DONLIN GOLD

PROJECT DESCRIPTION

PLAN OF OPERATIONS—VOLUME I

Donlin Gold Project

July 2012

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PLAN OF OPERATIONS
PROJECT DESCRIPTION
Donlin Gold Project

July 2012

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EXECUTIVE SUMMARY

Donlin Gold LLC[1] (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 probable[2] 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 Mm^3) 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 consists 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

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PLAN OF OPERATIONS
WATER RESOURCES MANAGEMENT PLAN
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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 km^2). 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 km^2) 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 m^3/h).
- Mill process loss averages 247 gpm (56 m^3/h).
- The process plant requires a minimum range of 3,170 gpm (720 m^3/h) to 3,615 gpm (821 m^3/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 (2,134m^3/h).
- Reclaim water is maximized at 14,668 gpm (3,331 m^3/h) when TSF pond volumes exceed 405 acre-ft (0.5 Mm^3).

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 Myd^3 (63 Mm^3) of voids. A total of 50,670 acre-ft (62.5 Mm^3) 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 Mm^3) of pit runoff which accumulates during placement of the backfill
- 29,840 acre-ft (36.8 Mm^3) 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 Mm^3)
- 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

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INTEGRATED WASTE MANAGEMENT PLAN

Donlin Gold Project

July 2012

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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

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Integrated Waste Management

MONITORING PLAN

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INTEGRATED WASTE MANAGEMENT

WASTE ROCK MANAGEMENT PLAN

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PLAN OF OPERATIONS

Integrated Waste Management Plan

WASTE ROCK MANAGEMENT PLAN

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NATURAL GAS PIPELINE

PLAN OF DEVELOPMENT

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NATURAL GAS PIPELINE
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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