



DONLIN GOLD



PROJECT DESCRIPTION

PLAN OF OPERATIONS—VOLUME I

Donlin Gold Project

July 2012

www.DonlinGold.com

**PLAN OF OPERATIONS
PROJECT DESCRIPTION**
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:

SRK Consulting (U.S.), Inc.
4710 Business Park Blvd., Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

Table of Contents	i
Figures	iii
Tables	iii
Acronyms	iv
Units of Measure	vi
EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1-1
1.1 Authors	1-1
1.2 Property Description.....	1-1
1.2.1 Location.....	1-1
1.2.2 Site Description and Physiographical Features.....	1-2
1.2.3 Project Land Status	1-4
1.2.4 History	1-6
1.2.5 Regional Geology	1-6
1.3 Project Geology.....	1-7
2.0 MINE COMPONENTS	2-1
2.1 Basic Design Information	2-1
2.2 Mining	2-5
2.2.1 Mining Methods and Phases.....	2-5
2.2.2 Loading and Hauling Equipment	2-7
2.2.3 Blasting.....	2-7
2.2.4 Waste Rock Facility and Overburden Stockpile	2-8
2.3 Milling.....	2-10
2.3.1 Overview	2-10
2.3.2 Crushing	2-14
2.3.3 Coarse Ore Reclaim	2-14
2.3.4 Grinding.....	2-16
2.3.5 Circuit	2-16
2.3.6 Flotation Tailings Neutralization	2-18
2.3.7 Pressure Oxidation	2-18
2.3.8 POX CCD – Carbon-In-Leach Feed Neutralization	2-21
2.3.9 Carbon-In-Leach.....	2-21
2.3.10 Cyanide Detoxification	2-21
2.3.11 Carbon Stripping.....	2-21
2.3.12 Electrowinning and Refining	2-21
2.3.13 Carbon Regeneration	2-22
2.3.14 Mercury Abatement Systems.....	2-22
2.3.15 Reagents	2-23
2.4 Tailings Storage Facility	2-25
2.5 Off-site Infrastructure	2-28
2.5.1 General.....	2-28
2.5.2 Bethel Cargo Terminal.....	2-28

2.5.3	Jungjuk Port.....	2-29
2.5.4	Diesel Fuel Delivery.....	2-29
2.5.5	Mine Access Road.....	2-30
2.5.6	Natural Gas Pipeline.....	2-30
2.5.7	Airstrip.....	2-33
2.5.8	Permanent Accommodation Camp.....	2-33
2.6	Mine Site Infrastructure.....	2-34
2.6.1	Summary.....	2-34
2.6.2	Truck Shop.....	2-34
2.6.3	Truck Wash.....	2-34
2.6.4	Utilidors.....	2-36
2.6.5	Cold Storage and Warehouse Facilities.....	2-36
2.6.6	Administration Offices / Change-Rooms / Assay Lab Facility.....	2-36
2.6.7	Explosives Storage Area.....	2-36
2.6.8	Construction Camp Facilities.....	2-36
2.7	Electrical Power, Utilities, and Services.....	2-37
2.7.1	Electrical Power and Distribution.....	2-37
2.7.2	Heating.....	2-38
2.7.3	Ventilation.....	2-38
2.7.4	Air Conditioning.....	2-38
2.7.5	Point-Source Dust and Fume Control.....	2-38
2.7.6	Fuel Storage and Distribution.....	2-38
2.7.7	Natural Gas / Propane.....	2-39
2.7.8	Waste Management.....	2-40
2.7.9	Sanitary Treatment Plant Systems.....	2-41
2.8	Water Requirements.....	2-41
2.8.1	Process and Freshwater Management System.....	2-41
2.8.2	Potable Water.....	2-44
2.8.3	Firewater.....	2-44
3.0	SAFETY AND OCCUPATIONAL HEALTH.....	3-1
3.1	Occupational Health & Safety Approach.....	3-1
3.2	Communications.....	3-1
3.3	Medical Emergency Response.....	3-2
3.4	Fire Control and Suppression.....	3-2
4.0	RECLAMATION AND CLOSURE PLANNING.....	4-1
4.1	Purpose and Approach.....	4-1
4.2	Tailings Storage Facility.....	4-2
4.3	Waste Rock Facility.....	4-3
4.4	Open Pits/Pit Lake.....	4-3
4.5	Jungjuk Port, Roads, and Airstrip.....	4-4
5.0	ENVIRONMENTAL PERMITTING PROCESS AND AUTHORIZATIONS.....	5-1
6.0	REFERENCES.....	6-1
7.0	GLOSSARY OF TERMS.....	7-1

FIGURES

Figure 1-1: Project Location Map	1-3
Figure 1-2: Regional Land Status.....	1-5
Figure 1-3: Regional Geology of the Proposed Project Area	1-7
Figure 1-4: Interpreted Donlin Gold Geology	1-8
Figure 1-5: Interpreted Surface Geology of the Donlin Gold Resource Area	1-9
Figure 1-6: Lewis Area Section (“A” Cross Section)	1-9
Figure 1-7: ACMA Area Section (“B” Cross Section)	1-10
Figure 2-1: Pit Design Concept	2-6
Figure 2-2: Waste Rock Facility and Overburden Stockpiles	2-9
Figure 2-3: Simplified Process Flowsheet	2-12
Figure 2-4: Preliminary Plant Site Layout	2-13
Figure 2-5: Grinding Bays and Sectionals	2-15
Figure 2-6: Flotation Circuit.....	2-17
Figure 2-7: Autoclave Circuit.....	2-19
Figure 2-8: Carbon-in-Leach Circuit	2-20
Figure 2-9: Location of Tailings Storage Facility	2-27
Figure 2-10: Mine Access Roads	2-31
Figure 2-11: Location of Proposed Natural Gas Pipeline Route	2-32
Figure 2-12: General Arrangement.....	2-35
Figure 2-13: Typical Fuel Storage Facility	2-39
Figure 2-14: Schematic Water Balance – Operations.....	2-43
Figure 4-1: Schematic Water Balance – Closure.....	4-5

TABLES

Table 2-1: Basic Design Information for Donlin Gold Project.....	2-1
Table 2-2: Blasting Criteria.....	2-8
Table 2-3: Waste Rock Classifications and Tonnage Estimates.....	2-10
Table 5-1: Potential Federal Agency Permits and Authorizations	5-3
Table 5-2: Potential State Agency Permits and Authorizations.....	5-4

EXECUTIVE SUMMARY

Donlin Gold LLC¹ (Donlin Gold) is proposing the development of an open pit, hardrock gold mine located 277 miles (446 km) west of Anchorage, 145 miles (233 km) northeast of Bethel, and 10 miles (16 km) north of the village of Crooked Creek (Figure 1-1). The proposed Donlin Gold project includes land leased from Calista Corporation (Calista), an Alaska Native Claims Settlement Act (ANCSA) regional corporation that holds the subsurface (mineral) estate for ANCSA lands in the region. In addition to the subsurface estate, Calista owns some surface estate lands in the lease area. A Surface Use Agreement with The Kuskokwim Corporation (TKC), an ANCSA village corporation, grants surface use rights.

Bethel, the largest community in western Alaska, is the administrative and transportation center of the Yukon–Kuskokwim Delta. The proposed Jungjuk (Angyaruaq) Port site is about 177 river miles (285 km) upstream of Bethel and about 57 river miles (92 km) upstream of Aniak, the regional transportation center for the middle Kuskokwim Valley.

The gold resource is hosted in intrusive and sedimentary rock in two main areas, Lewis and ACMA, with 80% found in intrusive rock. The proven and probable² reserves total 556.5 million short tons (Mst) (504.8 Mt) with an average grade of 0.061 oz/st (2.09 g/t). With mill recovery at approximately 90%, the property would produce an average of over one million ounces of gold annually (1 Moz/a).

The proposed Donlin Gold project would require three to four years to construct and have an active mine life of approximately 27.5 years. The mine is proposed to be a year-round, conventional “truck and shovel” operation using both bulk and selective mining methods. The operation would have a projected average mining rate 422,000 stpd (383,000 t/d), or 154 Mstpy (140 Mt/a), and an average mill production rate of 59,000 stpd (53,500 t/d). Milling components include a gyratory crusher, semi-autogenous grinding (SAG) and ball mills, followed by flotation, concentration, pressure oxidation, and carbon-in-leach (CIL) process circuits. Conventional carbon stripping and electrolytic gold recovery would produce an end product of gold doré bars, which would be shipped to a custom refinery for further processing. State-of-the-art mercury abatement controls would be installed at each of the major thermal sources, including the autoclave, carbon kiln, gold furnaces, and retort.

Tailings storage would encompass an area of 2,351 acres (951 ha) with a total capacity of approximately 335,000 acre-ft (413 Mm³) of mill tailings, decant water, and stormwater. Total waste rock material is estimated at 2,990 Mst (2,720 Mt), with approximately 2,460 Mst

¹ Donlin Gold LLC is a limited liability company jointly owned by Barrick Gold U.S. Inc. and NovaGold Resources Alaska, Inc. on a 50/50 basis.

² Based on an assessment of qualitative, non-technical factors, Barrick Gold Corporation treats mineralization at Donlin Creek as measured and indicated resources, rather than proven and probable reserves for securities reporting, accounting, and other public disclosure purposes. Mineral Reserves are those parts of Mineral Resources which, after the application of all mining factors, result in an estimated tonnage and grade that is the basis of an economically viable project after taking account of all relevant processing, metallurgical, economic, marketing, legal, environment, socio-economic, and government factors. Mineral Reserves are inclusive of diluting material that will be mined in conjunction with the Mineral Reserves and delivered to the treatment plant or equivalent facility. The term ‘Mineral Reserve’ need not necessarily signify that extraction facilities are in place or operative or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals.

(2,232 Mt) to be placed in a waste rock facility located outside the mine pit and the remaining waste rock backfilled in the pit.

Electric power for the proposed Donlin Gold project site will be generated on site from a dual-fueled (natural gas as primary and diesel) reciprocating engine power plant with a steam turbine utilizing waste heat recovery from the engines. The power plant would consist of two equal halves, each consisting of six reciprocating engines, and a single separate steam turbine for a total connected load of 227 MW, an average running load of 153 MW, and a peak load of 184 MW.

Natural gas would be transported to the Donlin Gold mine site via a 313 mile (503 km), 14 inch (35.5 cm) diameter buried steel pipeline originating from an existing 20 inch (51 cm) natural gas pipeline near Beluga, Alaska.

General cargo for operations would be transported to Bethel by marine barge from terminals in Seattle, Washington, Vancouver, BC, or Dutch Harbor, Alaska. At Bethel, cargo would be transferred to the dock for temporary storage or loaded onto river barges for transport up the Kuskokwim River to a port constructed at Jungjuk Creek. A 30 mile (48 km) all-season access road would be constructed from the proposed Jungjuk Port to the mine site.

Fuel would be transported to Dutch Harbor by tanker, then to Bethel by marine barge. At Bethel fuel would either be transferred directly to double-hull river barges for transport to Jungjuk, or be off-loaded for temporary storage. From Jungjuk Port fuel would be delivered to the mine site fuel storage facility by tanker trucks.

The Donlin Gold project would be a permanent camp operation accessible primarily by a 5,000 ft (1,524 m) gravel airstrip. The camp would be capable of housing 638 workers.

Reclamation and closure planning has been based on the concept of “design for closure,” which was initiated in the very early stages of the Donlin Gold project development to address post-closure impacts on the physical resources of the area and on local communities. In addition to reclaiming disturbances associated with mining, processing, and ancillary support facilities in a manner compatible with the designated post-mining land use, the goal of the Donlin Gold reclamation plan is to minimize the area affected by operations. During operations, concurrent reclamation would be performed whenever possible in areas no longer required for active mining.

Thickening – The partial separation of solids from liquid in a slurry by means of settling in a large tank. Typically, flocculants are added as a settling aid. Clarified water overflows from the top of the tank, and the thicker slurry exits from the bottom of the tank.

Toe – The bottom of a fill, such as a road embankment or dam.

Topsoil – The upper, outermost layer of soil, usually the top 2 inches (5.1 cm) to 8 inches (20 cm). It has the highest concentration of organic matter and microorganisms

Trash screen – A screen used to remove trash (such as plastic, wood, steel, etc.) from the slurry prior to leaching.

Underflow – That portion of a slurry that exits a hydrocyclone through the bottom and contains the larger, denser particles in the slurry.

Undersize – Particles that pass through a particular screen.

Work index – A measure of ore hardness used in sizing crushers, SAG mills, and ball mills.

Zero Discharge – The standard of performance that requires the containment of all process fluids for protection of surface waters.



DONLIN **GOLD**



WATER RESOURCES MANAGEMENT PLAN

PLAN OF OPERATIONS—VOLUME II

Donlin Gold Project

July 2012

www.DonlinGold.com

**PLAN OF OPERATIONS
WATER RESOURCES
MANAGEMENT PLAN**
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:

SRK Consulting (US), Inc.
4710 Business Park Blvd. Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

Table of Contents	i
Appendices	iii
Figures	iv
Tables	v
Acronyms.....	vi
Units of Measure	viii
Elements and Compounds	x
EXECUTIVE SUMMARY.....	ES-1
1.0 INTRODUCTION.....	1-1
1.1 Plan Objective	1-1
1.2 Project Location and Land Status	1-1
1.3 Project Overview	1-2
1.3.1 Definitions.....	1-6
1.3.2 Basic Design Criteria.....	1-6
2.0 METEOROLOGICAL AND HYDROLOGICAL CHARACTERISTICS OF THE PROJECT SITE	2-1
2.1 Water Balance Models	2-1
2.2 Meteorological Data/Hydrologic Inputs.....	2-1
2.2.1 Storm Frequency Analysis	2-2
2.3 Alaska Water Quality Standards	2-4
2.4 Surface Water.....	2-6
2.4.1 Stream Flow Data.....	2-8
2.4.2 Limited Stream Flow Measurements.....	2-8
2.4.3 Surface Water Quality	2-17
2.5 Groundwater.....	2-20
2.5.1 Groundwater Hydrology	2-20
2.5.2 Groundwater Quality	2-23
2.6 Permafrost	2-28
3.0 PROJECT WATER MANAGEMENT REQUIREMENTS.....	3-1
3.1 Water Supply and Management Concept – Construction	3-1
3.1.1 American Creek Runoff and Contact Water Dams	3-1
3.1.2 Pit Dewatering Groundwater	3-4
3.1.3 Ore Stockpile Berm	3-4
3.1.4 TSF – Anaconda Creek Runoff	3-4
3.1.5 Overburden Stockpiles.....	3-5
3.1.6 Construction Camp Potable Water Supply	3-6
3.1.7 Plant Start-Up Water Supply	3-6
3.2 Water Supply Concept – Operations.....	3-6
3.3 Process Water Requirements.....	3-10
3.3.1 Lower and Upper Contact Water Dams	3-10
3.3.2 Tailings Storage Facility	3-12
3.3.3 Snow Gulch Freshwater Dam	3-15

3.3.4	Waste Rock Facility.....	3-16
3.3.5	Ore Stockpile Berm	3-16
3.3.6	Open Pit and Dewatering	3-16
3.3.7	Process Water Requirement and Distribution.....	3-19
3.3.8	Power Plant	3-21
3.4	Summary of Operational Rules	3-22
3.4.1	Below Average Precipitation Conditions	3-22
3.4.2	Average Precipitation Conditions	3-22
3.4.3	Greater Than Average Precipitation Conditions	3-22
3.5	Water Supply and Management Concept – Closure	3-23
3.5.1	Anaconda Creek.....	3-26
3.5.2	American Creek.....	3-27
4.0	GEOCHEMISTRY	4-1
4.1	Waste Rock and Pit Wall Rock.....	4-1
4.2	Tailings	4-9
4.2.1	MWMP Tests on Final Tailings Samples	4-11
4.2.2	Kinetic Testing of Final Plant Tailings	4-17
4.2.3	ABA Analysis of Final Plant Tails	4-18
4.2.4	Arsenic Stability in Final Plant Tailings	4-20
4.2.5	Mercury Precipitation	4-22
4.2.6	Overburden	4-23
4.3	Water Quality Predictions	4-23
4.3.1	Waste Rock.....	4-24
4.3.2	Pit Walls Characterizations	4-26
4.4	Pit Lake.....	4-28
5.0	WASTEWATER MANAGEMENT.....	5-1
5.1	Stormwater and Domestic Wastewater	5-1
5.1.1	American Creek Freshwater Diversion Dam.....	5-1
5.1.2	TSF Temporary Freshwater Diversion Dams	5-2
5.1.3	Domestic Wastewater	5-2
5.2	Open Pit Dewatering Wells and Mine Pit Water.....	5-2
5.2.1	Construction / Operations Water Treatment Plants	5-2
5.2.2	Closure Pit Lake Water Treatment.....	5-3
5.3	Process Water	5-5
5.4	Tailings Liquor, Pore Water, and Seepage	5-5
5.4.1	Beach Runoff.....	5-7
5.4.2	Tailings Pore Water.....	5-8
5.4.3	TSF Seepage/Underdrain Flows.....	5-10
6.0	POTENTIAL IMPACTS TO WATER QUANTITY AND QUALITY	6-1
6.1	Surface Water Hydrology	6-1
6.1.1	Baseflow Reductions to Crooked Creek	6-1
6.1.2	Impact to Crooked Creek from Pit Dewatering	6-2
6.1.3	Runoff Reduction and Streamflow Alterations	6-2
6.1.4	Impacts to Surface Water Quality	6-7
6.1.5	Surface Water Temperature.....	6-7
6.2	Groundwater Hydrology.....	6-7
6.2.1	Impacts to Groundwater Levels	6-8
6.3	Water Quality.....	6-9

6.3.1	Water Quality during Mine Operations	6-9
6.3.2	Increased Sedimentation due to Alteration of Existing Topography in the Watersheds	6-9
6.3.3	Water Quality after Mine Closure	6-12
6.3.4	Monitoring.....	6-13
7.0	REFERENCES.....	7-1

APPENDICES

Appendix A	Water Quality
Appendix B	Water Balance

FIGURES

Figure 1-1:	Project Location Map	1-4
Figure 1-2:	Location of Mine Footprint	1-5
Figure 2-1:	Watershed Boundaries in Project Area	2-7
Figure 2-2:	Current Surface Water Monitoring Sites	2-9
Figure 2-3:	Measured Daily Stream Discharge and Precipitation for American and Anaconda Stations	2-11
Figure 2-4:	Measured Daily Stream Discharge and Precipitation for DCBO, CCBO, CCBA, and CCAC Stations	2-12
Figure 2-5:	Mean Annual Hydraulic Heads: Simulated vs. Observed Values	2-13
Figure 2-6:	Summer Stream Flows: Simulated vs. Observed Values	2-14
Figure 2-7:	Current Groundwater Monitoring Sites	2-21
Figure 2-8:	Potentiometric Surface Groundwater	2-24
Figure 2-9:	Piper Plot: Groundwater Monitoring Wells	2-26
Figure 2-10:	Permafrost Distribution Map - American Creek Area	2-29
Figure 2-11:	Permafrost Distribution Map – Anaconda Creek Area	2-30
Figure 2-12:	Permafrost Distribution Map Snow Gulch Area	2-31
Figure 3-1:	Water Management Plan – Construction	3-2
Figure 3-2:	Schematic Water Balance – Construction	3-3
Figure 3-3:	Water Management Plan – Operations	3-8
Figure 3-4:	Schematic Water Balance – Operations	3-9
Figure 3-5:	Water Management Plan – Closure	3-24
Figure 3-6:	Schematic Water Balance – Closure	3-25
Figure 4-1:	NP vs. Ap and Sulfur vs. NP/AP	4-3
Figure 4-2:	Comparison of Arsenic & Sulfur, Arsenic & Antimony; and Arsenic & Mercury Concentrations	4-5
Figure 4-3:	Humidity Cell Results	4-6
Figure 4-4:	Humidity Cell Release Rate Comparisons Sulfate and Arsenic	4-8
Figure 4-5:	Kinetic Cell Testing Profiles (As, Sb) of Two Final Tailings Samples	4-17
Figure 4-6:	Kinetic Cell Testing Profiles (pH, sulfate) of Two Final Tailings Samples	4-18
Figure 4-7:	Production Plan for Sulfur, Carbonate, and Molar Ratio (Carbonate/Sulfur)	4-19
Figure 4-8:	Production Plan for Arsenic, Iron (calculated with Arsenopyrite and Pyrite), and Molar Ratio of Iron/Arsenic	4-21
Figure 4-9:	Mercury Precipitation Tests on Detoxified Leach Tails Filtrate	4-22
Figure 4-10:	Mercury Precipitation Tests on Detoxified Leach Tails Slurry	4-23
Figure 4-11:	Water Quality Inflows from the Eight Waste Rock Categories	4-29
Figure 4-12:	Illustration of ACMA and Lewis Pits with Backfill at the End of Mine Operations	4-30

TABLES

Table 1-1:	Basic Design Information for Donlin Gold Project	1-7
Table 2-1:	Estimated Monthly Precipitation at Donlin	2-1
Table 2-2:	Potential Evaporation/Sublimation and Mean Temperature	2-2
Table 2-3:	Total Annual Precipitation/Maximum Daily Rainfall - Frequency Analysis	2-3
Table 2-4:	Snowmelt and Snowmelt/Concurrent Rainfall – Frequency Analysis.....	2-4
Table 2-5:	Alaska Most Stringent Water Quality Standards (Total recoverable unless noted)	2-5
Table 2-6:	Surface Water Data for the Donlin Gold Mine Site	2-10
Table 2-7:	Simulated Water Budget by Watershed: Average Conditions	2-15
Table 2-8:	Surface Water Characterization Locations, 2010	2-18
Table 2-9:	Summary of Groundwater Monitoring Wells and Vibrating Wire Piezometers	2-22
Table 3-1:	Lower and Upper CWDs Design Criteria	3-11
Table 3-2:	Snow Gulch Freshwater Dam	3-16
Table 3-3:	Summary of Open Pit Dewatering Wells	3-18
Table 4-1:	Waste Rock Management Category Definitions	4-9
Table 4-2:	Final Plant Tailings Solids Analysis*	4-10
Table 4-3:	2006 Pilot Plant Final Tailings Solids MWMP Species Results.....	4-12
Table 4-4:	2006 Pilot Plant Final Tailings MWMP Dissolved Metals Results	4-13
Table 4-5:	2007 Phase 2 Pilot Plant Transitional Tailings Solids MWMP Species Results	4-14
Table 4-6:	2007 Phase 2 Pilot Plant Final Transitional Tailings Solids MWMP Dissolved Metals Results	4-15
Table 4-7:	ABA Testing Results on Pilot Plant Final Tails Samples	4-20
Table 4-8:	Waste Rock Tonnage by Facility	4-24
Table 4-9:	WRF Average Annual Pore Water Predictions	4-27
Table 4-10:	Predicted Surface (0-10 m) Water Concentrations for a Suite of Parameters in the Donlin Pit Lake Year 65 – Year 100	4-32
Table 5-1:	American Creek Diversion Dam Height	5-1
Table 5-2:	Pit Dewatering Well Water Quality Estimates.....	5-4
Table 5-3:	Final Plant Tailings Liquor Components Analysis	5-5
Table 5-4:	Final Plant Tailings Liquor Metals Analysis	5-6
Table 5-5:	Predicted Concentrations in Beach Runoff.....	5-8
Table 5-6:	Summary of Tailings Pore Water Chemistry	5-9
Table 6-1:	Average Flow for Disturbed and Undisturbed Conditions – Operations (all years).....	6-4
Table 6-2:	Average Flow for Disturbed and Undisturbed Conditions – Operations (Year 20).....	6-4
Table 6-3:	Average Flow for Disturbed and Undisturbed Conditions – Closure (Years 1 to 56) – Pit Lake Filling	6-6
Table 6-4:	Average Flow for Disturbed and Undisturbed Conditions – Closure (Year > 51) – Pit Lake Treated Discharge	6-6
Table 6-5:	Summary of Water Quality of Major Inflows to ACMA Pit for Select Parameters	6-13

EXECUTIVE SUMMARY

This document provides a summary of the meteorological characteristics, surface water and groundwater resources, and water management strategies developed for the construction, operations, and closure phases of the proposed Donlin Gold project. Existing water data collected from the project area are presented, including a general baseline of water quality conditions for comparison with future water quality data. In addition, the report outlines water use requirements, identifies potential wastewater streams, summarizes reclamation activities as well as the post-closure pit lake, and discusses potential impacts to water quantity and quality from the proposed project.

The proposed project is located in an area of low-lying, well rounded ridges on the western portion of the Kuskokwim Mountains, with elevations ranging from 500 ft to 2,100 ft (152 m to 640 m). Area vegetation is typically hard shrubs and small trees. Hillsides are forested with black spruce, tamarack, alder, birch, and larch. Soft muskeg and discontinuous permafrost can be found in poorly drained areas at lower elevations. The area has a relatively dry interior continental climate, with an average annual precipitation of 19.6 inches (50 cm) and potential evaporation/sublimation of 13.4 inches (34 cm). Summer temperatures are relatively warm and may exceed 83°F (28°C). Minimum temperatures may fall to -45°F (-43°C) during the winter months.

Based on local meteorological information, water management strategies were evaluated using both deterministic and stochastic water balance models calibrated to site precipitation and stream flow data. The proposed project sits within Crooked Creek watershed, which encompasses approximately 300 sq. miles (777 km²). Major project facilities would be constructed in the American Creek and Anaconda Creek basins, both of which have catchment areas of approximately 7 sq. miles (18 km²) and yield large volumes of runoff due to high runoff coefficients. The proposed project is expected to operate with an overall water surplus; therefore, an important part of the water management strategy for construction and operations is to build a number of diversion structures. To account for the possibility of a series of successive dry years occurring early in the proposed project life, which could result in a process water shortage, the water management plan also focuses on the provision of sufficient water storage capacity early in the construction phase of the proposed project. The diversion structures, combined with optimized water use, would limit the volume of contact water remaining at the end of operations.

Water requirements for the process facilities are summarized below. Water requirements depend on mill feed rates, which vary annually:

- During the active operating period of the mine, the process plant requires an average water supply of 17,838 U.S. gallons per minute (gpm) (4,051 m³/h).
- Mill process loss averages 247 gpm (56 m³/h).
- The process plant requires a minimum range of 3,170 gpm (720 m³/h) to 3,615 gpm (821 m³/h) of fresh water; this includes contact water, pit dewatering water, and non-contact water, but does not include Tailings Storage Facility (TSF) reclaim water.

- Reclaim water from the TSF and Seepage Recovery System (SRS) is pumped back to the process plant at a minimum rate of 9,397 gpm (2,134m³/h).
- Reclaim water is maximized at 14,668 gpm (3,331 m³/h) when TSF pond volumes exceed 405 acre-ft (0.5 Mm³).

In years with average and below-average precipitation, the Lower/Upper contact water dams (CWDs) and pit dewatering system would not always meet the year-round freshwater requirements for the plant. In this event, additional water would be obtained from the Snow Gulch Freshwater Dam (FWD). Geochemical characterization and leachability studies have been completed on representative samples of waste rock and ore/tailings. Using the characterization findings, seven waste rock *management* categories have been developed using the neutralization potential (NP_{CO3})/acid generating potential (AP) range and the ratio of arsenic (As)/sulfur (S) (*Waste Rock Metal Leaching and Acid Rock Drainage Assessment for Feasibility Study* [SRK 2007]).

In summary, metal leaching (primarily arsenic) and acid rock drainage (ARD) characterizations to date have shown that most of the waste rock at the proposed project has a low potential for ARD and that segregation of waste rock based on acid-base accounting (ABA) characteristics could potentially reduce the volume of waste rock requiring management to prevent ARD. Current mine planning incorporates this segregation. Other long-term management strategies such as blending, encapsulation, and backfilling the pit are incorporated into the waste rock management strategy (See *Waste Rock Management Plan*, Donlin Gold Project, SRK 2012a). Concurrent reclamation of overburden and waste rock dumps to minimize stormwater contact with the rock will result in lower arsenic content in drainage from the material.

The key environmental considerations and characteristics of the waste rock and process plant tailings are described in this document. The most stringent Alaska water quality standard (AWQS) presented in comparative tables are for reference only in reviewing anticipated water quality from waste rock and process tailings, as there is no design intent to discharge waste rock contact water or process solution into waters of the State of Alaska, or the U.S. The purpose of the analysis is to better understand the potential long-term properties of the different waste rock categories and process tailings so that appropriate control measures can be implemented to manage these specific materials.

The facilities have been designed to minimize discharge of water affected by the mining operations. Environmental protection measures include synthetic liners, runoff collection and diversions, and seepage collection and pump back facilities. During wet years, some pit dewatering water would be discharged; this water would be treated in a water treatment plant (WTP) to meet applicable standards prior to discharge. Section 5.2 describes the proposed WTP and the concomitant controls that would be associated with the discharge of treated water during mining.

At closure, the pit would receive inflows from the following sources:

- excess surface water from the TSF
- tailings beach runoff

- tailings consolidation water and cover infiltration water
- pit highwall runoff
- non-acid generating (NAG) and potentially acid generating (PAG) seepage from waste rock in the American Creek watershed
- groundwater
- surface runoff from the waste rock facilities
- runoff from the undisturbed areas within the pit watershed
- direct precipitation on the lake surface.

These inflows were introduced into the pit lake model at locations and times corresponding to the closure water management plan. The pit lake water quality was simulated according to the laws governing lake physics, geochemistry, and mixing.

The pit will be backfilled with waste rock to an elevation of 111.5 ft (34 m) above mean sea level (amsl). The pit backfill is estimated to contain approximately 82 Myd³ (63 Mm³) of voids. A total of 50,670 acre-ft (62.5 Mm³) will be required to fill the voids in the pit backfill material. The following source will contribute to the filling:

- 8,970 acre-ft (11.1 Mm³) of pit runoff which accumulates during placement of the backfill
- 29,840 acre-ft (36.8 Mm³) of excess tailings water delivered to the pit at closure
- the first five years of tailings consolidation water, beach runoff, and tailings cover infiltration water 17,684 acre-ft (21.8 Mm³)
- direct precipitation, groundwater inflow, American Creek waste rock facility (WRF) runoff and seepage, and TSF SRS water will contribute the remaining volume.

The pit lake modeling was based on all flows from the TSF, and NAG and PAG seepage flow from waste rock in the American Creek watershed are captured and directed to the bottom of the pit lake. Clean runoff is directed to the pit lake surface waters.

The ACMA pit would fill to an operating level approximately 33 ft (1 m) below the designed spillway overflow elevation of 349 ft (106.5 m) amsl over a period of approximately 56 years. The presence of the waste rock backfill in the combined ACMA and Lewis pit, results in the development of a deep pit lake maintained through seasonal water treatment and discharge at a maximum depth of approximately 1,045 ft (318.5 m) in the deepest portion of the pit lake.

Once the pit lake fills, streamflow in Crooked Creek is expected to return to within 2% of pre-development conditions on an average annual basis. The reduction is mostly related to reduced runoff from the covered WRF in American Creek.



DONLIN GOLD



INTEGRATED WASTE MANAGEMENT PLAN

PLAN OF OPERATIONS—VOLUME III

Donlin Gold Project

July 2012

www.DonlinGold.com

PLAN OF OPERATIONS
INTEGRATED WASTE
MANAGEMENT PLAN
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:

SRK Consulting (U.S.), Inc.
4710 Business Park Blvd. Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

Table of Contents	i
Appendices.....	iii
Figures	iv
Tables	iv
Acronyms	v
Units of Measure	vii
Elements and Compounds.....	vii
EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1-1
1.1 Authors	1-1
1.2 Project Location and Summary	1-1
2.0 WASTE MANAGEMENT REQUIREMENTS	2-1
2.1 Regulatory Overview.....	2-4
2.1.1 Definition of Solid Waste.....	2-4
2.1.2 Definition of Hazardous Waste.....	2-5
2.2 Waste Management Priorities	2-6
2.3 Purchasing of Materials.....	2-6
2.4 Waste Minimization	2-7
2.5 Recycling and Reuse of Materials	2-8
2.6 Waste Segregation.....	2-9
2.7 Container Management.....	2-9
2.8 Procedures for Emptying Containers.....	2-11
2.9 Onsite Waste Management.....	2-12
2.9.1 Solid Waste Landfills	2-12
2.9.2 Monitoring.....	2-13
2.9.3 Reporting and Record Keeping.....	2-13
2.10 Materials to be Managed off Site.....	2-13
2.11 Hazardous Waste Management.....	2-14
2.11.1 Hazardous Waste Determinations	2-15
2.11.2 Hazardous Waste Accumulation	2-15
2.11.3 Satellite Accumulation Areas	2-16
2.11.4 Shipments of Hazardous Waste.....	2-16
2.12 Universal Waste Management	2-16
2.13 Used Oil Management.....	2-17
2.14 Employee Training	2-18
2.15 Handling and Storage of Hazardous Materials	2-18
2.16 Specific Hazardous Materials Handling Requirements	2-19

2.16.1	Explosives	2-19
2.16.2	Sodium Cyanide	2-19
2.17	Inventory of Hazardous Materials	2-20
2.18	Material Safety Data Sheets	2-21
2.19	Inspections	2-21
2.20	Transportation of Hazardous Materials	2-21
2.21	Reporting Requirements	2-22
3.0	SPECIFIC WASTE / MATERIAL HANDLING METHODS	3-1
3.1	Absorbents/Floor Dry	3-1
3.2	Antifreeze/Coolant	3-1
3.3	Asbestos and Lead Based Paint	3-2
3.4	Batteries	3-2
3.5	Building Construction and Demolition Materials	3-2
3.6	Camp Waste	3-3
3.7	Chemicals / Reagents	3-3
3.8	Containers / Packaging	3-4
3.8.1	Empty Drums	3-4
3.8.2	Compressed Gas Cylinders	3-4
3.8.3	Aerosol Cans	3-5
3.9	Contaminated Soil	3-5
3.9.1	Cyanide-Contaminated Soil	3-5
3.9.2	Petroleum-Contaminated Soil	3-5
3.9.3	Caustic / Acid Spills Outside the Mill and Secondary Containment	3-6
3.10	Filters	3-6
3.11	Food Waste (Putrescibles)	3-7
3.12	Assay Lab Waste	3-8
3.13	Light Bulbs/Lamps	3-8
3.13.1	Hazardous Lamps	3-8
3.13.2	Non-Hazardous Lamps	3-9
3.14	Lubricants / Petroleum Products	3-9
3.14.1	Brake Fluid	3-9
3.14.2	Grease	3-9
3.14.3	Used Oil	3-9
3.15	Mineral Processing	3-9
3.16	Miscellaneous Materials	3-10
3.17	Oily Waste	3-10
3.18	Paints	3-11
3.19	Radioactive Materials	3-11
3.20	Rags	3-11

3.21	Scrap Metal.....	3-12
3.22	Solvents	3-12
3.23	Tires.....	3-12
3.24	Wildlife	3-12
3.25	Wood, Paper, and Cardboard.....	3-12
4.0	SPILL PREVENTION AND RESPONSE	4-1
4.1	Spill Reporting.....	4-2
5.0	REFERENCES	5-1

APPENDICES

Appendix A	Requirement for Hazardous Waste Accumulation Areas
Appendix B	Reporting Criteria for Process Solutions and Petroleum Spills

FIGURES

Figure 1-1: Project Location Map	1-3
Figure 2-1: Project Layout	2-2
Figure 2-2: General Arrangement.....	2-3

TABLES

Table 2-1: Applicable Regulations for Hazardous Waste Generators	2-15
Table 4-1: Oil Spill Response Plans	4-1

EXECUTIVE SUMMARY

Donlin Gold LLC² (Donlin Gold) is proposing the development of an open pit, hardrock gold mine, located 277 miles (446 kilometers [km]) west of Anchorage, 145 miles (233 km) northeast of Bethel, and 10 miles (16 km) north of the village of Crooked Creek (Figure 1-1). Bethel, the largest community in western Alaska, is the administrative and transportation center of the Yukon-Kuskokwim Delta. The proposed Jungjuk (Angyaruaq) Port site is about 178 river miles (286 km) upstream of Bethel, and about 57 river miles (92 km) upstream of Aniak, which is the regional transportation center for the middle Kuskokwim Valley.

This Integrated Waste Management Plan (Plan) describes procedures for managing solid wastes and hazardous materials generated at the proposed Donlin Gold project facilities. This Plan also includes procedures for reusing and recycling materials wherever possible, which is a priority of the Donlin Gold project.

Decisions that may affect the generation of solid wastes would be made with consideration to the following order of priorities:

1. waste source reduction
2. recycling of materials
3. waste treatment
4. waste disposal

Appropriate management begins at the procurement stage, before materials are purchased. Material Safety Data Sheets (MSDS) of any new material proposed to be used at the Donlin Gold project would be reviewed prior to purchasing. The goal is to avoid materials that are considered hazardous or would be classified as hazardous waste once the materials can no longer be used for their intended purposes, both for the protection of the workers handling these materials and for the benefit of the environment.

Methods to minimize the production of waste include proper handling and storage of hazardous materials to prevent accidental releases and cross-contamination of materials, providing appropriate secondary containment for hazardous materials to prevent releases and the associated generation of waste materials and spill residues, and the reuse and/or recycling of materials whenever possible. Materials that could be recycled include mill liners, antifreeze, batteries, lamps, tires, containers, scrap metal, and used oil.

Wastes would be characterized to determine their appropriate management method. Non-liquid, non-hazardous wastes that cannot be recycled would be disposed of at on site inert landfill (18 AAC 60.460). Liquids, hazardous wastes and other materials that cannot be managed on site would be shipped off site for recycling or disposal. This includes solvents, lamps, batteries, liquid paints, co-product mercury, and assay lab waste.

² Donlin Gold LLC is a limited liability company, jointly owned by Barrick Gold U.S. Inc. and NovaGold Resources Alaska, Inc. on a 50/50 basis.

Solid waste landfills would be constructed at the mine site and possibly at the Jungjuk Port facility for the disposal of inert solid waste. The inert landfills at the mine site would be constructed as trenches within the Waste Rock Facility (WRF). At the Jungjuk Port facility, a small inert solid waste landfill may be constructed if needed in a designated area within the port facilities.

Water resources and reclamation management information for the onsite solid waste facilities is provided in the *Water Resources Management Plan, Donlin Gold Project* (SRK 2012b) and the *Reclamation and Closure Plan, Donlin Gold Project* (SRK 2012c).

The environmental monitoring proposed for the Donlin Gold project can be found in the *Monitoring Plan, Donlin Gold Project* (SRK 2012d).



DONLIN GOLD



INTEGRATED WASTE MANAGEMENT MONITORING PLAN

PLAN OF OPERATIONS—VOLUME III A
Donlin Gold Project

July 2012

www.DonlinGold.com

PLAN OF OPERATIONS
Integrated Waste Management
MONITORING PLAN
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:
SRK Consulting (U.S.), Inc.
4710 Business Park Blvd. Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

Table of Contents	i
Appendices.....	ii
Figures	ii
Tables	ii
Acronyms	iii
Units of Measure	v
Elements and Compounds.....	vi
1.0 INTRODUCTION	1-1
1.1 Authors	1-1
1.2 Purpose	1-1
1.3 Administrative Information.....	1-6
1.4 Project Description.....	1-6
1.5 Objectives	1-7
2.0 COMPLIANCE MONITORING – CONSTRUCTION AND OPERATIONS	2-1
2.1 Fluid Management and Monitoring	2-4
2.1.1 Process Water Sampling and Monitoring	2-4
2.1.2 Contact Water Dams	2-5
2.1.3 Temporary Reservoirs – Tailings Storage Facility	2-5
2.1.4 Tailings Storage Facility.....	2-6
2.1.5 Pit Perimeter Dewatering Wells	2-6
2.2 Surface Water Monitoring/Sampling – Construction and Operations	2-6
2.3 Waste Characterization Sampling	2-7
2.4 Domestic Wastewater Treatment	2-8
2.5 Solid Waste Landfill.....	2-9
2.6 Tailings Storage Facility Embankment Monitoring.....	2-10
2.7 Jungjuk Port Road Stormwater.....	2-10
3.0 POTABLE WATER MONITORING/PUBLIC WATER SYSTEM	3-1
4.0 AVIAN AND TERRESTRIAL WILDLIFE MONITORING	4-1
5.0 CLOSURE MONITORING	5-1
5.1 Tailings Storage Facility	5-1
5.2 Pit Lake.....	5-2
5.3 Waste Rock Facility Monitoring	5-2
6.0 ANALYTICAL PROFILES FOR LIQUID SAMPLES	6-1
7.0 MONITORING RECORDS AND REPORTING	7-1
7.1 Documentation of Measurements, Monitoring, and Quality Assurance Program Plan.....	7-1
7.2 Retention of Records	7-1
7.3 Monitoring Reports and Submission Schedules	7-1
8.0 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM	8-1
9.0 REFERENCES	9-1

APPENDICES

Appendix A	Quality Assurance Project Plan (QAPP) for the Donlin Gold Project Water Quality Monitoring, Sampling and Analysis Activities
Appendix B	Wildlife Mortality Reporting Forms

FIGURES

Figure 1-1: Project Location Map	1-5
Figure 2-1: Monitoring/Sampling Locations - Construction	2-2
Figure 2-2: Monitoring/Sampling Locations – Operations	2-3
Figure 5-1: Monitoring/Sampling Locations – Closure	5-3

TABLES

Table 1-1: Summary of Monitoring and Sampling Activity	1-2
Table 2-1: Mill Process Fluid Management System Monitoring Requirements	2-5
Table 2-2: Pit Perimeter Dewatering Water Treatment Plant and Sewage Treatment Plant Outfalls.....	2-6
Table 2-3: Surface Water Monitoring Sites.....	2-7
Table 2-4: Waste Rock Management Category Definitions*	2-7
Table 2-5: Summary of Monitoring Requirements for Solid Waste Landfill	2-9
Table 2-6: Tailings Storage Facility Inspection Schedule	2-11
Table 3-1: Summary of Potable Water Monitoring Requirements.....	3-1
Table 5-1: Summary of Closure and Post-Closure Monitoring.....	5-1
Table 6-1: Long List-1, Water Quality Parameters for Analysis of Water Samples	6-1
Table 6-2: Bottle Set List for Long List-1	6-3



DONLIN GOLD



INTEGRATED WASTE MANAGEMENT WASTE ROCK MANAGEMENT PLAN

**PLAN OF OPERATIONS—VOLUME III B
Donlin Gold Project**

July 2012

www.DonlinGold.com

PLAN OF OPERATIONS
Integrated Waste Management Plan
WASTE ROCK MANAGEMENT
PLAN
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:
SRK Consulting (U.S.), Inc.
4710 Business Park Blvd. Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

Table of Contents	i
Appendices.....	i
Figures.....	ii
Tables.....	ii
Acronyms.....	iii
Units of Measure.....	iv
Elements and Compounds.....	v
1.0 INTRODUCTION	1-1
1.1 Authors.....	1-1
1.2 Project Location and Summary.....	1-1
1.3 Objective and Scope.....	1-4
2.0 SITE CONDITIONS	2-1
2.1 Physical Setting.....	2-1
2.2 Climate.....	2-1
2.3 Geology.....	2-3
2.3.1 Regional Geology.....	2-3
2.3.2 Project Geology.....	2-5
2.3.3 Major Rock Types.....	2-7
2.3.4 Geology Underlying the Waste Rock Facility.....	2-8
3.0 WASTE ROCK CHARACTERIZATION	3-1
3.1 Waste Rock Geochemical Modeling.....	3-4
3.2 Development of Waste Rock Classification System.....	3-6
3.3 Mine Plan and Waste Rock Distribution.....	3-8
4.0 WASTE ROCK MANAGEMENT	4-1
4.1 Waste Rock Classification.....	4-1
4.2 Waste Rock Mining and Segregation.....	4-1
4.3 Waste Rock Designation and Placement.....	4-2
4.3.1 American Creek Valley WRF.....	4-4
4.3.2 Isolated Cells on WRF.....	4-5
4.3.3 ACMA Pit Backfill.....	4-7
4.3.4 Tailings Storage Facility.....	4-7
5.0 WASTE ROCK FACILITY DESIGN	5-1
5.1 Waste Rock Facility Construction.....	5-1
5.2 Waste Rock Facility Reclamation.....	5-2
6.0 MONITORING AND REPORTING	6-1
6.1 Operational Monitoring and Reporting.....	6-1
6.2 Closure and Post-Closure Monitoring and Reporting.....	6-1
7.0 REFERENCES	7-1

APPENDICES

Appendix A	Summary of Mine Production Schedule
Appendix B	Block Model Views

FIGURES

Figure 1-1: Project Location Map	1-3
Figure 2-1: Regional Geology Map.....	2-5
Figure 2-2: Geologic Map of the Donlin Gold Area	2-6
Figure 3-1: Total Waste Rock Material Distribution.....	3-9
Figure 4-1: Waste Rock and Stockpile Locations	4-3
Figure 4-2: PAG 6 Cell Evolution.....	4-6

TABLES

Table 2-1: Estimated Monthly Precipitation at Donlin	2-2
Table 2-2: Potential Evaporation/Sublimation and Mean Temperature.....	2-3
Table 3-1: Characteristics of Samples Tested Using Sequential MWMP.....	3-3
Table 3-2: Site-specific Calculation of ABA Parameters.....	3-5
Table 3-3: Donlin Gold Waste Rock Management Categories (SRK 2011)	3-7
Table 3-4: Donlin Gold Waste Rock Classification System.....	3-8
Table 3-5: Donlin Gold Waste Rock Tonnage Estimates.....	3-9
Table 4-1: Waste Rock Tonnage by Facility	4-4
Table 5-1: Waste Rock Facility Design Parameters	5-1



DONLIN GOLD



NATURAL GAS PIPELINE PLAN OF DEVELOPMENT Donlin Gold Project

July 2012

www.DonlinGold.com

**NATURAL GAS PIPELINE
PLAN OF DEVELOPMENT**
Donlin Gold Project

July 2012



4720 Business Park Blvd. Suite G-25
Anchorage, Alaska 99503

Prepared By:

SRK Consulting (US), Inc.
4710 Business Park Blvd. Suite F-40
Anchorage, Alaska 99503

TABLE OF CONTENTS

1.0 INTRODUCTION	1-1
2.0 PURPOSE AND NEED	2-1
2.1 Purpose	2-1
2.2 Need	2-1
2.3 Background and Proposed Mine Information	2-1
2.4 Expected Public Benefits.....	2-2
3.0 PROJECT DESCRIPTION	3-1
3.1 Commodity to be Transported and Purpose.....	3-2
3.2 Pipe to be used for Transportation of Natural Gas	3-3
3.3 Timeline of Proposed Project	3-4
3.3.1 Planned Commencement Date for Construction	3-4
3.3.2 Estimated Construction Time.....	3-4
3.3.3 Planned Commencement Date for Operation.....	3-7
3.3.4 Duration of Pipeline Operation.....	3-7
3.4 Estimated Number of Persons to be Employed.....	3-7
3.5 Financing Requirements for the Proposed Project.....	3-7
3.5.1 Corporate Organization Structure.....	3-7
3.6 Natural Gas Distribution Line.....	3-8
3.7 Surface and Subsurface Attributes.....	3-9
3.8 Length/Width of ROW; Area Needed for Related Activities.....	3-9
3.9 Ancillary to an Existing Right-of-Way	3-10
3.10 Alternative Routes and Locations.....	3-10
3.10.1 Pipeline	3-10
3.10.2 Theodore River Alternate Route	3-11
3.10.3 Little Mt. Susitna Alternate Route	3-11
3.10.4 Round Mountain Alternate Route	3-11
3.10.5 Goodman Pass Alternate Route	3-12
3.10.6 Egypt Mountain Alternate Route.....	3-12
3.10.7 St. John’s Hill Alternate Route	3-12
3.10.8 Windy Fork Alternate Route.....	3-12
3.10.9 Big River Alternate Route	3-13
3.10.10 Tatlawiksuk River Alternate Route.....	3-13
3.10.11 Kuskokwim River Alternate Route	3-13
3.10.12 Moose Creek Alternate Route.....	3-13
3.10.13 Kuskokwim Hills Alternate Route	3-13
3.10.14 Alternative Route Assessments for the Electric Transmission Line.....	3-13
3.11 Safeguards for Persons, Property, and Public and the Environment	3-26
3.11.1 Safety of Workers	3-26
3.11.2 Public Health and Safety	3-27
3.11.3 Public or Private Property	3-29

3.11.4	Vegetation or Timber	3-30
3.11.5	Fish or Other Wildlife or Their Habitat	3-31
3.11.6	Restoring Areas of Vegetation or Timber	3-31
3.11.7	Erosion and Rehabilitation of Areas Eroded.....	3-32
3.11.8	Ensure Compliance by Contractors and Subcontractors.....	3-32
3.11.9	Quality Control and Procedures for Inspecting and Testing the Pipeline	3-33
3.11.10	Special Safeguards to Protect the Interests of Individuals Living in the General Area for Subsistence Purposes.....	3-34
3.11.11	Special Safeguards to Protect the Interests of Commercial Lodges.....	3-35
4.0	Right-of-Way Location (ROW)	4-1
4.1	Legal Description.....	4-1
4.2	Site-specific Engineering Surveys for Critical Areas	4-1
4.3	River Crossings	4-1
4.4	Calculation of Estimated right-of-way Acreage.....	4-3
5.0	Pipeline Design Factors	5-1
5.1	Technical Summary.....	5-1
5.2	Toxicity of Pipeline Product	5-2
5.3	Anticipated Operating Temperatures.....	5-2
5.4	Depth of Pipeline	5-3
5.5	Permanent Width or Size.....	5-3
5.6	Temporary Areas Needed	5-4
6.0	Additional Right-of-Way Components.....	6-1
6.1	Connection to Existing Right-of-Way.....	6-1
6.2	Existing Components on or off Public Land.....	6-1
6.3	Possible Future Components	6-1
6.4	Location and Description of Compressor Station	6-1
6.5	Location and Description of Electric Transmission Line	6-2
6.6	6-4	
6.7	Location and Description of Fiber Optic Cable and Repeater Station	6-4
6.8	Location and Description of Sand and Gravel Sites	6-4
6.9	Location and Description of Pig Launcher/Receiver Facilities.....	6-4
6.10	Location and Description of Metering Stations.....	6-5
6.11	Location and Description of Mainline Block Valves	6-7
7.0	Government Agency Involvement.....	7-1
7.1	Entities that have Regulatory Authority or would be affected by the Proposed Project.....	7-1
7.2	Communications Protocol.....	7-2
7.2.1	State Agency Coordination	7-2
7.2.2	Federal Agency Coordination	7-2
7.3	List of Project Authorizations	7-4
7.3.1	State ROW Lease Required Documents	7-4

8.0	Construction of Facilities.....	8-1
8.1	Construction Planning Considerations	8-1
8.1.1	Remote Cabins/Residential Areas	8-1
8.1.2	Iditarod Trail.....	8-1
8.1.3	Active Faults	8-4
8.1.4	Wetlands.....	8-4
8.1.5	Waterbodies.....	8-5
8.1.6	Access	8-5
8.1.7	Susitna Flats State Game Refuge	8-6
8.1.8	Construction Communications Details.....	8-6
8.2	Construction Execution.....	8-6
8.2.1	Overview of Construction Execution.....	8-7
8.2.2	Construction Execution Sequence.....	8-10
8.2.3	Beluga Tie-In to BPL.....	8-12
8.2.4	Terminus at Mine Site.....	8-12
8.2.5	Compressor Station	8-13
8.2.6	Electric Transmission Line.....	8-18
8.2.7	Fiber Optic Communication Line	8-18
8.2.8	Ancillary Construction Support Facilities	8-21
8.2.9	Transportation of Equipment and Materials.....	8-51
8.2.10	Construction Labor Requirements/Mobilization	8-52
8.2.11	Personnel to Support Construction.....	8-52
8.2.12	Land Requirements	8-54
8.2.13	Flagging or Staking the ROW	8-54
8.2.14	Barrier Delineation	8-55
8.2.15	Vegetation Clearing and Grading	8-55
8.2.16	Workpad Construction	8-56
8.2.17	Ice and Snow Pads.....	8-57
8.2.18	Frost Packing.....	8-59
8.2.19	Winter grading	8-59
8.2.20	Summer Grading	8-60
8.2.21	Granular Workpad	8-60
8.2.22	Workpad versus Graded Construction.....	8-60
8.2.23	Temporary Stormwater Control	8-61
8.3	Pipe Installation	8-62
8.3.1	Blasting.....	8-62
8.3.2	Stringing.....	8-63
8.3.3	Bending and Set-up.....	8-63
8.3.4	Lineup and Welding.....	8-64
8.3.5	Inspection (Nondestructive Examination)	8-65
8.3.6	Field Joint Coating.....	8-65
8.3.7	Trenching.....	8-66
8.3.8	Bedding.....	8-67
8.3.9	Lowering In	8-67
8.3.10	Buoyancy Control	8-68
8.3.11	Trench Breakers	8-68
8.3.12	Padding and Backfill	8-68
8.3.13	Backfill	8-68

8.3.14	Tie-ins	8-69
8.3.15	Waterbody and Wetland Crossings	8-69
8.3.16	Waterbody Crossings	8-70
8.3.17	Wetland Crossings.....	8-73
8.3.18	Waterbody Approaches	8-75
8.3.19	Equipment Crossing	8-75
8.3.20	Residential Areas (primarily remote cabins)	8-76
8.3.21	Iditarod.....	8-76
8.3.22	Fault Crossings.....	8-76
8.3.23	Snow Avalanche Hazards.....	8-79
8.3.24	Unsuitable Soils	8-79
8.3.25	Permafrost	8-79
8.3.26	Mainline Block Valves and Launchers/Receivers	8-82
8.3.27	Cathodic Protection	8-82
8.3.28	Cleanup, Erosion Control and Reclamation Crews	8-82
8.3.29	Cleaning, Pressure Testing and Drying	8-83
8.3.30	Pipeline Commissioning	8-85
8.3.31	Engineering Drawings and Specifications	8-85
8.4	Safety and Training Requirements	8-85
8.4.1	Environmental, Safety and Project Orientation/Training.....	8-85
8.5	Environmental and Quality Control and Procedures for Inspection.....	8-87
8.6	Signs and Markers.....	8-87
8.7	As-Built Survey	8-88
8.8	Contingency Planning.....	8-88
8.9	Contacts	8-88
8.9.1	Holder Contacts	8-88
8.9.2	ROW Granting Agency Contacts	8-88
8.10	Waste Management	8-89
9.0	Resource Values and Environmental Concerns.....	9-1
9.1	Location with Respect to Existing Corridors	9-1
9.2	Anticipated Conflicts with Resources or Public Health and Safety	9-1
9.2.1	Air	9-1
9.2.2	Noise.....	9-2
9.2.3	Geologic Hazards	9-4
9.2.4	Mineral and Energy Resources	9-5
9.2.5	Paleontological Resources	9-5
9.2.6	Cultural Resources	9-6
9.2.7	Regional Setting	9-8
9.2.8	Water Resources	9-4
9.2.9	Wetlands and Vegetation.....	9-5
9.2.10	Fisheries Resources	9-8
9.2.11	Wildlife Resources	9-10
9.2.12	Special Status Species	9-12
9.2.13	Visual Resources	9-13
9.2.14	Social and Economic	9-15
9.2.15	Subsistence	9-16
9.2.16	State or Federal Projects	9-17

9.2.17 Recreation Activities	9-17
9.2.18 Wilderness	9-18
10.0 Stabilization, Rehabilitation and Reclamation	10-1
10.1 Soil Removal and Replacement	10-2
10.1.1 Trench/Right-of-Way.....	10-2
10.2 Drainage and Erosion Control, Clean-up and Reclamation.....	10-2
10.2.1 Stabilization of the Backfilled Trench.....	10-3
10.2.2 Streambank Protection	10-4
10.2.3 Reclamation of Waterbody Crossings	10-4
10.3 Clean-up Crew Functions	10-5
10.4 Reclamation Crew Functions.....	10-6
10.5 Natural Reinvasion/Seeding Specifications.....	10-6
10.6 Fertilizer.....	10-7
10.7 Control of Non-Native Invasive Plants.....	10-7
10.8 Limiting Access to ROW.....	10-7
10.9 Status of Temporary Roads following Construction	10-7
10.10 Status of Temporary PSYs and Campsites	10-7
10.11 Status of Temporary Camp Facilities following Construction	10-7
10.12 Status of Temporary Airstrips following Construction	10-8
10.13 Status of Material Sites following use for Construction.....	10-8
10.14 Status of Barge Landings and Port Facilities following Construction	10-8
10.15 Disposition of Salvageable Materials at Completion of Construction	10-8
10.16 Status of Temporary Land needs following Construction	10-8
10.17 Pipeline Maintenance Activities	10-8
10.18 Inspection and Monitoring.....	10-8
10.19 Unconditional Guaranty for Duties and Obligations.....	10-9
11.0 Operation and Maintenance.....	11-1
11.1 Operation and Maintenance Plan/Manual	11-1
11.2 ROW Maintenance Schedules	11-1
11.3 Safety	11-1
11.4 Removal/Addition of Pipe & Equipment Operation or Maintenance.....	11-1
11.5 Signs and Line Markers.....	11-1
11.6 New and Expanded Access for Operation and Maintenance	11-2
11.7 Inspection and Testing of Pipeline.....	11-2
11.8 Facilities Security.....	11-2
11.9 ROW Configuration	11-2
11.9.1 Minimum Cover.....	11-3
11.9.2 Inspection, Surveillance and Monitoring of Right-of-way	11-3
11.9.3 Encroachments.....	11-4
11.9.4 ROW Maintenance Clearing	11-4

11.9.5	Heavy Equipment Crossing Buried Pipeline ROW	11-4
11.10	Pigging.....	11-5
11.10.1	Maintenance Pigging	11-5
11.10.2	Smart Pigging Inspections	11-5
11.10.3	Disposal of Operational and Pigging Wastes.....	11-5
11.11	Cathodic Protection and Corrosion Control	11-6
11.12	Valves	11-6
11.12.1	Access to Values	11-7
11.13	Overpressure Safety Devices	11-7
11.14	Smoking or open Flames.....	11-7
11.15	Pipe Movement.....	11-7
11.16	Normal Operating and Maintenance Procedures Review.....	11-8
11.17	Construction Records	11-8
11.18	Operations Records.....	11-9
11.19	Drug Testing	11-10
11.20	Industrial Waste and Toxic Substances near Right-of-way	11-11
12.0	Termination and Final Reclamation	12-1
12.1	Removal of Structures at Termination	12-1
12.2	Status of Pipe	12-1
12.3	Status of Transmission Line	12-2
12.4	Status of Fiber Optic Cable	12-2
12.5	Status of Roads.....	12-2
12.6	Status of Material Sites.....	12-2
12.7	Status of Retained Barge Landings.....	12-3
12.8	Status of Retained Airstrips.....	12-3
12.9	Disposition of Salvageable Materials.....	12-3
12.10	Final Stabilization, Rehabilitation and Reclamation of Disturbed Areas	12-3
13.0	References	13-1

APPENDICES

- Appendix A: Strip Maps
- Appendix B: Line List
- Appendix C: Geotechnical Survey Data
- Appendix D: Stream Crossings
- Appendix E: Engineering Typical
- Appendix F: Construction Plan and Schedule
- Appendix G: Right-of-Way Typical

FIGURES

Figure 1-1: Location of Proposed Donlin Gold Natural Gas Pipeline Route	1-2
Figure 3-1: Corporate Organization Structure	3-8
Figure 3-2: Theodore River Alternate Route	3-14
Figure 3-3: Little Mount Susitna Alternate Route	3-15
Figure 3-4: Round Mountain Alternate Route.....	3-16
Figure 3-5: Goodman Pass Alternate Route	3-17
Figure 3-6: Egypt Mountain Alternate Route	3-18
Figure 3-7: St Johns Hill Alternate Route	3-19
Figure 3-8: Windy Fork Alternate Route.....	3-20
Figure 3-9: Big River Alternate Route	3-21
Figure 3-10: Tatlawiksuk River Alternate Route.....	3-22
Figure 3-11: Kuskokwim River Alternate Route	3-23
Figure 3-12: Moose Creek Alternate Route.....	3-24
Figure 3-13: Kuskokwim Hills Alternate Route	3-25
Figure 3-14: Lodge Locations.....	3-37
Figure 4-1: Beluga Camp Storage & Pipe Yard Areas.....	4-2
Figure 6-1: Compressor Site Location Map.....	6-3
Figure 6-2: Metering Stations	6-6
Figure 7-1: Communication Protocol.....	7-3
Figure 7-2: State ROW Lease Required Documents	7-5
Figure 8-1: Compressor Station Site Plan.....	8-15
Figure 8-2: Electric Transmission Line and Fiber Optic Cable.....	8-20
Figure 8-3: General Construction Camp Configuration.....	8-35
Figure 8-4: Camp Movement Plan Diagram.....	8-36
Figure 8-5: Permafrost Distribution Map	8-81
Figure 9-1: Physiographic Divisions	9-9
Figure 9-2: ADF&G Game Units and Guide Use Areas within Pipeline Corridor.....	9-21

TABLES

Table 3-1: Composition of Gas to be Transported	3-2
Table 3-2: Spread Execution Sequence.....	3-6
Table 3-3: Number of Persons Employed	3-7
Table 3-4: Cost of Proposed Natural Gas Pipeline	3-7
Table 3-5: Commercial Lodges	3-36
Table 4-1: Estimated Acres Calculation	4-3
Table 5-1: Project Specific Design Criteria.....	5-1
Table 5-2: Minimum Cover Requirements.....	5-3
Table 6-1: Mainline Valve Location Summary.....	6-8
Table 7-1: Federal, State and Local Agencies with Regulatory Authority.....	7-1
Table 7-2: Federally Recognized Tribes along the Pipeline Route by Region.....	7-2
Table 7-3: Permits and Authorizations	7-6
Table 8-1: Proximity of Pipeline to Iditarod Trail.....	8-3
Table 8-2: Construction Execution Sequence	8-10
Table 8-3: Operating Design Factors	8-14
Table 8-4: Pipe Storage Yards	8-23
Table 8-5: Potential Material Sites.....	8-27
Table 8-6: Pipeline Shoofly and Access Roads Material Needs	8-31
Table 8-7: Pipeline Airfields Material Needs	8-31
Table 8-8: Access Road Identifications	8-38
Table 8-9: Potential Water Sources and Use	8-41
Table 8-10: Pipeline Construction Fuel Estimate	8-47
Table 8-11: Approximate Fuel Quantities by Spread and Section	8-48
Table 8-12: HDD and HDD Camp Fuel Estimate	8-49
Table 8-13: Fuel Handling and Storage	8-50
Table 8-14: Characteristics of Castle Mountain Fault	8-77
Table 8-15: Characteristics of Denali Fault	8-78

RAA	Resource Associates of Alaska
RCA	Regulatory Commission of Alaska
ROD	Record of Decision
ROW	Right-of-way
RT	radiographic testing
SCADA	supervisory control and data acquisition
SHPO	State of Alaska Historic and Preservation Office
SLE	section line easements
SPCC	Spill Prevention, Control, Countermeasure Plan
SPCO	State Pipeline Coordinator's Office
SRK	SRK Consulting (US), Inc.
SWPPP	Storm Water Pollution Prevention Plan
TAPS	Trans Alaska Pipeline System
TKC	tThe Kuskokwim Corporation
TSCA	Toxic Substances Control Act
UL	Underwriters Laboratories
UPS	uninterruptible power supply
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	visual resource management
WT	wall thickness