effects on the Kuskokwim River from barging activity; however, these differences would not alter the intensity, duration, extent, and context of impacts compared to Alternative 2.

Alternative 6A (Dalzell Gorge Route)

This alternative would reduce stream crossings and would proportionally reduce the intensity, of impacts compared to Alternative 2.

3.2. Groundwater Hydrology

Chapter 3, Section 3.6

Groundwater is water contained in underground aquifers (as opposed to surface water), replenished by rainfall and snowmelt, and depleted by human use and natural conditions such as discharge to streams during dry conditions. The Donlin Gold Project would use groundwater for mining operations, particularly in the area of the mine pit, which would affect the water table in the area.

Existing Conditions Summary

The Mine Site is associated with three groundwater units, one of which (an alluvial aquifer) contributes a high proportion of flow to Crooked Creek. Considerable groundwater is found in alluvial and sandy deposits along the Kuskokwim River. Groundwater wells are an important source of drinking water for communities in the EIS Analysis Area along the Kuskokwim River. In addition to feeding Crooked Creek flow in the Mine Site area, groundwater also feeds year-round flow in the Kuskokwim River. Approximately 35 percent of the pipeline route is underlain by shallow groundwater within 3 feet of the land surface. Expected Effects of Alternatives

Alternative 1 (No Action)

There would be no new impacts to groundwater hydrology.

Alternative 2 (Donlin Gold's Proposed Action)

A three-dimensional mathematical model of roughly 85 square miles surrounding the Mine Site (to a depth of 1,500 feet below the deepest mine area) was constructed using field measurements and field-based estimates for water inputs, outputs, and underground geology. Estimates of the effects of the project on groundwater hydrology are based on this modeling.

The intensity of impacts would vary depending on the type of activity and stressor. Groundwater flow changes at the South Overburden Stockpile, or small stresses to aquifers tapped for water supply along the Transportation Corridor or Pipeline components, would result in changes in water quantities within historic or minimal variation. The highest intensity groundwater impacts associated with the Mine Site would occur during Operations. The mine would lower the water table in the area around the pit in order to establish stable pit walls and dry working conditions. Dewatering would be accomplished by pumping groundwater from wells. The deepening and lowering of the water table below the pit level would form a cone of depression (a hydrologic low into which the groundwater would drain), which would continue through the life of the mine. This would reduce or stop groundwater flow to Crooked Creek and drainages east of the creek as groundwater would flow toward the dewatering wells. The flow reductions in Operations would occur mostly across about a 2- to 3-mile stretch around the Mine Site and would extend some distance downstream, but not further than the mouth of Crooked Creek. The unlined WRF could leak contact water into the groundwater, which would be captured by pit dewatering during Operations. After Closure, shallow groundwater beneath the WRF would flow into the pit lake. Models predict that the pit lake would continue to be a destination for groundwater flow, and that Crooked Creek would continue permanently to lose water to the groundwater gradient flowing to the pit lake after Closure. Groundwater system recovery would cause the cone of depression and water table to slowly recover to the elevation of the post-Closure operating lake level. This level would be permanently managed by pumping to maintain hydraulic containment of contact water in the pit lake.

The extent or scope of impacts would be geographically limited to discrete portions of the Project Area. In terms of context, impacts would affect usual or ordinary groundwater resources not currently depleted, but shared and protected by legislation.

The transportation facilities in the Transportation Corridor component would have effects on groundwater, limited to construction of potable water supply wells for new port facilities. Shallow groundwater exists along the pipeline corridor in the Pipeline component which would not be impacted past Construction. Based on terrain features, the occurrence of shallow groundwater intersected by the pipeline trench along the North Option is expected to be roughly 3 miles less than that of Alternative 2.

Other Alternatives

The effects of other action alternatives on groundwater hydrology would be similar to those of Alternative 2.

3.3. Water Quality

Chapter 3, Section 3.7

The mine and ore processing processes would result in discharges of treated water. Mining increases the rates of physical and chemical processes such as weathering and chemical dissolution of rocks and minerals. Weathering releases rock constituents into surface water, groundwater, and sediment by increased surface area exposure to elements during excavation. Weathering can result in acid release from rocks containing certain minerals, leading to acidic water, called acid rock drainage.

Existing Conditions Summary

Donlin Gold has conducted studies of baseline water quality conditions within the Project Area since 2005. There are no water bodies in the Project Area that are listed as impaired under Section 303(d) of the Clean Water Act, which is the primary law governing surface water quality in the United States. Two elements of concern in the Mine Site are mercury and arsenic. Mercury and arsenic compounds are often found in association with gold-bearing deposits. Naturally elevated mercury and arsenic levels are found sporadically in surface water and groundwater in the vicinity of the mine, with some concentrations exceeding water quality standards. Arsenic and mercury are also both present in sediment samples, especially below mineralized areas.

Water in the Kuskokwim River is generally considered fit for all purposes, and several villages draw drinking water directly from it; however, there are points along the Kuskokwim—naturally mineralized areas and sites of historical mining operations—where concentrations of mercury and other minerals are elevated above Sediment Quality Guidelines. Sediment sampling along the Kuskokwim River between Crooked Creek and Bethel showed elevated metal levels, including arsenic and mercury, at all sampling sites.

Expected Effects of Alternatives

Alternative 1 (No Action)

There would be no new impacts to water quality.

Alternative 2 (Donlin Gold's Proposed Action)

Mine Site – Surface water in the American and Anaconda Creek watersheds would be influenced by the creation and perpetual (i.e., for an indefinitely long period of time) maintenance of managed mine facilities such as the pit lake, TSF, and CWDs. Due to planned water treatment and water management practices, untreated water from the TSF and pit lake would not leave these watersheds, and would be restricted to facilities within discrete portions of the Project Area. Effects from pit dewatering discharge to Crooked Creek during construction; from pit dewatering, CWD water, and TSF pond water during Operations; and from pit lake and SRS water discharged during post-Closure would be below applicable regulatory limits, as all water would be treated to meet the most stringent permit limits based on Alaska water quality standards prior to discharge. Excess water would be treated and discharged under an Alaska Pollutant Discharge Elimination System (APDES) permit.

Changes to groundwater quality are expected to result from seepage from the WRF to shallow groundwater and from rain and snowmelt seeping through disturbed rock. Although most seepage would be captured and treated, some may infiltrate shallow groundwater, resulting in discrete areas of groundwater that may exceed regulatory limits within the Mine Site area.

Impacts to sediment quality would result from increased concentrations of mercury in the Crooked Creek watershed resulting from atmospheric deposition of mercury released by mine facilities. However, the localized increase in mercury concentrations would be a maximum of 2.5 percent over existing background levels, and would not exceed regulatory guidelines.

Transportation Corridor and Pipeline – During Operations, barging in shallow sections may have discrete effects on sediment and turbidity and surface water quality would be below regulatory limits. Similarly, construction of the pipeline would create discrete surface water and sediment effects at stream crossings that would be below regulatory limits. Discharges of hydrostatic test water would meet the requirements of the applicable APDES General Permit.

Other Alternatives

The effects of other action alternatives on water quality would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would have reduced surface water effects such as increases in turbidity arising from barging compared to Alternative 2. The intensity, duration, extent, and context of impacts would be the same as described for Alternative 2.

Alternative 3B (Diesel Pipeline)

This alternative would have additional impacts in Upper Cook Inlet from the extension of the Tyonek North Foreland Facility dock during construction, and along the additional pipeline length from Tyonek. The intensity, duration, extent, and context of impacts would be the same as described for Alternative 2.

Alternative 4 (BTC Port)

This alternative may slightly increase surface water impacts; the number of stream crossings would be reduced, but the longer access road would increase runoff while sediment impacts would be slightly decreased in the Kuskokwim River because of reduced barge distances. However, the overall intensity, duration, extent, and context of impacts would be the same as described for Alternative 2.

Alternative 5A (Dry Stack Tailings)

More water would need to be treated on an ongoing basis in operations prior to discharge under this Alternative. Different amounts of contact water would be released into subdrains beneath the dry stack depending on whether it is unlined (Unlined Option) or lined (Lined Option). The main difference between the two is the time it would take for SRS water to clean up to the point that it can be decommissioned in post-Closure and the State of Alaska surface water quality standards met; that is, roughly 200 years under the Unlined Option, and about 10 to 50 years under the Lined Option. The Lined Option would provide the additional advantage of minimizing (but not preventing) the potential for groundwater quality impacts. Under either option, effects on downgradient water quality in Crooked Creek would be the same as Alternative 2, as the SRS water would be contained and conveyed to the open pit. Increased deposition of mercury to surface water and sediment from fugitive dust, and the potential for increased rates of mercury methylation, are possible. The intensity, duration, extent, and context of impacts would be the same as described for Alternative 2.

3.4. Air Quality

Chapter 3, Section 3.8

The mine and ore processing activities would result in air emissions that could affect air quality in the region. Contaminants from the mining process such as mercury, dust, and greenhouse gases (GHGs) are of concern for the health of residents and wildlife and vegetation.

Existing Conditions Summary

Three major categories of pollutants could be generated by the proposed project: criteria pollutants, hazardous air pollutants, and GHGs. Criteria pollutants are air constituents that are harmful in concentrations above a certain threshold—for instance, dust (also known as particulate matter). Hazardous air pollutants (HAPs) are toxic substances not ordinarily present in the atmosphere in most places (or only in trace amounts), such as mercury. GHGs are not necessarily toxic but contribute to global climate change.

The EIS Analysis Area contains mercury from existing natural (vegetation, biomass burning, volcanoes, and surface waters) and anthropogenic sources (coal combustion, waste incineration, and historic mining activities). Mercury abatement (reduction) and containment methods have been a subject of study and improvement in gold processing in recent decades. In the air, the most common form of gaseous mercury deposits can travel long distances before depositing on the ground.

GHGs contribute to climate change. A number of substances potentially released by project components act as GHGs, including carbon dioxide, oxides of nitrogen, and sulfur dioxide.

Oxides of nitrogen are produced by the reaction of gaseous nitrogen and oxygen during combustion. They contribute to acid rain, and to the formation of ozone in the lower atmosphere, which can be harmful to human and wildlife health. Oxides of nitrogen are GHGs.

Donlin Gold implemented an ambient air quality field monitoring program to collect baseline data, which confirmed that ambient pollutant concentrations comply with the respective federal and Alaska state ambient air quality standards (AAQS).

Expected Effects of Alternatives

Alternative 1 (No Action)

There would be no new impacts to air quality.

Alternative 2 (Donlin Gold's Proposed Action)

Expected air quality impacts were evaluated based on the results of dispersion modeling (if available) and emissions estimates. No emissions are expected to exceed air quality standards in Alternative 2.

Mine Site - Emissions modeling for the Mine Site was performed assuming that only diesel fuel is used at the power plant, which is using a conservative scenario for air impact analysis because burning diesel generates more emissions than burning natural gas. The Mine Site would be a major source of pollutants such as carbon monoxide, oxides of nitrogen, PM2.5, PM10, and volatile organic compounds. In terms of intensity, these pollutants remained below 100 percent of allowable increments in the models, or the amount of additional pollutant that is allowed beyond the baseline pollutant level, the highest being the 24-hour high of PM10, at 86 percent. Ambient mercury modeling shows expected exposure at the Mine Site of less than 1 percent of the most stringent standard for annual exposure, with no observable adverse effect.

Construction and Closure air quality effects would be considered temporary, while Operations impacts would be long-term. Neither construction nor closure would create conditions above permitting thresholds. During Operations, the intensity of emissions would be above thresholds but meet regulatory ambient air standards. Operations emissions would require an air quality permit, but would meet ambient air standards.

During the Construction Phase, air quality would be reduced infrequently and is expected to return to pre-activity levels at the completion of the activity. During Operations and Closure phases, impacts would persist through the life of project. The extent or scope of impacts would affect air quality only locally in discrete portions of the Project Area. The EPA determines air quality attainment status based on whether the air quality in the area meets (attains) air quality standards. If there is insufficient data to designate as attainment or nonattainment, the area is considered "unclassified" and is treated as attainment area. In terms of context, impacts to air quality would affect attainment/unclassified areas.

Transportation Corridor and Pipeline - No permit or reporting thresholds for air quality would be exceeded in any project phase for these components. Impacts to air quality would range from discrete portions of the Project Area to areas potentially throughout the EIS Analysis Area or outside the Project Area. Ambient air quality standards would not be exceeded.

Other Alternatives

The effects of other action alternatives on air quality would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would reduce the use of diesel fuel and increase consumption of natural gas, creating minor reductions in emissions of carbon monoxide, oxides of nitrogen, particulate matter, sulfur dioxide, volatile organic compounds, and GHGs at the Mine Site, and reduced emissions from barging compared to Alternative 2. The intensity, duration, extent, and context of impacts would be similar to Alternative 2.

Alternative 3B (Diesel Pipeline)

This alternative would result in equipment at the Mine Site being run on diesel, the basis for the impact assessment for Alternative 2. In practice, Alternative 2 emissions would be less than those modeled, while Alternative 3B emissions would be at modeled levels, meaning reduced volatile organic compounds but increased carbon monoxide, oxides of nitrogen, sulfur dioxide, and particulate matter at the Mine Site compared to Alternative 2. There would also be reduced emissions from barging compared to Alternative 2. The intensity, duration, extent, and context of impacts from Alternative 3B, including the Port MacKenzie Option and Collocated Pipeline Option, would be similar to Alternative 2.

Alternative 5A (Dry Stack Tailings)

This alternative would require a filter plant to dewater tailings and produce filter cake, which would be transported by truck to the Anaconda Creek valley for dry stacking. At Closure, the storage facility would be covered and flattened. This alternative would call for increased power generation, resulting in an increase in emissions from the power plant. It would require a 6 percent increase in barge traffic, and would create more fugitive dust than Alternative 2. None of these changes affect the overall intensity of air quality impacts.

3.5. Fish and Aquatic Resources

Chapter 3, Section 3.13

Fish and aquatic resources, including habitat characteristics, species abundance, and fisheries, are of central importance to the livelihood of residents of the EIS Analysis Area.

Existing Conditions Summary

Habitat and Abundance - The Kuskokwim River and many of its tributaries, including the creeks in the Crooked Creek drainage, are designated as Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act for Pacific salmon. In Crooked Creek, in addition to populations of Chinook, chum, and coho salmon, limited numbers of sockeye and pink salmon have been recorded as have 12 species of resident fish, including Dolly Varden, Arctic grayling, pike, roughly 200 years and two species of whitefish.

The Transportation Corridor includes roughly 199 miles of the Kuskokwim River, habitat characterized by sediment-rich, low-gradient, meandering channels of water depth that fluctuates with tides and seasons. At least 27 species of freshwater and anadromous fish are found here. Chinook salmon are of special concern in recent years due to low populations, but no endangered or threatened fish species are found in the Kuskokwim River drainage.

Fisheries - The Kuskokwim River subsistence fishery is one of the largest in Alaska. The Kuskokwim drainage contains about 4,600 households in 38 communities. More than 1,500 households engage in subsistence fishing, sharing with additional households. Although there are generally no limits on individual or household take of subsistence salmon, urgent conservation measures have limited harvest of Chinook salmon in recent years. Subsistence use of Chinook and sockeye predominates over commercial take, while commercial harvest of chum is generally greater than subsistence, and commercial use of coho far outweighs subsistence harvest. Sport fisheries also occur in the Kuskokwim River, and both commercial and subsistence use of aquatic resources extend into Kuskokwim Bay.

Expected Effects of Alternatives

Alternative 1 (No Action)

There would be no new impacts to fish and aquatic resources.

Alternative 2 (Donlin Gold's Proposed Action)

Mine Site - Construction of the mine would result in habitat removal, stream flow and temperature changes, and sedimentation, all of which would affect fish and aquatic resources, including EFH in the Crooked Creek drainage. Just under 8 miles of streambed would be removed, representing about 8 percent of the Crooked Creek watershed. Habitat in American Creek and Anaconda Creek, which supports about 200 coho salmon, would be lost. Stream flow changes would be seasonal, with greatest reductions during winter months, affecting resident fish more than salmon. Permit-mandated water management practices at the Mine Site would avoid and mitigate effects on downstream aquatic habitat. Impacts would vary in intensity depending on the type and source of activities. In terms of intensity, notable impacts that may cause acute or obvious changes could result from streamflow reduction and sedimentation that cause local effects to fish populations and aquatic habitat in Crooked Creek and its tributaries in the vicinity of the Mine Site area.

The duration of impacts would also vary and in some cases, aquatic habitat would not be anticipated to return to its pre-disturbance character or levels. The extent of impacts to aquatic habitat would be limited to waters in the vicinity of the project footprint and the associated watershed(s) (aquatic life in the lower parts of Crooked Creek would not be measurably impacted). In terms of context, impacts would affect aquatic habitat that is regulated as EFH.

Transportation Corridor - The intensity of impacts from the Transportation Corridor would vary and depend on water conditions, barge/tug wakes and propeller wash along the Kuskokwim River. Notable impacts that may cause acute or obvious changes could result from:

• Barge traffic waves and turbulence that could displace or strand young-of year salmon or degrade shoreline water quality along shorelines of confined segments of the Kuskokwim River navigation channel;

• Riverbed scour and degradation of aquatic

habitat, in areas utilized for rainbow smelt spawning and egg-incubation in late May and June as a result of tug propeller forces along the navigation channel where depths are shallow and generally less than about 8-10 feet; and

• Potential injuries or mortalities from tug propeller shear forces when small young-of-year salmon or resident fishes are migrating in dense concentrations, particularly where barge traffic is passing through constricted channel segments of the river.

Pipeline – Impacts would affect fish and aquatic resources through behavior disturbance and habitat alterations from stream crossings, water withdrawals, and various discharges. Effects would be limited and mitigated by methods such as HDD or timing pipe installation for least disruption of aquatic life. The North Option would have similar effects to fish and fish habitat.

Other Alternatives

The effects of other action alternatives on fish and aquatic resources would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would decrease the total number of barge trips per season from 122 to 83, thereby reducing erosion and riverbed scour effects. None of these changes affect the overall intensity, duration, extent, and context of impacts compared to Alternative 2.

Alternative 3B (Diesel Pipeline)

This alternative would eliminate fuel barging after the Construction Phase, reducing the total number of barge trips per season from 122 to 64, thereby reducing erosion and riverbed scour effects. However, impacts during construction would remain, and impacts associated with the access roads would be higher. The Port MacKenzie Option would involve similar additional construction infrastructure, but would require crossing of the Susitna River and Little Susitna River. The Collocated Pipeline Option would require a wider pipeline construction footprint. The overall intensity, duration, extent, and context of impacts would be the same as Alternative 2.

Alternative 4 (BTC Port)

This alternative would eliminate the upriver portion of the river route, replacing it with a longer access road. Under this alternative, decreased impacts within the river might be offset by new impacts to the wetlands from the extended road. The overall intensity, duration, extent, and context of impacts would be the same as Alternative 2.

3.6. Socioeconomics

Chapter 3, Section 3.18

Potential socioeconomic impacts to employment, income, and sales; tax revenue and other fiscal effects; and public infrastructure and services were analyzed for the regional and out-of-region (i.e., statewide) economies, including 56 potentially affected communities in the Yukon-Kuskokwim (Y-K) region. Analysis included potential beneficial impacts from the project such as new jobs, along with potential negative impacts, such as patterns of boom and bust cycles in the local economy.

Existing Condition Summary

The potentially affected area covers a wide geographic range and diverse socioeconomic conditions. With the exception of Bethel, the villages of the Y-K region are all generally small, remote communities with subsistence-based economies and few opportunities for year-round employment. Most of these villages have less than 1,000 inhabitants. Government jobs are critical, and communities have felt the effects of federal and state funding cuts in recent years. Commercial fishing, which is seasonal and subject to fluctuating stocks, is the mainstay of the private economy. These small communities have among the lowest rates of per capita income in Alaska, and among the highest rates of unemployment. Many people leave these small communities for economic opportunities in urban areas.

The city of Bethel, the regional hub for services and transportation and home to more than 20 percent of the population of the Y-K region, has much higher employment. Other affected areas include the city of Unalaska, the Kenai Peninsula Borough, the Matanuska-Susitna Borough, and the Municipality of Anchorage, all with higher populations and wider economic bases.

Small communities in the affected area typically do not levy taxes. Infrastructure and services vary widely across the potentially affected communities. Anchorage and surrounding areas provide extensive infrastructure and services in education, transportation, health care, public safety, and other areas, while villages in the Y-K region typically provide basic amenities such as an elementary school and a resident health aide for health care. Residents of small communities routinely travel for health care and for higher education. Within the potentially affected area, only the communities in Southcentral Alaska use natural gas; in Western Alaska, both heat and electricity are often provided by diesel fuel, leading to the highest energy costs in the nation.
Expected Effects of Alternatives

Alternative 1 (No Action)

There would be fewer jobs available in the Y-K region as a result of trends in decreasing opportunity, particularly after the termination of Donlin Gold opportunities. Minority and low-income communities are largely affected. Public infrastructure and tax revenue would not be affected by the No Action Alternative, and impacts to the larger state economy would be imperceptible.

Alternative 2 (Donlin Gold's Proposed Action)

Socioeconomic impacts would vary due to increased levels of employment and expenditures in excess of historic limits and trends, with greater increases in employment during the Construction Phase. There would be beneficial socioeconomic impacts, particularly for employment within the Y-K region. Donlin Gold has an established in-region, Calista-shareholder hiring preference and has committed to maintaining this throughout the project. Many workers with the skills needed for the construction phase are available within the region, and an estimated 1,600 to 1,900 individuals from Y-K communities would be employed during this phase. During Operations, an estimated 500 to 600 regional residents would be employed. Employment income could help to offset the current trend of decreasing income from fishing.

Additionally, for each year the project is operational, an estimated 650 jobs and $40 million in wages would be generated statewide through multiplier effects, while sales within the state would increase by $150 million per year. Landowners would receive substantial income through Mine Site and ROW leases, while state and local governments would receive tax revenue. The intensity of the effects of project payments to state and local governments and ANCSA corporations would be beneficial and range from socioeconomic indicators that are slightly outside normal limits and trends (5 to 10 percent increase) to changes well outside normal limits and trends (greater than 10 percent increase) for the ANCSA landowners.

Increased employment opportunities would benefit low-income and minority populations in particular. Impacts would vary in duration, depending on whether they occur during Construction, Operations, or Closure. The extent of socioeconomic impacts would vary but primarily affect communities throughout the EIS Analysis Area. In terms of context, direct impacts would affect primarily minority and low-income population given Donlin Gold's commitment to hire qualified Y-K region residents. The impacts to socioeconomics from the North Option would be the same as Alternative 2.

Other Alternatives

The effects of other action alternatives on socioeconomic resources would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would reduce fuel barging and reduce the need for increased tank capacity at Dutch Harbor. Therefore, property tax payments to the City of Unalaska would not increase as under Alternative 2. In addition, fewer transportation jobs would be created (due to reduced fuels shipping, barging, and trucking), fewer expenditures would occur during the Construction Phase of the Transportation Corridor facilities, and there would be substantially less expenditure on truck fuel costs resulting from the use of LNG instead of diesel.

Alternative 3B (Diesel Pipeline)

This alternative would eliminate diesel fuel barging and decrease work and tax income from diesel storage tanks. Pipeline expenditures would increase proportionally including increased employment expenditures for pipeline maintenance. This would offset decreases in employment opportunities and expenditures resulting from reduced diesel shipping and transport. In addition, construction of a new or expanded dock facility in Cook Inlet would increase beneficial effects in the Kenai Peninsula Borough. The Port MacKenzie Option would be similar to Alternative 3B, except the Kenai Peninsula Borough would not receive any additional revenues. The Collocated Pipeline Option would include larger labor and material costs during Construction; other effects would be similar to Alternative 3B.

Alternative 4 (BTC Port)

This alternative would reduce river barging distance and require construction of a longer mine access road to the upriver barge landing. The net effect on employment would be similar because the increased workforce required to operate a longer road would offset the decreased workforce required to operate barges.

Alternative 6A (Dalzell Gorge Route)
This alternative may require more labor and expenditures for horizontal directional drilling (HDD) than Alternative 2. This would enhance the beneficial employment, income, and expenditures impacts during Construction.

3.7. Subsistence

Chapter 3, Section 3.21

During the scoping meetings, Alaska Native residents in the EIS Analysis Area emphasized their desire to protect their cultural traditions and subsistence way of life. Historically, the culture and economy of both Yup'ik and Athabascan societies (the two primary Alaska Native groups in the EIS Analysis Area) revolved around subsistence practices. Rural communities in the EIS Analysis Area embrace their subsistence traditions as a link to their rich cultural heritage, and as a foundation for today's economy, society, and culture. Examples of potential impacts to subsistence would include reductions in subsistence harvest levels due to changes in availability or abundance of subsistence resources such as fish, restrictions on access to traditional use areas, increased competition for resources, and sociocultural changes due to employment and shift work.

Existing Conditions Summary

Subsistence patterns, focusing on community profiles from subregions, are described in terms of the seasonal round of harvests of a wide diversity of species, subsistence use areas of community-based groups, and sharing practices. The Kuskokwim River is divided into four subregions: Upper, Central, Lower-Middle, and Lower. Other subregions are the Bering Sea Coast, Mouth of the Yukon River, Lower Yukon River, Middle Yukon River, and Cook Inlet. Each of these subregions shares a common ecology, a common language, and some common harvest patterns.

Subsistence is important for nutritional, economic, social, spiritual, and cultural reasons within these communities. Subsistence resources most common include moose, salmon and other fish, other game, birds and eggs, and vegetation. Wild foods have considerable economic value as part of the modern mixed economy of rural Alaska, and can supplement or partially replace the need for income derived from wage employment.

Expected Effects of Alternatives:

Alternative 1 (No Action)
Subsistence resources that may have been displaced during the exploration and baseline studies period would likely reoccupy the Mine Site area, and subsistence users from Crooked Creek may reestablish their use of the area. There would be positive effects on subsistence resources and access. There would be no increase in competition from non-local residents for subsistence resources. The loss of jobs and associated income resulting from the termination of Donlin Gold activities in the area

would lead to less available income for purchase of fuel or ammunition for subsistence activities, but would increase labor and time available. The duration of these effects would extend indefinitely. The extent or scope of effects would be realized by rural communities across the EIS Analysis Area. The context in which the impacts would occur would affect areas of high cultural importance to the affected communities.

Alternative 2 (Donlin Gold's Proposed Action)

Mine Site - During Construction and Operations, disturbance to subsistence resources and displacement of subsistence harvest activities would be limited to small portions of the subsistence use areas of Crooked Creek and Aniak residents for black bear, furbearers, waterfowl, and berries.

Interviews with knowledgeable subsistence users in eight communities emphasized that new employment and income would increase the ability of households to meet the high costs of subsistence equipment and fuel. Crooked Creek residents would see continued displacement from historical use areas at the Mine Site, but this displacement would be reduced after Closure and would be limited to a small percent of the total subsistence use area.

Most of the impacts would be limited to the vicinity of the mine, except that waterfowl users on the Bering Sea coast may have a perception that the tailings pond and the pit lake (after Closure) would contaminate the waterfowl they hunt. Competition for subsistence resources near the Mine Site would be prevented by Donlin Gold policies of no hunting and fishing from the Mine Site. However, historical patterns of competition in the Kuskokwim River drainage over moose and Chinook salmon may increase due to new incomes and increased subsistence activity.

Transportation Corridor - During Construction and Operations, subsistence resources would be affected by habitat loss in small acreages associated with the port sites, airstrip and mines access road. Limited disturbance from river and ocean barge traffic would affect fish, marine mammals, and terrestrial mammals, with greater effects in the narrow and shallow segments of the river, such as near Aniak and the Oskawalik River. Fugitive dust from vehicle traffic would affect berry resources along the mine access road. Subsistence activities near the mine access road and Angyaruaq/Jungjuk port site would be displaced, affecting residents of Crooked Creek and other Kuskokwim River villages. River barge traffic would intermittently disturb subsistence fishing and moose hunting along the bank, with greater displacement in narrow and shallow segments of the Kuskokwim River near BTC, Aniak, and Oskawalik River. Redirection to alternative times and places at low expense and effort would result in little change in harvest levels.

Pipeline - During Construction, wildlife and bird habitat would be affected along the 316-mile pipeline corridor. Construction activities and noise would affect subsistence resources beyond the pipeline corridor, but would be unlikely to result in reduced abundance of resource that may avoid the area of activity. The natural gas pipeline corridor overlaps with portions of the subsistence use areas of Crooked Creek, Stony River, McGrath, Nikolai, Skwentna, and Tyonek. Displacement would be greater during Construction and very limited during Operations and Closure. The ROW affects small portions of these subsistence use areas, and alternative areas would be available at low cost and effect, resulting in little change to harvest levels. Increased access for fly-in hunters and trappers associated with improvements at Farewell Airstrip and the ROW to the north and west may increase competition for McGrath and Nikolai subsistence users. The impacts would be the same for the North Option as the proposed route for subsistence resources, access, and competition during Construction, Operations, and Closure.

Other Alternatives

The effects of other action alternatives on subsistence resources would be similar to the effects of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would reduce fuel barging due to reduced need for diesel, which would proportionally reduce impacts to fish and subsistence fishing in narrow reaches of the river.

Alternative 3B (Diesel Pipeline)

This alternative would eliminate diesel fuel barging and proportionally reduce impacts to fish in narrow reaches of the river. The expansion of the dock near Tyonek to receive diesel tankers would result in impacts to marine mammals, including beluga whales. Under the Port Mackenzie Option, there would be no impacts to the residents of Tyonek. The impacts from the Collocated Pipeline Option would be the same as in Alternative 2.

Alternative 4 (BTC Port)

This alternative would reduce river barging distance by 69 miles, avoiding the narrower reaches of the river above the BTC mine access road and the fishing areas of Aniak, Chuathbaluk, and Napaimute. A longer mine access road (76 miles) would disturb casual, summertime subsistence uses in the vicinity of BTC Port and mine access road.

3.8. Spill Risk

Chapter 3, Section 3.24

Although many environmental protections and precautions would be built into the mine design and operations, including mitigation measures and spill and emergency response plans, regional residents expressed concern about spills during scoping. Five hazardous substances are of concern: diesel, liquefied natural gas (LNG), mercury, cyanide, and tailings. Detailed possibility, characteristics, and magnitude of a spill of one of these substances, along with the impacts of a spill under each alternative, are analyzed in Section 3.24, Spill Risk. The analysis focused on nine representative examples of the types of spills that could occur, and do not represent "worst case" possibilities. Instead, the focus is on high-consequence, low probability occurrences, including ocean barge rupture at sea, river barge release, tank farm release, tanker truck release, diesel pipeline release, LNG release, cyanide release, mercury release, and partial tailings dam failure.

Existing Conditions Summary

Because the area is remote and little infrastructure exists, the existing capacity for response to spills is limited. While the state-wide capacity for oil spill response is well-established, there is minimal capacity to handle a spill of LNG, cyanide, or mercury. These gaps in response capacity would be addressed via new plans created for the project to comply with regulations regarding spill prevention, containment, preparedness, and response.

Donlin Gold is a member of Alaska Chadux Corporation (Chadux), an oil spill removal organization that covers Western Alaska and the Aleutians. In the event of a diesel spill, Chadux would provide experienced response personnel and equipment for recovery and cleanup operations.

A hazardous substance spill would be extremely unlikely but could impact multiple resources to differing extents. The impact intensity would vary depending on the size, extent, and type of spill.

Likelihood and Characteristics of a Spill under Each Alternative

Alternative 1 (No Action)

There is no likelihood of a diesel, LNG, cyanide, mercury, or tailings spill.

Alternative 2 (Donlin Gold's Proposed Action)

Spill likelihood was determined based on experience with similar operations in the region, the design of barges and storage tanks to prevent and limit spill sizes, and BMPs and mitigation measures. In general, there is a high probability of a small volume (less than 10 gallon) spill from the diesel storage tanks, barges, tanker trucks, and the pipeline, while there is a very low probability of a large volume spill (over 100,000 gallons) from these same sources.

An LNG spill as defined in Section 3.24 would not be associated with this alternative. Sodium cyanide would be used to separate gold from the ore. Sodium cyanide only poses an environmental threat if handled improperly, and must come in contact with water to pose immediate toxic and acute health dangers. The likelihood of a very large cyanide spill is very low, as the sodium cyanide would be transported as solid briquettes and in specially designed containers.

A mercury release by lost cargo or container rupture would have a very low probability. A partial unplanned release of tailings and water from the TSF facility was determined to have a very low probability of a very high volume of material release.

Other Alternatives

The likelihood and fate of spilled hazardous substances under other action alternatives would be similar to those of Alternative 2. Differences of note include:

Alternative 3A (LNG-Powered Haul Trucks)

This alternative would reduce fuel barging due to reduced need for diesel, which would reduce the likelihood of diesel spills, but add the possibility of an LNG release.

Alternative 3B (Diesel Pipeline)

This alternative would have the same diesel usage during the construction phase as Alternative 2, with diesel barged up the Kuskokwim River. Spill risk for diesel along the pipeline would be higher during Operations, but storage needs would be eliminated at Bethel and Angyaruaq (Jungjuk) Port. Spill risk along the Transportation Corridor would be eliminated during Operations. Impacts would be similar for both the Port MacKenzie Option and the Collocated Pipeline Option.

Alternative 4 (BTC Port)

This alternative would have the same spill risk in all phases as Alternative 2, with slightly increased risk of land spills due to longer road length from the BTC Port to the Mine Site, and slightly decreased risk of water transportation corridor spills due to shorter barging distance.

Alternative 5A (Dry Stack Tailings)

This alternative would nearly eliminate the risk of a combined tailings and process affected water release because the tailings would be stored in a DST facility. There would be a dam for operating pond containment, so a risk of release of process affected water would remain.

3.9. Climate Change

Chapter 3, Section 3.26

No standard methodology currently exists to assess how any project's GHG emissions would translate into physical effects on the global environment. However, project GHG contributions are at a level (above 25,000 metric tons) that warrants analysis per Council on Environmental Quality (CEQ) draft guidance from 2014 (at this time, final CEQ 2016 guidance has been rescinded; EIS analysis follows CEQ 2014 guidance).

Predictions, available data, and information vary widely on current understanding and anticipated impacts of climate change on resources. Some impacts are expected during the project life, such as shifts in migratory bird patterns, early break-up, or changes in vegetation composition. Long term trends may be better understood as new information, better models, and further analysis of climate trends becomes available.

Alternatives Comparison Summary

Table 5 summarizes main impact differences in action alternatives for the seven resources and the two issue topics. The first column (Impact Area) describes the impact-causing project component, or the direct or indirect impact. A comprehensive summary table of differences for all Chapter 3 resources is available in Chapter 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Surface Water Hydrology (Chapter 3, Section 3.5)						
Mine Site – Streamflow in Operations Phase	• Crooked Creek average annual flow reductions under average precipitation conditions: 12% near American Creek; 5% near Bell Creek. • Increased effects on dammed Crooked Creek tributaries, and in Crooked Creek adjacent to mine (under below average precipitation and high K conditions).	No differences from Alternative 2.				
Mine Site – Streamflow Post-Closure	• Crooked Creek impacts would result in monthly flow changes range from -12% to +21% just below mine. • Localized increased effects on permanently dammed tributaries.	No differences from Alternative 2.			Similar to Alternative 2. • Slightly reduced discharge to Crevice Creek and Anaconda Creek during post-Closure period. • Slightly increased treated water discharge to Crooked Creek at Outfall 001.	No differences from Alternative 2.
Transportation Corridor – Road and Ports	• Impacts from Angyaruaq (Jungjuk) Port site 30-mile mine access road, 51 streams, 6 bridges, and 45 culverts. • Most impacts would result in maintained surface water flow systems and changes in water quantity likely within limits of historic seasonal variation.	• Fewer fuel trucks on mine access road.	• Addition of Tyonek Port Site, reduced fuel trucks on mine access road.	• BTC port site and 76-mile mine access road, 40 streams, 8 bridges, 32 culverts.	No differences from Alternative 2.	
Transportation Corridor – River	• Impacts from 122 barge trips/year, 110 day barge season. • 8 critical sections over 199 miles.	• 83 barge trips/year, reduced barge-	• 64 barge trips/year, fewest trips means least	• 122 barge trips/year, eliminates	• Barge trips/year increase to 129.	No differences from Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	• Impacts through Operations would not result in changes in the surface water flow systems that are likely to exceed historic seasonal variation. • Annual recovery is expected for scour at critical sections. • During post-Closure, surface water flow systems would be maintained and changes in water quantity are likely within limits of historic seasonal variation.	related impacts	barge-related impacts.	barge-related impacts upstream of BTC Port. • 3 critical sections over 124 miles.		
Pipeline	• 316 mile-long natural gas pipeline and 400 stream/river crossings would mostly result in maintained surface water flow systems and changes in water quantity within historic seasonal variation. • North Option: 419 stream crossings; small water use increase for HDD.	No differences from Alternative 2.	Similar to Alternative 2. • 335 mile-long diesel pipeline, 406 stream/river crossings, small water use increase for pressure testing/ice roads/pads during Construction. • Port MacKenzie Option: 336-mile-long; about 330 stream crossings.	No differences from Alternative 2.		• 314 mile-long natural gas pipeline, 377 streams crossings.
Groundwater Hydrology (Chapter 3, Section 3.6)						
Mine Site – Mine Pit Dewatering	Groundwater elevation change below original conditions: • 1,600 feet in Operations; 30 feet in post-Closure. Groundwater flow direction changes: • Flow towards pit in Construction and Operations.	Similar to Alternative 2, except reduced potential for diesel spill impacts.	Similar to Alternative 2, except increased potential for diesel spill impacting groundwater.	No differences from Alternative 2.	Similar to Alternative 2, except capture of up to about 20% more water during early Closure period of	No differences from Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	• Temporary (8 years), localized (within pit rim) flow away from pit, though overall hydraulic containment maintained due to strong topographic gradients beyond pit. • Flow towards pit in post-Closure (in perpetuity). Areal extent of cone of depression: • 9,000 acres in Operations; 2,000 acres in post-Closure.				Unlined Option, declining to equal amount of capture as Lined Option or Alternative 2 200 years after Closure.	
Mine Site – Reduced or Loss of Winter Flow, Crooked Creek	Range from average K-average flow to high K-low flow conditions: • 20%-100% flow reduction near pit • 10%-40% flow reduction 8 miles downstream.					
Mine Site – Groundwater Capture and Diversion, Anaconda Watershed	• Under TSF and SRS: 450 gpm of groundwater is used for processing water in Operations, and piped to pit lake after Closure.					
Transportation Corridor – Groundwater Port Site Usage	• Groundwater flow systems are maintained. • Changes in water quantity within historic seasonal or minimal variation.	• Slightly reduced potential for diesel spill impacts from reduction in fuel barge trips from 58 to 19 per season along Kuskokwim River.	• Decreased potential for diesel spill impacting groundwater.	• Translocation of port water well; slight increased potential for trucking-related spill as a result of longer road.	No differences from Alternative 2.	
Pipeline – Camps Groundwater Usage	• Groundwater flow systems are maintained. • Changes in water quantity within historic seasonal or minimal variation.	No differences from Alternative 2.	Similar to Alternative 2, except increased potential for diesel spill impacting groundwater and	No differences from Alternative 2.		Similar to Alternative 2; shallow groundwater 3 miles <
Pipeline – Construction or	Effect on shallow groundwater beneath 112 miles ($1/3^{rd}$) of ROW (about 3 miles less					

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Operations Potential Groundwater Diversion	under Alternative 2-North Option). Groundwater flow systems are maintained. Changes in water quantity within historic seasonal or minimal variation.		shallow groundwater: • 9 miles > Alternative 2 for Port MacKenzie Option. • 10 miles > Alternative 2 for Collocated Option.			Alternative 2.
Water Quality (Chapter 3, Section 3.7)						
Mine Site - Geochemistry	• Drainages from the WRF, TSF, operating pond and TSF cover drain layer are predicted to exceed Alaska Water Quality Standards (AWQC) for several constituents. • Lower CWD and drainage from the SOB predicted to exceed AWQC for several constituents during Operations. • Surficial pit lake water expected to exceed AWQC for several constituents; about Year 52 post-Closure, the surficial water would be treated to meet AWQC and then discharged.	No differences from Alternative 2.			• Pit lake stratification would occur at an approximately 40 percent shallower depth, and surface water concentrations of metals would likely be higher than Alternative 2. • About Year 42 to 47 post-Closure (depending on Option), surficial pit lake water would be treated to meet AWQC	No differences from Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
					and then discharged.	
Mine Site – Surface Water Quality	• Surface water in the American and Anaconda Creek watersheds influenced by the creation and perpetual maintenance of the pit lake and TSF impoundment. Pit dewatering discharge to Crooked Creek would be treated to meet AWQC prior to discharge. • Atmospheric deposition of mercury could be sufficient to exceed AWQC and baseline ranges in some cases, depending on watershed location and existing baseline concentrations.	No differences from Alternative 2.	Additional diesel would result in increased potential of adverse impacts resulting from diesel fuel spills.	No differences from Alternative 2.	• SRS decommissioning under the Unlined Option would be 200 years. • Slight increase in indirect effects from dry stack fugitive dust atmospheric deposition and terrestrial runoff from dust deposition; these impacts could exceed AWQC.	No differences from Alternative 2.
Mine Site – Groundwater Quality	• Seepage from the WRF underdrain to groundwater between the WRF and Lower CWD (during Operations) and the pit lake (during Closure) would occur. • Net discharge of water from the pit lake to surrounding deep bedrock groundwater would occur during pit lake filling, primarily during first 8 years following Closure.	No differences from Alternative 2.			Lined Option would provide an advantage over the Unlined Option of minimizing (but not preventing) the potential for impacts to groundwater quality.	No differences from Alternative 2.
Mine Site – Sediment Quality	• Impacts to sediment quality could result from altered stream flows and water	No differences from Alternative 2.			Impacts from fugitive dust	No differences from

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	chemistry in Crooked Creek and project-related atmospheric deposition of mercury. • Impacts from dust deposition would likely exceed Small Quantity Generators (SQGs), but remain within the naturally occurring range presently found in the study area.				would be slightly greater and likely exceed SQGs, but would likely remain within the naturally occurring range.	Alternative 2.
Transportation Corridor – Surface Water Quality	• Impacts from occasional barge-induced suspended sediment or erosion effects at construction sites would meet AWQC. • Runoff of water from rock used for road construction could include inputs from constituents of concern.	Potential impacts related to surface water quality in the Kuskokwim River resulting from increases in suspended sediment concentrations and turbidity would decrease due to reduced barging activity.	Increased risk of spills associated with fuel handling at the Tyonek North Foreland Facility, and a decrease in potential impacts resulting from fuel handing at the ports.	Increased road length but decreased number of stream crossings from Alternative 2 would result in fewer impacts. Material sites along road would be used for road construction, which could result in leaching from constituents of concern.	No differences from Alternative 2.	
Transportation Corridor – Groundwater Quality	• Placement of sheet pile associated with construction of port terminals could infrequently affect groundwater quality within discrete portion of the project area. • Use of groundwater for drinking water supplies at the Angyaruaq (Jungjuk) Port would not impact groundwater quality.	No differences from Alternative 2.		No differences from Alternative 2.	No differences from Alternative 2.	
Transportation Corridor – Sediment Quality	Resettled sediment from barging and construction of the ports would be of similar composition to the existing natural deposit.	Reduction in barging would reduce the amount of low water river	Reduction in barging would reduce the amount of low water river	Impacts from propeller wash would be less.	No differences from Alternative 2.	

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
		travel, resulting in fewer situations where sediment quality could be impacted.	travel, resulting in fewer situations where sediment quality could be impacted.			
Pipeline – Surface Water Quality	Potential erosion impacts and the introduction of fine-grained sediments to surface water associated with the pipeline would be mitigated to meet AWQC.	No differences from Alternative 2.	Diesel pipeline would increase risk to surface water resources from spills or pipeline rupture.	No differences from Alternative 2.		No differences from Alternative 2.
Pipeline – Groundwater Quality	Installation of the pipeline could result in alterations to groundwater flow patterns, minor pipeline corrosion, and small changes in groundwater quality; changes would be infrequent and not last longer than the Construction Phase.	No differences from Alternative 2.	Diesel pipeline would increase risk to groundwater resources from spills or pipeline rupture.	No differences from Alternative 2.		No differences from Alternative 2.
Pipeline – Sediment Quality	Sediment quality would be impacted during pipeline construction as a result of increased sedimentation at the more than 400 stream crossing sites; impacts would not exceed regulatory limits.	No differences from Alternative 2.	Diesel pipeline would increase risk to sediment resources from spills or pipeline rupture.	No differences from Alternative 2.		No differences from Alternative 2.
Air Quality (Chapter 3, Section 3.8)						
Mine Site - Construction	• Direct impacts would result from fugitive and mobile sources. • Air emissions would not exceed thresholds, and impacts would meet regulatory standards.	No differences from Alternative 2.				
Mine Site - Operations	• Direct impacts would result from fugitive, stationary, and mobile sources. • Mercury emissions would be released from the open pit, ore, and waste rock	• Reduced consumption of diesel with less diesel storage	• Emissions of NOx, CO, PM, SO_2, VOCs and GHGs would	No differences from Alternative 2.	• Increase in mobile emissions. • Exposure of	No differences from Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	(volitization of weathered sulfide minerals); ore processing and other mining operations (emitted as fugitive dust); and from the TSF. Gaseous mercury from the point sources would be collected and treated, such that only 0.4 percent of the mercury passing through the mine would be released into the atmosphere. • Emissions would be above air quality thresholds; however, impacts comply with regulatory standards.	needed. • Natural gas consumption would increase. No vented emissions from LNG storage tanks, reducing HAPs emissions by approximately 8%. • Emissions of carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, volatile organic compounds, and carbon dioxide equivalent (CO^{2}_{e}) at Mine Site would decrease.	increase. • Mercury emissions would increase due to use of diesel in the dual fuel-fired boilers, but would still be within permitting and regulatory thresholds.		the dry stack surface would increase fugitive emissions, and the increase in power consumption would cause an increase in stationary emissions from the power plant. The increase in fugitive emissions due to the dry stack would be offset by the elimination of fugitive dust emissions from the TSF beach area.	
Mine Site - Closure		No differences from Alternative 2.				
Transportation Corridor - Construction	• Direct impacts would result from fugitive, stationary, and mobile sources. • Air emissions would not exceed thresholds, and impacts would meet regulatory standards.	No differences from Alternative 2.		Criteria air pollutants and GHG emissions along the longer roadway would increase. Increase would be largely offset by the reduced barging	No differences from Alternative 2.	

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
				emissions.		
Transportation Corridor - Operations		LNG haul truck use would result in lower emissions of all pollutants.	Emissions of all criteria pollutants and GHGs from water transportation would decrease, but could be offset by emissions from increased use of diesel fuel in other transportation facilities-related equipment.	Criteria air pollutants and GHG emissions would increase about 3 times compared to Alternative 2. The increase in emissions due to the longer road would be largely offset by the reduced barging emissions.	Six percent increase in cargo barge traffic.	No differences from Alternative 2.
Transportation Corridor - Closure	• Direct impacts would result from fugitive, stationary, and mobile sources. • Access roads, Angyaruaq (Jungjuk) Port, and airstrip would be used for long-term monitoring at the Mine Site and would not be reclaimed. • Air emissions would not exceed thresholds, and impacts would meet regulatory standards.	No differences from Alternative 2.				
Pipeline - Construction	• Direct impacts would result from fugitive, stationary, and mobile sources. • Air emissions would not exceed thresholds, and impacts would meet regulatory standards.	No differences from Alternative 2.	Temporary emissions of criteria pollutants and GHGs would increase by about six percent due to construction of the additional 18-mile diesel pipeline.	No differences from Alternative 2.		

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Pipeline - Operations		No differences from Alternative 2.	Fugitive GHG emissions from the diesel pipeline would be less.	No differences from Alternative 2.		
Pipeline - Closure	• Fugitive and mobile emissions during reclamation of the pipeline and associated above-ground facilities would occur. • Air emissions would not exceed thresholds, and impacts would meet regulatory standards.	No differences from Alternative 2.	Inclusion of reclamation activities for the 18-mile Tyonek diesel pipeline segment and Operations Center and Pumping Facility at Tyonek.	No differences from Alternative 2.		
Fish and Aquatic Resources (Chapter 3, Section 3.13)						
Mine Site – Construction (Habitat Alterations, Injury and Mortality, Behavioral Disturbance)	Construction, Operations, and Closure of open pit, WRF, TSF, and freshwater reservoir: Tailings storage and operating pond footprint = 2,394 acres. Tailings stored in combined tailings and operating pond facility contained by one dam. • Direct loss of 8 miles of instream habitat in five Crooked Creek drainages near the Mine Site. • 5.6 miles of aquatic habitat in American and Anaconda Creeks. • 0.66 mile of EFH. • 2.36 miles of perennial stream habitat. Impacts in 5 tributaries in the vicinity of the Mine Site and in the middle and lower reaches of Crooked Creek. Reduced surface flows in nearby tributaries and in middle reaches of Crooked Creek.	No differences from Alternative 2.			Construction, Operations, and Closure of open pit, WRF, TSF, and freshwater reservoir: Tailings storage and operating pond footprint = 2,463 acres. Tailings stored as dry stack upstream of operating pond; operating pond contained by a main dam and two upper dams. Reduced storage requirements	No differences from Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
					within TSF would lessen risk of potential dam failure and downstream release of slurry materials.	
Transportation Corridor – Barge Traffic Increase (Habitat Alterations, Injury and Mortality, Behavioral Disturbance)	River and ocean barge traffic: • 50 river cargo trips per year to Angyaruaq (Jungjuk) Port Site - Construction • 64 river cargo trips per year to Angyaruaq (Jungjuk) Port Site - Operations • 19 river fuel trips per year to Angyaruaq (Jungjuk) Port Site - Construction • 64 river fuel trips per year to Angyaruaq (Jungjuk) Port Site - Operations • 20 pipe and equipment barges to staging area near Devil's Elbow, above Stony River (during first two years of pipeline construction - Construction • 16 ocean cargo trips per year to Bethel - Construction • 12 ocean cargo trips per year to Bethel - Operations • 14 ocean fuel trips per year to Bethel - both Construction and Operations Totals: • 89 river trips per year - Construction • 122 river trips per year - Operations • 30 ocean trips per year to Bethel - Construction) • 26 ocean trips per year to Bethel - Operations	• 19 river fuel trips per year to Angyaruaq (Jungjuk) Port Site - Operations • 5 ocean barge fuel trips per year to Bethel - Operations Summary Differences: • 83 river trips per year - Operations • 17 ocean trips per year to Bethel - Operations	• No river fuel trips per year to Angyaruaq (Jungjuk) Port Site - Operations • No ocean barge fuel trips per year to Bethel - Operations Summary Differences: • 64 river trips per year - Operations • 12 ocean trips per year to Bethel - Operations	• River trips would only go as far as BTC Port Site	• 71 river cargo trips per year to Angyaruaq (Jungjuk) Port Site - Operations Summary Differences: • 129 river trips per year - Operations	No differences from Alternative 2.
Pipeline – Barge	River and ocean barge traffic:	No differences	River and ocean	No differences from Alternative 2.		

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Traffic Increase (Habitat Alterations, Injury and Mortality, Behavioral Disturbance)	• 20 ocean barges during first year of pipeline construction from Anchorage to Beluga Landing	from Alternative 2.	barge traffic: • 12 ocean trips per year to Tyonek - Operations			
Pipeline – Stream Crossings and Water Withdrawals (Behavioral Disturbance, Habitat Alterations)	Pipeline: • Length = 316 miles (North Option: 0.5 miles shorter). • 28 stream crossings using HDD and open-cut methods.	No differences from Alternative 2.	Pipeline: • Length of 334 miles (additional 19-mile segment between Tyonek and start of proposed corridor). • 29 stream/river crossings using open-cut and HDD methods. • Port MacKenzie Option would add additional HDD crossing at the Susitna River and crossing at Little Susitna River. • Collocated Natural Gas and Diesel Pipeline Option would extend ROW by 5 feet.	No differences from Alternative 2.		Pipeline: • Length of 313 miles. • 22 stream crossings using HDD and open-cut methods.
Socioeconomics (Chapter 3, Section 3.18)						

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Employment, Income, Sales – Construction Phase*	Total Direct Jobs: 3,200 • Direct jobs, Alaska: 2,500 • Direct jobs, Y-K region: 1,600 to 1,900 • Indirect Jobs, Alaska: 7,300 Total Direct Payroll: $1.2 billion over project life • Direct Payroll, Alaska: $940 million • Indirect Payroll, Alaska: $390 million over project life. Total Direct Expenditures: $5.2 billion over project life • Direct Expenditures, Alaska: $1.7 billion. • Indirect Expenditures, Alaska: $1.1 billion over project life.	• Decrease in direct and Indirect expenditures for transportation by tens of millions of dollars.	• Increase in direct and indirect jobs for pipeline. • Decrease in direct and indirect expenditures for mine site and transportation by tens of millions of dollars and increase for pipeline by hundreds of millions of dollars. Collocated Pipeline Option: • 40% increase in construction personnel to build pipe. • 50% increase in barge and truck traffic to move pipe. • 8% increase in footprint of laydown yards, larger mainline work camps. • Incremental increased capital cost estimated at $320 (32% over Alternative 3B).	• Increase in direct and indirect jobs for transportation • Increase in direct and indirect expenditures for transportation by tens of millions of dollars.	No differences from Alternative 2.	• Increase in direct and indirect jobs for pipeline. • Increase in direct and indirect expenditures for pipeline by tens of millions of dollars.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Employment, Income, Sales – Closure Phase	Total direct jobs: 20 to 100 for deconstruction, 6 for about 50 years after mine closure, 6 in perpetuity.		• Increase in direct and indirect jobs for pipeline.	• Increase in direct and indirect jobs for transportation. • Increase in direct and indirect expenditures for transportation.	No differences from Alternative 2.	
***Alternative 1 (No Action) Socioeconomic Impacts for Employment, Income, Sale include:** Continuing decrease of employment and income related to pre-development activities; advance royalties to Calista would terminate, which would negatively impact dividends and employment opportunities that Calista provides to its 12,000 shareholders.						
Lease Fees, ROW Acquisition, Tax Revenue, Royalties	Construction Total ROW Acquisition: $4.4 million • ROW Acquisition to federal: $2.75 million • ROW Acquisition to state: $1.5 million • ROW Acquisition to ANCSA corps: $250,000 Operations • Total Oil and Gas Property Tax from pipeline to Matanuska-Susitna Borough (MSB): $356,000 per year. • Royalties to Calista (and shared with other ANCSA regional corporations): $55.4 million per year over project life. • Lease payments to Calista and Cook Inlet Region Inc.: $250,000 per year over project life. • Corporate Income Tax and Mining License Tax to state: $1.24 billion over project life. Closure Impact generally within normal variation and	Construction and Operations • No property taxes paid to Unalaska.	Construction and Operations • Increase in property tax for Kenai Peninsula Borough (KPB) and no additional taxes from diesel storage in Dutch Harbor. Port MacKenzie Option: • No property tax for KPB.	No differences from Alternative 2.		

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	trends.					
Local Public Infrastructure and Services	• Communities' impacts lessened due to temporary and permanent camps housing project workers being self-contained, and operated and maintained by Donlin Gold for all project phases. • Possibility of natural gas in some communities. • Potential creation of a new borough.	No differences from Alternative 2.	No possibility of natural gas in some communities; some possibility of cheaper diesel. Collocated Option: Both natural gas and diesel could be an option in communities.	No differences from Alternative 2.		
Subsistence (Chapter 3, Section 3.21)						
Mine Site	Construction and Operations • Disturbance and displacement of subsistence harvest activities limited to small portions of the subsistence use areas of Crooked Creek and Aniak residents. • Bering Sea coast uses of migratory waterfowl could be affected by concerns over contamination at Mine Site. • Little reduction in harvest levels. • Increased employment and incomes may increase subsistence activities and indirectly increase historic forms of competition among regional residents for resources such as Chinook salmon and moose. • Sociocultural impacts from project employment and income would include improved support for subsistence equipment and transportation costs. • Project employment may stabilize	No differences from Alternative 2.				

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	employed households, but about half of employed household may outmigrate. • After Closure, disturbance would diminish along with sociocultural effects, both beneficial and adverse, from project employment and incomes. • Mine operation could result in exposure to mercury, arsenic, and antimony through stack emissions and fugitive dust through consumption of subsistence foods harvested in vicinity of mine.					
Transportation Corridor	Construction and Operations • Some habitat loss in small acreages associated with the port sites, airstrip and mine access road. • Limited disturbance from river and ocean barge traffic would affect fish, birds, marine mammals, and terrestrial mammals, with greater effects in narrow and shallow segments of river, such as near Aniak and Oskawalik River. • Fugitive dust from vehicle traffic would affect berry resources along mine access road. • Subsistence activities near mine access road and Angyaruaq/Jungjuk port site would be displaced, affecting residents of Crooked Creek and other Kuskokwim River villages. • River barge traffic would intermittently disturb subsistence fishing and moose hunting along bank, with greater displacement in narrow and shallow segments of the Kuskokwim River near BTC, Aniak, and Oskawalik River.	Reduced diesel fuel barging would reduce impacts to subsistence fish resources and fishing activity, particularly in narrow and shallow segment of Kuskokwim River.	• Reduced barge trips would reduce impacts to subsistence fish resources and fishing activity, particularly in narrow and shallow segments of Kuskokwim River. • Expanded dock near Tyonek receiving diesel tankers may result in impacts to marine mammals, including beluga whales, although occurrence in that area is low.	Reduced barging distance would avoid narrow and shallow segments upstream of BTC, reducing potential conflicts with subsistence fishing. Longer mine access road may affect moose, black bear, waterfowl, and berry picking areas for Aniak and Chuathbaluk residents.	No differences from Alternative 2.	

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	• Redirection to alternative times and place at low expense and effort would result in little change in harvest levels.					
Pipeline	Construction and Operations • Construction activities and noise would affect subsistence resources beyond pipeline corridor, but would be unlikely to result in reduced abundance. • Pipeline corridor overlaps with portions of the subsistence use areas of Crooked Creek, Stony River, McGrath, Nikolai, Skwentna, and Tyonek. Displacement would be greater during Construction. • ROW affects small portions of subsistence use areas, and alternative areas would be available at low cost and effect, resulting in little change to harvest levels. Increased access for fly-in hunters and trappers at Farewell Airstrip and ROW to the north and west may lead to a small increase in competition for McGrath and Nikolai subsistence users.	No differences from Alternative 2.	• Retention of airstrips and gravel access roads during operations for spill response capacity may result in greater competition impacts to Beluga, McGrath, Nikolai, Takotna, Central Kuskokwim villages and Crooked Creek. • Diesel pipeline operation requiring helicopter surveillance may disturb wildlife and interfere with subsistence hunting activity.	No differences from Alternative 2.		
Spill Risk (Chapter 3, Section 3.24)						
Diesel, LNG, Cyanide, Mercury, and Dam Tailings Risk	*Diesel:* High probability of a less than 10 gallon spill and a very low probability of a spill over 100,000 gallons. *LNG*: No risk.	*Diesel:* Same as Alternative 2. *LNG*: High probability of a release less than 10	*Diesel:* Same as Alternative 2 except pill risk along the Transportation	*Diesel:* Same as Alternative 2, with slightly increased risk of land spills, and	*Diesel:* Same as Alternative 2. *LNG*: Same as Alternative 2. *Cyanide*: Same as	*Diesel:* Same as Alternative 2. *LNG*: Same as Alternative 2. *Cyanide*: Same as

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
	Cyanide: The likelihood of a spill is very low. *Mercury*: A release would have a low or very low probability. *Dam Tailings*: A partial unplanned release of tailings and water from the TSF would have a very low probability of a very high volume of material release.	gallons, and a release over 50,000 gallons would be very low or would not occur. *Cyanide*: Same as Alternative 2. *Mercury*: Same as Alternative 2. *Dam Tailings*: Same as Alternative 2.	Corridor would be eliminated during Operations. *LNG*: Same as Alternative 2. *Cyanide*: Same as Alternative 2. *Mercury*: Same as Alternative 2. *Dam Tailings*: Same as Alternative 2.	slightly decreased risk of transportation corridor spills. *LNG*: Same as Alternative 2. *Cyanide*: Same as Alternative 2. *Mercury*: Same as Alternative 2. *Dam Tailings*: Same as Alternative 2.	Alternative 2. *Mercury*: Same as Alternative 2. *Dam Tailings*: The risk of a release of a combined tailings and process affected water release would be eliminated and the risk of release of process affected water would remain.	Alternative 2. *Mercury*: Same as Alternative 2. *Dam Tailings*: Same as Alternative 2.
Climate Change (Chapter 3, Section 3.26)						
Climate Change and Atmosphere	GHG emissions would represent at most 4% of state of Alaska emissions in 2010. Impacts would last the life of the project, with GHG emissions occurring throughout the duration of the project	Approximately 28% reduction in GHG emissions from haul trucks.	Anticipated to have higher GHG emissions; however, impacts would be similar to Alternative 2.	GHG emissions not substantially different than Alternative 2.	Anticipated to have approximately 3% GHG emissions as compared to Alternative 2.	GHG emissions not substantially different than Alternative 2.
Climate Change and Water Resources	Climate effects may or may not be discernable beyond predicted extremes. Hydrologic designs would meet state guidelines and would be adequate to accommodate climate change effects. Water management and treatment strategies would accommodate potential long-term precipitation trends.	Less potential for low water barge impacts (fewer trips needed). Other impacts would be the same as Alternative 2.	Slightly less effects along Transportation Corridor (fewer barge trips); slightly more effects along Pipeline component (more stream crossings subject to climate effects). Other impacts would be the same as Alternative 2.	Less potential for low water barge effects. Other impacts would be the same as Alternative 2.	Flexible mine water management and design of operating pond would be able to accommodate climate-caused precipitation changes. Other impacts would be the same as Alternative 2.	Potential for slightly higher climate-caused precipitation and aufeis effects. Other impacts would be the same as Alternative 2.

Table 5: Impact Comparison for Select Resources and Issue Topics

Impact Area	Alternative 2[1]	Alternative 3A	Alternative 3B[2]	Alternative 4	Alternative 5A[3]	Alternative 6A
Climate Change and Permafrost	Slightly more climate change effects on Transportation Corridor (Bethel Dock, a connected action) and Pipeline ROW than from project-induced thaw. Climate change would not add to project-induced effects at the Mine Site, but could affect intermittent areas of permafrost not impacted by project activities. Small beneficial effects (preservation of remaining permafrost) could occur in some areas following reclamation.	While there could be a slight increase in the effects of climate change on permafrost thaw at the Bethel Dock, the increase would be relatively small compared to the project as a whole.	No differences from Alternative 2.	Slightly more climate-caused effects along Crooked Creek ice road. Other impacts would be the same as Alternative 2.	Slight increases in permafrost impacts, but overall impacts would be the same as Alternative 2.	No differences from Alternative 2.
Climate Change and Biological Resources	Effects on biological resources (primarily vegetation and wetlands) would be incremental and include changes in vegetation community types or shifts in use patterns by wildlife, with changes tied to broad regional landscape shifts in vegetation type at the biome level, or large-scale fire regime changes.	No differences from Alternative 2.				
Climate Change and Subsistence	Subsistence losses to coastal and riverine communities may occur as traditional harvest species change relative location and abundance. Effects would be incremental.	No differences from Alternative 2.				

Notes:

1 Includes Alternative 2 – North Option

2 Includes Alternative 3B-Port MacKenzie Option and Alternative 3B-Collocated Pipeline Option

3 Includes Unlined Option and Lined Option

Chapter 4: Cumulative Effects

The cumulative impact analysis identifies project impacts that, when combined with impacts from other past, present, and RFFAs, may become cumulatively significant. Direct effects are limited to the proposed action and alternatives only, while cumulative effects pertain to the additive or interactive effects that would result from the incremental impact of the proposed action and alternatives when added to other past, present, and RFFAs. Cumulative impacts are assessed by combining the potential environmental impacts of the project and alternatives (Chapter 3, Environmental Analysis) with the impacts of other actions that have occurred in the past, are currently occurring, or are proposed in the future in the vicinity of the project.

Not all actions identified in Chapter 4, Cumulative Effects, would have cumulative impacts in all resource areas. Potential impacts for such actions are discussed for the appropriate resource. In some instances in which an action is reasonably foreseeable, quantitative estimates of impacts are not possible and qualitative assessments are provided.

Two factors, place and time, are considered when establishing the affected environment for a cumulative effects analysis, or the spatial and geographical environment and the temporal range of relevant past, present and reasonably foreseeable future projects. Present actions are those that are ongoing and have activities that contribute to potential cumulative effects. Future actions are those that are reasonably foreseeable within the life of the project, or the next 30 years.

The past, present, and RFFAs considered for this analysis include oil and gas exploration and development; mining; commercial fishing; transportation; energy and utilities; community development/capital improvement projects; subsistence activities; tourism, recreation, sport hunting, and fishing; scientific research and surveys; land use and planning; self-determination; and global industrial pollutants.

Results of the cumulative impacts analysis are summarized below.

4.1. Physical Resources

Geology

While the individual impacts of the proposed project are measurable, the cumulative effect is considered to be limited, given the limited area of disturbance over a large region.

Geohazards and Seismic Conditions

The project and its alternatives would not directly or indirectly affect geohazards and seismic conditions; therefore, no cumulative effects are identified.

Surface Water Hydrology

The incremental contribution of any action alternatives to cumulative effects on surface water hydrology would include localized noticeable changes in resource character during the life of the project, and relatively small geographical area of effects on surface water.

Groundwater Hydrology

The incremental contribution of any action alternatives and impacts to groundwater from the proposed project and the past, present and RFFAs would result in acute or obvious changes in the vicinity of the pit during the life of the project, because the effects of the proposed project on groundwater are limited to a relatively small area and would be reduced in post-Closure.

Surface Water and Sediment Quality

The intensity of additive, incremental cumulative impacts attributable to any action alternative would vary within the Mine Site vicinity, as the addition of mercury deposition from project sources to global sources could result in water and sediment quality that is likely to be within regulatory limits or natural variation on average, but could exceed water quality criteria for total mercury in some areas. Project-related impacts at the Mine Site would be expected to result in neither increases nor decreases to the cumulative effects on sediment quality associated with rates of mercury methylation in the Project Area. There would be additive incremental cumulative impacts attributable to Alternative 2 along the Transportation Corridor and Pipeline components.

Air Quality

The impacts to air quality from any action alternatives and the past, present and RFFAs are expected to increase air emissions, including GHGs, in the region and the State.

Noise and Vibration

For all action alternatives with the exception of Alternative 3B, cumulative impacts on noise and vibration levels are considered to have little additional impact from RFFAs, because the intensity of effect at a given sensitive receptor, such as a community, depends largely on the proximity of cumulative projects that may involve concurrent temporary construction activities or post-construction operations. The cumulative effects for Alternative 3B would be similar to Alternative 2, although the intensity of noise levels at the sensitive receptors during construction would be slightly greater than under Alternative 2.

4.2. Biological Resources

Vegetation and Nonnative Invasive Species

Habitat for nonnative invasive species (NNIS) is expected to increase with climate change. Overall, the impacts on vegetation from the action alternatives and the past, present and RFFAs are expected to be measureable, but geographically limited.

Wetlands

The effects of predicted climate change on wetlands under the action alternatives may increase in later years of the project due to warming temperatures and altered precipitation patterns, resulting in permafrost loss, vegetation type changes, a general drying trend, and changed fire regime. The cumulative effects on wetlands from the action alternatives and the past, present and RFFAs are expected to be measureable, but geographically limited.

Wildlife

The cumulative effects on wildlife from the action alternatives and the past, present and RFFAs are expected to be geographically or temporality limited within a large area. While the individual impacts of the action alternatives are measurable, the cumulative effect is still considered to be limited, given the limited area of disturbance over the region.

Fish and Aquatic Resources

The cumulative effects on fish and aquatic resources of the action alternatives in combination with those of other past, ongoing, and reasonably foreseeable future projects, are expected to increase over the life of the project. The cumulative effects on fish and aquatic resources of Alternatives 2, 4, 5A, and 6A are expected to be measurable, but geographically limited. Due to reduced barge traffic under Alternatives 3A and 3B, the contribution to cumulative effects on fish and aquatic resources for these alternatives is expected to be less than other alternatives.

Threatened and Endangered Species

The cumulative effects on threatened and endangered species from the action alternatives and the past, present and RFFAs are expected to be geographically or temporality limited within a large area. While the individual impacts of the proposed project are measurable, the cumulative effect is still considered to be limited, given the limited area of disturbance over the region.

4.3. Social Resources

Land Ownership, Management, and Use

Direct and indirect effects to land use include no change to land ownership, beneficial impacts to the management plans of Calista and TKC, minimal change to state and federal land management, and impacts to land use, primarily associated with use of the cleared ROW after construction. Overall impacts to land ownership from the action alternatives and the past, present and RFFAs would not be noticeable or apparent. There would be some minimal overall impact on land management and use in some areas along the pipeline ROW, as well as around the Mine Site from the proposed project along with past, present and RFFAs.

Recreation

The impact on recreation from the action alternatives and the past, present and future actions is minimal, since most recreation in the project area occurs away from RFFAs. However, an increase in tourism or competition with subsistence users could increase on the Kuskokwim River or along the pipeline ROW.

Visual Resources

The contribution of the action alternatives to cumulative effects on visual resources would result in additive incremental impacts. Past, present, and RFFAs are anticipated to be within normal limits and trends. Overall, the impact on visual resource from the action alternatives and the past, present and RFFAs would be modest but noticeable.

Socioeconomics

The contribution of the action alternatives to cumulative effects on socioeconomics is considered additive, and little additional impact is anticipated from RFFAs. Past and present actions have generally induced impacts within normal limits and trends.

Cultural Resources

All of the action alternatives would have some measurable impacts and loss of integrity to National Register of Historic Places (NRHP) sites.

Subsistence

Overall, the impact on subsistence resources from the action alternatives and the past, present and future actions could result in some harvest decrease and slightly increase competition for resources, although there would be minimal impact to access.

Transportation

For Alternatives 2, 4, 5A, and 6A, the impact on transportation from these alternatives and the past, present and RFFAs may not be measurable or apparent. Across all transportation elements, Alternative 3A would have noticeable disturbance and limited displacement of other uses, and Alternative 3B would have a contribution to cumulative effects that may not be measurable or apparent.

4.4. Climate Change

The ultimate effects of the project on climate change (and vice versa) are the results of incremental cumulative effects of many actions. Cumulative impacts for climate change focuses on whether other RFFAs would interact with and alter the projected trends in climate change.

Under the No Action Alternative, past actions are expected to continue, such as existing infrastructure operations, transportation modes, and energy and utility development and upgrades. There would be no incremental contribution to cumulative effects related to climate change.

For all of the action alternatives, RFFAs would likely induce little additional change to climate change trends. While some large-scale projects are proposed in the region, they are generally still considered to be speculative, and are not considered reasonably foreseeable. While the individual impacts of the proposed project are measurable, the cumulative effect is considered to be limited, given the limited contribution of GHGs over the region, state, or world.

Chapter 5: Impact Avoidance, Minimization, and Mitigation

5.1. Introduction

NEPA requires federal agencies to consider appropriate mitigation measures during the NEPA process. Additionally, the Corps Section 404(b)(1) permitting process has very specific requirements for mitigation including: 1) impact avoidance, 2) minimization, 3) resource-specific mitigation measure development and application to compensate for unavoidable impacts under their jurisdiction.

Measures to avoid or minimize impacts to resources identified in this EIS include design features; BMPs (including industry standards or standard permit requirements); agency considered mitigation, or additional measures agencies consider that would further reduce impacts; and monitoring to assess that mitigation measures are achieving the expected results or monitoring for adaptive management.

The review process for the Department of the Army Permit (Section 404) is largely conducted concurrently with the NEPA review process. The Corps' regulatory authority encompasses waters of the U.S. and aquatic resources and ensures that environmental impacts on aquatic resources from projects are avoided, minimized and mitigated.

Following publication of the Final EIS, each agency will prepare their ROD, which will be the formal decision on whether to issue the requested permit as proposed, a modified permit, or no permit. The federal agency RODs would each identify those mitigation measures that the agency has decided to require of the project and that are within the agency's authority. In addition, the RODs must explain why any other practicable mitigation measures have not been adopted.

BLM also has responsibility to identify the conditions including all required mitigation for any Mineral Leasing Act ROW issued pursuant to the Final EIS. BLM has participated in the development of the mitigation measures being considered by the Corps.

5.2. Design Features

The Corps views design features as part of the project, and considers Donlin Gold's design measures as inherent to the proposed action (Alternative 2) as well as applicable components of the other alternatives' descriptions. These measures become part of the alternative description, and are considered part of the alternative during the NEPA impact analysis and decision-making process. Impact-reducing design features are described in Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation.

5.3. Best Management Practices and Permit Requirements

Donlin Gold would follow BMPs, industry standards, and standard permit requirements that are designed to reduce impacts to the environment. The Corps took these BMPs and permit requirements into consideration when assessing the impacts of the project on the resources as described in Chapter 3, Environmental Analysis.

Relevant permits and regulatory requirements are described in Chapter 1, Purpose and Need, and Appendix AA.

5.4 Strain-based Design Special Permit Conditions

Donlin Gold anticipates there will be areas along the pipeline with frost unstable soils or ground movement, and has requested a Special Permit from PHMSA to allow Strain-Based Design (SBD) of segments of the pipeline. SBD involves advanced metallurgy and engineering to allow the pipe to deform in the longitudinal direction and better maintain its integrity and safety. PHMSA issues special permits only when consistent with pipeline safety, and will comply with NEPA in deciding whether to issue the special permit. Strain based design special permit conditions are further described in Section 5.4 of Chapter 5, Impact Avoidance, Minimization, and Mitigation.

5.5. Agency Considered Mitigation

Mitigation measures were developed based on analysis of project impacts, the project public comments, results from mitigation workshops in July 2015 and May 2017, and input from federal, state, and Tribal cooperating agencies. Additional mitigation identified during the process may include project modifications that are in part considered feasible from a cost and constructability perspective. Agency considered mitigation measures are described in Section 5.5 tables in Chapter 5, Impact Avoidance, Minimization, and Mitigation.

5.6. Compensatory Mitigation

CEQ has defined mitigation in its regulations at 40 CFR 1508.20 to include "compensating for the impact by replacing or providing substitute resources or environments." Compensatory mitigation for unavoidable impacts may be required to ensure that activities requiring a permit comply with Clean Water Act (CWA) Section 404(b)(1) Guidelines. Compensatory mitigation may be provided through permittee-responsible mitigation activities, or as payment for preserving existing wetlands through mitigation banks or in-lieu fees.

For unavoidable losses to waters of the United States, Donlin Gold has proposed compensatory mitigation. Donlin Gold developed a Compensatory Mitigation Plan in coordination with federal, state, and local governments and landowners (Appendix M). Compensatory mitigation is further described in Section 3.11-Wetlands of Chapter 3, Environmental Analysis and Section 5.6 of Chapter 5, Impact Avoidance, Minimization, and Mitigation.

5.7. Mitigation Monitoring and Adaptive Management

To assess the success of mitigation efforts, monitoring plans which may include elements of adaptive management could be developed. Agency-considered monitoring and adaptive management is included in Section 5.7 tables in Chapter 5, Impact Avoidance, Minimization, and Mitigation.

Chapter 6: Consultation and Coordination

EIS development included consultation and coordination with agencies and the public. For details regarding locations and dates of meetings, see Chapter 6, Consultation and Coordination.

6.1. Scoping Notice and Public Scoping Meetings

The Corps published the Notice of Intent to prepare the Donlin Gold Project EIS in December 2012, which started the scoping period. Also in December, the project website was launched (www.DonlinGoldEIS.com) and the first informational newsletter was circulated to 1,000 stakeholders and 7,450 mailing addresses. The first newsletter contained a self-mailing comment form; other comment submission avenues included the website's comment form; email; U.S. mail; facsimile; or speaking at public meetings.

The formal scoping period was December 14, 2012, to March 29, 2013. Several techniques were used to notify the public of the proposed project and EIS, of scheduled public scoping meetings, and how to solicit comments. The Corps placed advertisements in regional newspapers and on local radio stations, as well as sent notices by press release and mail.

Public scoping meetings were held in thirteen communities throughout the EIS Analysis Area plus Anchorage from January 2013 through March 2013. Residents could also participate via teleconference to facilitate comments. For communities where public meetings were not held, Tribal representatives selected and sent participants to meetings. Donlin Gold provided travel support. Overall, representatives from 21 neighboring villages attended scoping meetings in the host communities, for a total of 35 villages participating in person. Discussions with potentially affected Tribal governments will continue throughout the project.

6.2. Agency Scoping Meeting

To gather agency input regarding scoping issues, alternatives, and information sources, an agency scoping meeting was held in February 2013 in Anchorage. Attendees included: BLM, USFWS, EPA, ADNR, ADF&G, and Alaska Department of Health and Human Services. Tribal governments that participated in the agency scoping meeting included: Village of Crooked Creek, Native Village of Chuathbaluk, and Native Village of Napaimute.

6.3. Government to Government Consultation

The Corps identified 66 federally recognized tribes potentially affected by the project (see Appendix P, Corps Initiation of the Government-to-Government Relationship with Federally Recognized Tribes). The Corps sent a letter of notification and inquiry September 24, 2012, to all recognized tribes offering the opportunity to participate in formal government-to-government consultation, to participate as a cooperating agency, or to simply receive information about the project.

The letters included a Tribal Coordination Plan for project development. The Corps also requested information from the tribes on subsistence, archaeological sites, and traditional cultural properties as well as special expertise regarding any environmental, social, or economic impacts.

Throughout the project the Corps has held staff level government-to-government Tribal coordination meetings regarding the Donlin Gold Project with tribes, per Tribal request.

The BLM, conducting a separate government-to-government inquiry regarding the project, sent a letter of notification on August 19, 2014, to all the recognized tribes, offering the opportunity to participate in formal government-to-government consultation with the BLM, apart from the Corps.

6.4. Comments

During the scoping period, the Corps received 164 unique submissions, including 14 transcripts of public meetings which generated 134 oral responses from participants. The term submission refers to the entirety of oral testimony at a public meeting, an entire letter, or an email message. Most submissions included many comments, a term which refers to each of the discrete concepts conveyed in a submission. In all, 2,619 substantive comments were received and grouped into 438 Statements of Concern (SOC) which reflect a single point that may have been expressed by several individuals. Issues and concerns expressed by the public and agencies were used as part of the process to develop alternatives (see Scoping Report, Appendix B).

6.5. Additional Public Outreach

As opportunities arose, the Corps continued to provide project information and updated presentations to stakeholder groups. Over 30 supplemental outreach meetings have been held statewide, regionally, and in villages. The Corps has produced seven newsletters.

6.6. Draft EIS and Public Comment Period

On November 25, 2015, the Corps published a Special Public Notice regarding the release of the Draft EIS. The Special Public Notice regarding the comment period featured a 157-day comment period that began on November 25, 2015 and ended April 30, 2016. Given the receipt of multiple requests to extend the comment period on the Department of the Army Permit Application and/or the Draft EIS, the Corps extended the public comment period to May 31, 2016.

In addition, 17 public meetings were held in the same locations as the scoping meetings, with the additions of Tyonek, Lower Kalskag, and Chuathbaluk. The Draft EIS meetings were well attended, with a total estimated attendance of 1,004 persons in the 17 meetings and oral comments offered by 204 persons.

Public comments regarding the Draft EIS were received as oral and written testimony at the public meetings, and as written comments received through postal mail, fax, and email. Comments were submitted by individual citizens as well as groups, including federal agencies, tribal governments, state agencies, local governments, businesses, special interest groups, and non-governmental organizations.

6.7. Draft EIS Comments Received

During the Draft EIS public comment period, the Corps received 529 unique submissions. Of these, 17 were transcripts of the public meetings. Three form letters were received. The submissions included over 5,000 comments which were then grouped into Statements of Concern (SOCs). The SOCs are summary statements capturing a single substantive point that may have been expressed in a number of individual comments. Each SOC (and by extension, each individual comment) was acknowledged, and a response was written. Changes to the document were made as appropriate, and additional analyses performed as needed to address concerns. A summary of the comment analysis process, all SOCs, and the response to each SOC can be found in the Comment Analysis Report (CAR) in Appendix X. Each submission, with comments bracketed by SOC category, can be found in Appendix A, Volumes 1-5, of the CAR.

A newsletter summarizing the major themes from the comment analysis process was sent in November 2016 and the release of the Final EIS was announced in a Newsletter in April 2018.

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