Mine Development and Operations Plan

Area 2 Stage 3 Pit Design Change

2017-01

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Contents

List of Tables

List of Figures

1 Introduction

This document supplements the Mine Development and Operations Plan (MDOP) dated June 2014 (Minto Explorations Ltd., 2014) and referenced in *Schedule C* of QML-0001. That document, submitted as part of Phase V/VI licensing, described the addition of several open pits to Minto's mine plan:

1. Minto North
2. Area 2 Stage 3
3. Ridgetop South
4. Ridgetop North

In October 2016, Minto submitted an updated MDOP showing a revised Area 2 Stage 3 design that mined a substantially smaller volume than the original Phase V/VI pit presented in 2014. The October 2016 redesign considered additional in-fill exploration drilling and geotechnical drilling completed in 2015, as well as a degree of conservatism in the economic assumptions.

This document further revises the Stage 3 design based on current economic conditions, increasing it to approximately match the original pit presented in the 2014 MDOP.

The content of this MDOP is derived from the Plan Requirement Guidance for Quartz Mining Projects (Yukon Water Board/Yukon Energy, Mines and Resources, 2013). Design Criteria – Surface Mining

The depth and extents of the four pits were determined in the Phase VI Pre-Feasibility Study (Minto Explorations Ltd., 2012) by a Lerchs-Grossman pit optimization of the mine's resource model with the following parameters:

Table 1: Input parameters used in pit optimization.

Item	Unit	Value
Metal Prices and Exchange Rate		
Copper	US$ / lb	2.50
Gold	US$ / oz	300.00
Silver	US$ / oz	3.90
Exchange rate	US$ / C$	0.90
Processing		
Copper recovery to concentrate	%	91.0
Sulphide Gold recovery to concentrate	%	70.0
Sulphide Silver recovery to concentrate	%	78.0
Copper grade in concentrate	%	40.0
Gold grade in concentrate	g/t	variable with Cu
Silver grade in concentrate	g/t	variable with Cu
Concentrate moisture content	%	8.0
Smelter Payables		
Payable copper in concentrate	%	96.75
Payable gold in concentrate	%	Per MRI contract
Silver deduction	g/t in conc.	Per MRI contract
Remaining payable silver in concentrate	%	Per MRI contract
Other Parameters		
Pit slope angles		
Minto North	°	52
Area 2 Stage 3 Rock	°	53
Area 2 Stage 3 Overburden	°	30
Dilution	%	6.0
Mining recovery	%	100
Mill throughput	t / year	1,370,000
Costs		
Mining cost	C$ / t mined	3.12
Processing cost	C$ / t milled	16.50
G&A cost	C$ / t milled	11.90
Royalties	%	1.0%
Conc. transportation, marketing, insurance	US$ / dmt conc.	169.54

The optimum pit shell was selected as the basis for each pit design.

Haul road criteria are detailed in Section 4.1.6, and a discussion of wall angles in the final pit designs is presented in Section 1.2.

1.1 Ore Quantities

The Area 2 Stage 3 pit shares similar geology to the deposits previously mined at Minto: copper mineralization is contained in a series of sub-horizontal stacked lenses of foliated granodiorite. These lenses are characterized by sharp contacts with the surrounding host rock.

The foliated granodiorite zones are highly variable in the content of their mineralization: copper grade ranges from undetectable to the highest recorded assay value of 39.6% over 1.0m of core.

The following table summarizes the Area 2 Stage 3 pit expansion ore reserves at the mine's cutoff grade of 0.50% for sulphides and 0.80% for partially oxidized material. It is important to note that the reserves as shown in Table 2 are in addition the October 2016 Area 2 Stage 3 pit design.

Table 2: Open-pit reserves for the Area 2 Stage 3 pit expansion.

Area 2 Stage 3 Expansion Pit	2017
Ore (Tonnes)	593,639
Cu Grade (%)	1.16
Au Grade (g/t)	0.27
Ag Grade (g/t)	0.95
Cu Mlb, undiluted	15.1

1.2 Slope Stability and Geotechnical Assessments

Slope angles for Minto's open pits were evaluated in 2009 as part of a report authored by SRK Consulting in support of the Phase IV Pre-Feasibility Study (SRK Consulting, 2009). A subsequent detailed geotechnical drilling, laboratory testing, geotechnical characterization and stability analysis program was completed in 2015 for Area 2 Stage 3, summarized in the report "Pit Slope Stability Evaluation, Minto Mine, Area 2 Pit – Stage 3" (SRK Consulting, 2015).

A relatively deep soil overburden deposit exists in the south portion of the proposed Area 2 Stage 3 pit expansion, consisting primarily of transported silt and fine sand with occasional lenses of clay and coarse sand to gravel. The soil is high in organic content and contains permafrost. It is considered ice poor and not anticipated to exhibit creep behavior. In April 2013, an inclinometer and a thermistor string were installed at the southeast corner of the proposed pit. The inclinometer has thus far shown no movement, indicating that the overburden layer around the pit is not affected by the creep movement of the nearby Dry Stack Tailings Storage Facility.

The rock mass was separated into three geotechnical units; properties resulting from the 2015 drilling and laboratory testing program are summarized in Table 3 below.

Table 3: Rock Mass Parameters

Geotechnical Unit	UCS (MPa)	GSI	mi	D	Unit Wt. (kN/m3)	Phi	C (kPa)
Overburden Soils	-	-	-	-	21.7	30	20
Weathered Rock	20	60	20	0.7	25.4	-	-
Fresh Rock	79	70	25	0.7	26.2	-	-

Based on the rock mass and rock structure characterization completed, three design sectors were delineated, shown in Figure 1.

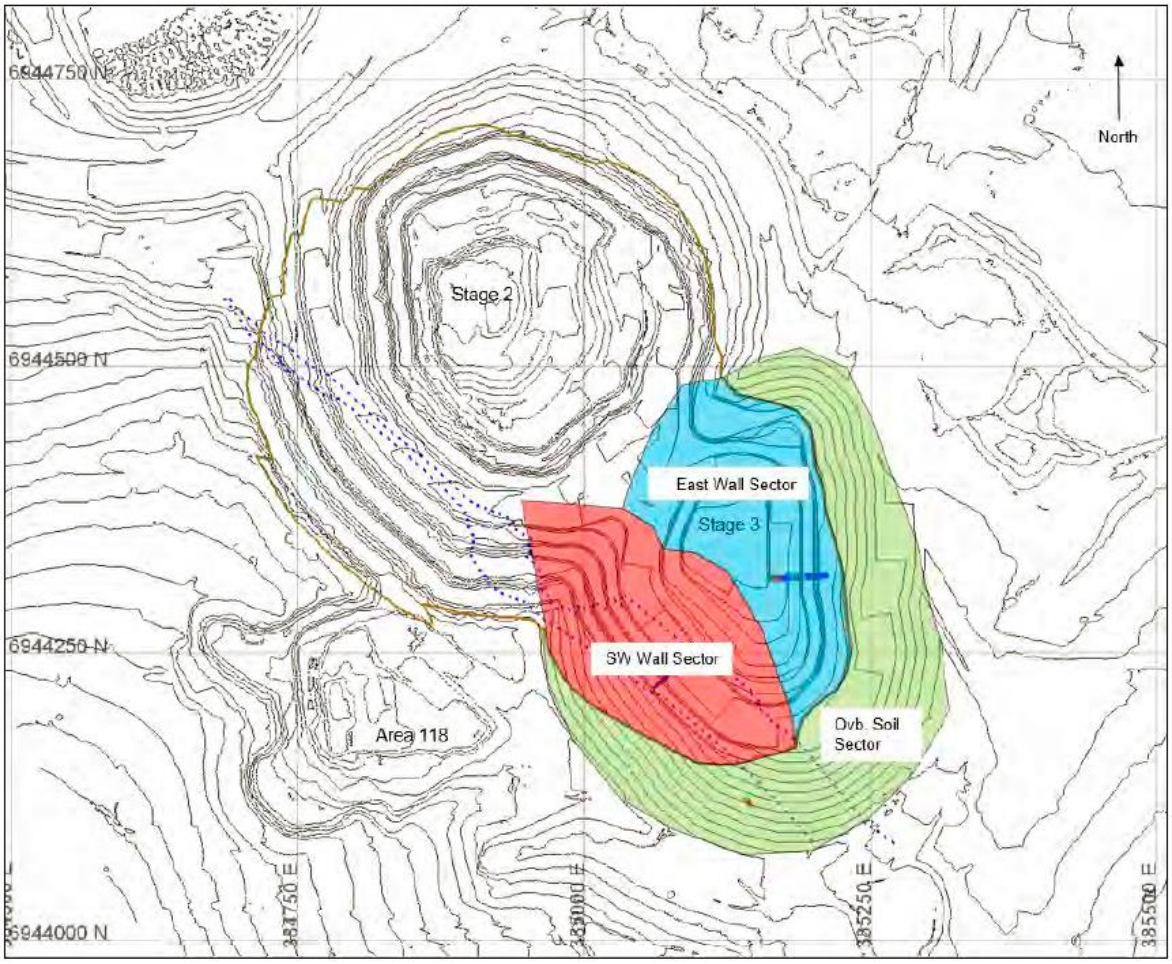

Figure 1: Geotechnical design sectors relative to the Phase V/VI design.

Stability analyses indicated the following factors of safety, and final pit slope design criteria summarized in Table 4.

- Stability of soil overburden slope - FOS of 1.55;
- Stability of upper, weathered rock slope - FOS of 2.76; and,
- Global wall stability; FOS of 2.65.

Table 4: Pit Slope Design Parameters

Pit Sector	Wall Dip Dir. (Az)		Interramp Slope Angle	Bench Face Angle	Bench Height (m)	Bench Width (m)
	From	To				
SW Wall	325°	100°	50°	68°	24	10.5
East Wall	100°	325°	53°	72°	24	10
Overburden	-	-	30°	-	-	-

2 Design and Construction

2.1 Site Preparation

The organic-rich topsoil layer from the Area 2 Stage 3 pit expansion will continue to be stripped using the mine's dozer fleet and stockpiled separately on existing dumps, including the Main Waste Dump Expansion, Southwest Waste Dump, Main Pit Dump and Mill Valley Fill Extension Stage 2. This approach, already employed for the topsoil stripped from the original Area 2 Stage 3 pit (October 2016), Minto North pit, and from the footprint of the Mill Valley Fill Extension Stage 2, places topsoil near the location of its final use, minimizing reclamation costs.

The Area 2 Stage 3 pit expansion requires re-routing of the south diversion ditch and haul road. The revised ditch design was submitted to Yukon Energy, Mines and Resources in June, 2017 in the document "Area 2 Stage 3 Pit Expansion – Intake and Overflow Spillway – Final Design".

The Area 118 backfill dump will require a new access point with the additional material coming from the Area 2 Stage 3 pit expansion. The road alignment is shown in figure 4 and will be built using construction grade rock.

2.2 Construction QA/QC

No new infrastructure is planned for the site as part of the continuation of Phase V/VI mining.

Geotechnical monitoring of pit highwalls is described in Section 4.1.4, and the monitoring and quality control of waste rock dispatching is described in the site's Waste Rock and Overburden Management Plan (WROMP).

2.3 Stability Analyses

No additional stability analyses were required in addition to the slope stability analysis and monitoring practices summarized in sections 1.2 and 4.1.4, respectively.

2.4 Construction Schedule

Mining of the Area 2 Stage 3 expansion will start mid-August 2017and is scheduled to be completed in the final week of February 2018. A mining rate of 12,000 BCM/day is planned for the first five months of operation, lowering to 5,600BCM/day for the month of February.

Table 5: Start and completion dates for the expansion of the Area 2 Stage 3 open-pit mining.

Pit	Start Date	Completion Date	Duration of Mining
Area 2 Stage 3 Expansion	August 2017	February 2018	7 months

2.5 Material Release Schedule

The following figure shows the material releases for the life of the Area 2 Stage 3 expansion.

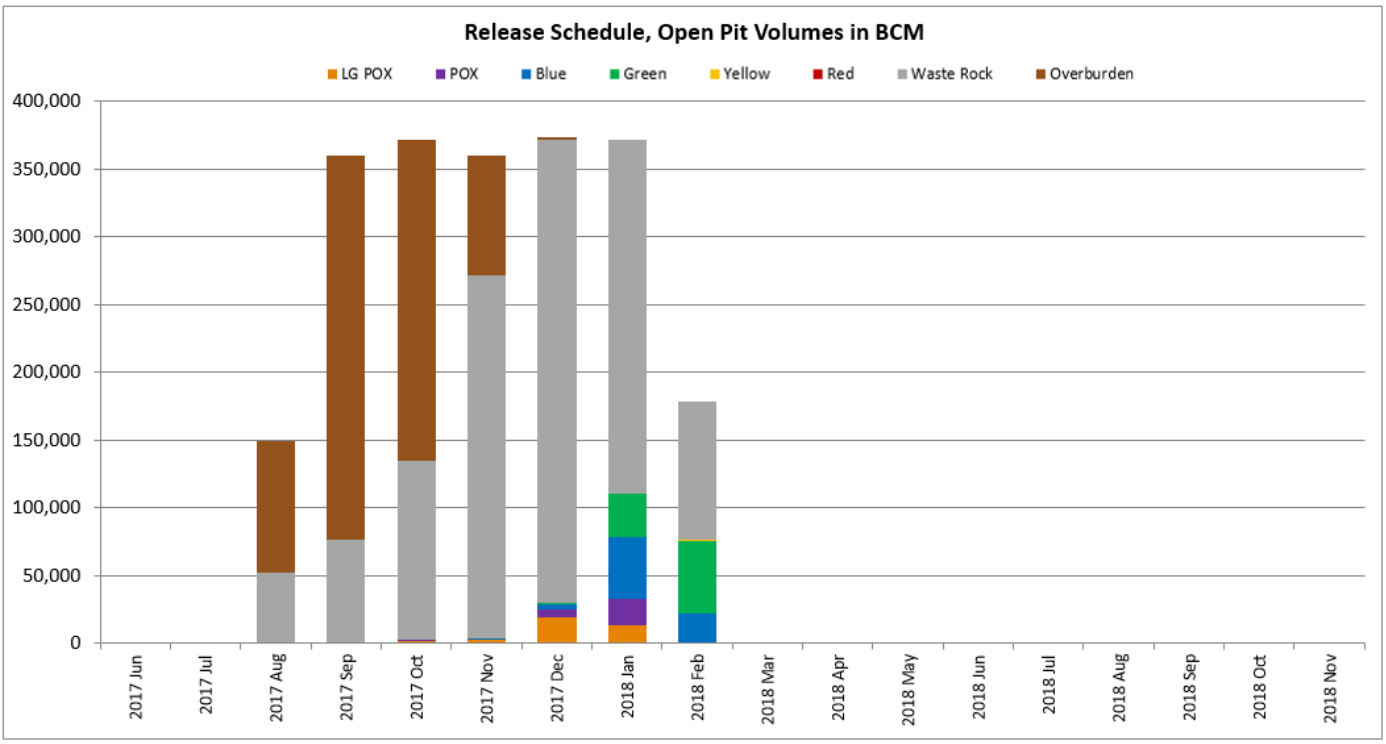

Figure 2: Material release by month.

2.6 Ore Handling Procedures

Ore handling practices for sulphide minerals are unchanged from previous phases of mining. The partially oxidized ore grade range has changed to create a higher grade partially oxidized ore stockpile. Ore will be classified, based on copper grade, into the material types presented in the table below.

Table 6: Classification of ore by copper grade.

Material Type	Copper Grade Range	Soluble Copper
Blue Ore	0.50 – 1.00% Cu	<15.0%
Green Ore	1.00 – 2.00% Cu	<15.0%
Yellow Ore	2.00 – 4.00% Cu	<15.0%
Red Ore	>4.00% Cu	<15.0%
Partially Oxidized Ore	>1.50% Cu	>15.0%
Low-Grade Partially Oxidized Ore	0.80 – 1.50% Cu	>15.0%

Classification of material as one of the six types of ore (or as waste) is based on blasthole assays. The following is a description of the process.

1. Drill cuttings from every blast hole are sampled, tagged, and sent for assay at the on-site lab prior to blasting;
2. Representative samples of the cuttings are assayed using atomic absorption (AA) to determine the copper and silver content. A separate sample is acid-leached and assayed for copper grade, allowing for a determination of soluble copper;
3. The environmental assay lab tests representative samples for total sulfur and total inorganic carbon content, which are used to calculate an NP/AP ratio;
4. The assay results are sent to the geology department for interpretation;

5. The geology department plots the results spatially, then draws polygons enclosing holes with similar assay results to identify regions of similar average grade (for ore) or similar waste class (for waste);
6. After blasting, the aforementioned polygons are laid out in the field by the mine surveyor working with the production geologist, using stakes and flags of various predefined colours;
7. Mine operations personnel, under the supervision of the pit foreman, excavate and haul material to the destination designated for the material type. Destinations are communicated to foremen and operators by the production geologist.

Material containing more than 15% soluble copper content is classified as partially oxidized.

Waste rock having an NP:AP ratio greater than 3.0 is classified as bulk waste and deposited to one of several rock dumps, while material with a ratio less than 3.0 is deposited either below the final flooded levels of the Area 2 or Main pits.

Stockpile inventory will be drawn down until the Area 2 Stage 3 expansion starts producing ore in December 2017. Stockpile volumes will then increase until February 2018 with the completion of the Area 2 Stage 3 expansion. Stockpiles will be drawn down over the next approximately 8 months until November 2018, supplemented by ongoing feed from underground operations.

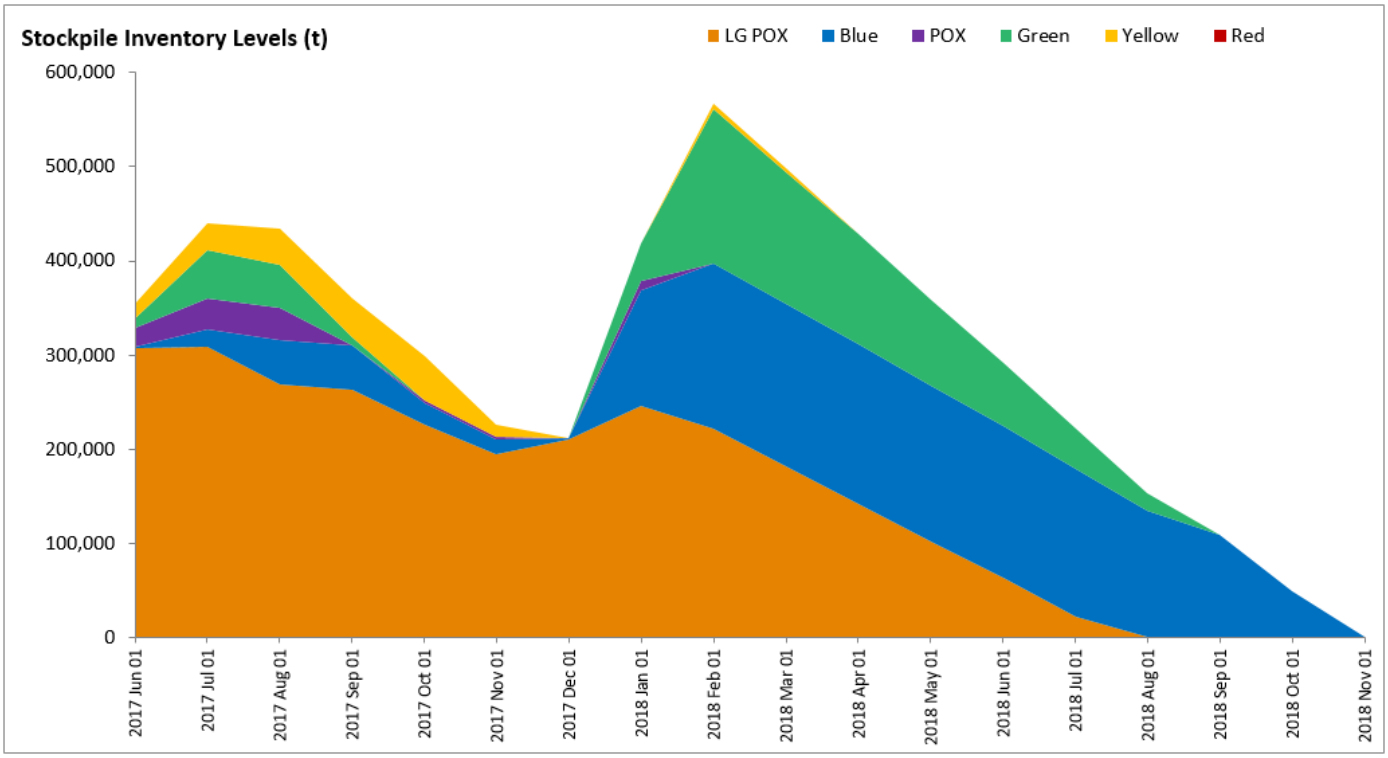

Figure 3: Life-of-mine stockpile inventory levels.

3 Associated Mine Services and Infrastructure

3.1 Ancillary Infrastructure

The surface mining fleet will continue to be diesel-powered. No new electrical infrastructure will be created for the open pit mine.

Two-way VHF radios will continue to be used for communication with the mining fleet. Sixteen channels are available on site, with three available everywhere on the property: one channel dedicated to routine pit traffic, one for extended conversations or other uses, and the site emergency channel.

3.2 Waste Management

3.2.1 Overburden Management

A significant portion of the overburden released from mining Area 2 Stage 3 was dispatched to existing waste dumps, where it was used in soil covers as described in the mine's Reclamation and Closure Plan (RCP). The RCP specifies a minimum cover thickness of 0.50m. Mine Operations will begin grading the final cover surfaces on existing waste dumps in the summer of 2017.

The Area 2 Stage 3 pit expansion overburden release is expected to be 0.70M BCM, which will be dispatched to South West Dump, Main Pit Dump, Mill Valley Fill Extension and the Area 118 Backfill Dump. South West Dump requires an additional 50,000 BCM of soil cover, while Main Pit Dump requires 68,000 BCM of cover material. The upper lifts of the Mill Valley Fill Extension will be used to stockpile soil cover for the reclamation of areas active until final closure. Overburden that does not meet cover specifications will be placed in the Area 118 Backfill Dump.

Mine Operations will continue to visually classify cover soil material at the dig face; acceptable soil cover material will be loaded and direct-hauled for bulk material placement, while unacceptable material will be wasted in the Area 118 Pit. Unacceptable cover material includes material which does not meet the grading specification or contains massive ice.

3.2.2 Waste Rock Management

The waste rock, totaling 1,095,000BCM, will be placed in the Main Pit Dump, the adjacent Area 2 Stage 2 pit (now referred to as the Area 2 Pit Tailings Management Facility) or used for reclamation of Main Waste Dump (reducing slope angles). The fraction of the waste rock projected to have an NP:AP ratio less than 3.0 will be co-disposed with tailings in either the Area 2 Pit Tailings Management Facility or the Main Pit Tailings Management Facility.

The Main Pit Dump and Area 118 overburden dump designs, shown in Figure 4, have been modified to include additional waste released by the redesigned Area 2 Stage 3 pit expansion. No changes were made to the design parameters. As per the previous design, none of the NP:AP<3 rock currently on the Main Pit south wall buttress will be covered by the revised Main Pit Dump design.

Several lifts of waste rock have been designed around the toe of the Main Waste Dump, shown in Figure 4, to shallow the slope for reclamation. This will reduce the potential for erosion of the slopes and improve the revegetation process.

Figure 4: Waste Dumps for Area 2 Stage 3 Pit

3.3 Tailings Management

No changes are required to tailings management, described in the Tailings Management Plan, for the expanded design of Area 2 Stage 3 pit. All tailings will continue to be deposited in either the Area 2 Pit Tailings Management Facility or the Main Pit Tailings Management Facility.

3.4 Industrial Complex

Minto's site infrastructure consists of a primary crusher, secondary crusher, coarse ore stacker/conveyor, mill, concentrate storage shed, tailings filtration building, water treatment plant, propane tanks, camp complex, warehouse, and laydown area. No changes to the locations of these structures were planned as part of Phase V/VI, and no further changes are expected as part of remaining mining.

3.5 Fuel Storage

Diesel fuel is stored in a diesel storage facility located north of the process plant. Six large diesel tanks have a combined storage capacity of approximately 3.2 million litres (L). These tanks were sized to store sufficient fuel for two months of operation, under generator power, during the Yukon River freeze and thaw periods when vehicle access to the site is not possible. The mine's connection to the electrical grid has reduced fuel use and the tanks, if filled, now represent a four-month fuel supply. A fuel tank inventory, including the types of products and volumes is presented in the table that follows.

Table 7: Fuel storage capacity.

Number of Storage Tanks (#)	Product Type	Volume (L)
6	Diesel	3,267,668
1	Gasoline	8,000
6	Propane	911,000

4 Mine Design and Methods

4.1 Mine Design

4.1.1 Volumes

Area 2 Stage 3 pit expansion extends the Area 2 pit to the east with an additional 2.1M BCM of mining. The first two stages of Area 2, for comparison, mined 12.0M BCM. Figures 4 and 5 shows the redesigned pit. No changes were made to the west wall of the pit or saddle area between the Stage 2 and Stage 3 pits.

Approximately 0.70M BCM of the material to be mined from the pit is overburden, which will be sloped at 30°. The maximum height of the overburden slope is 48m.

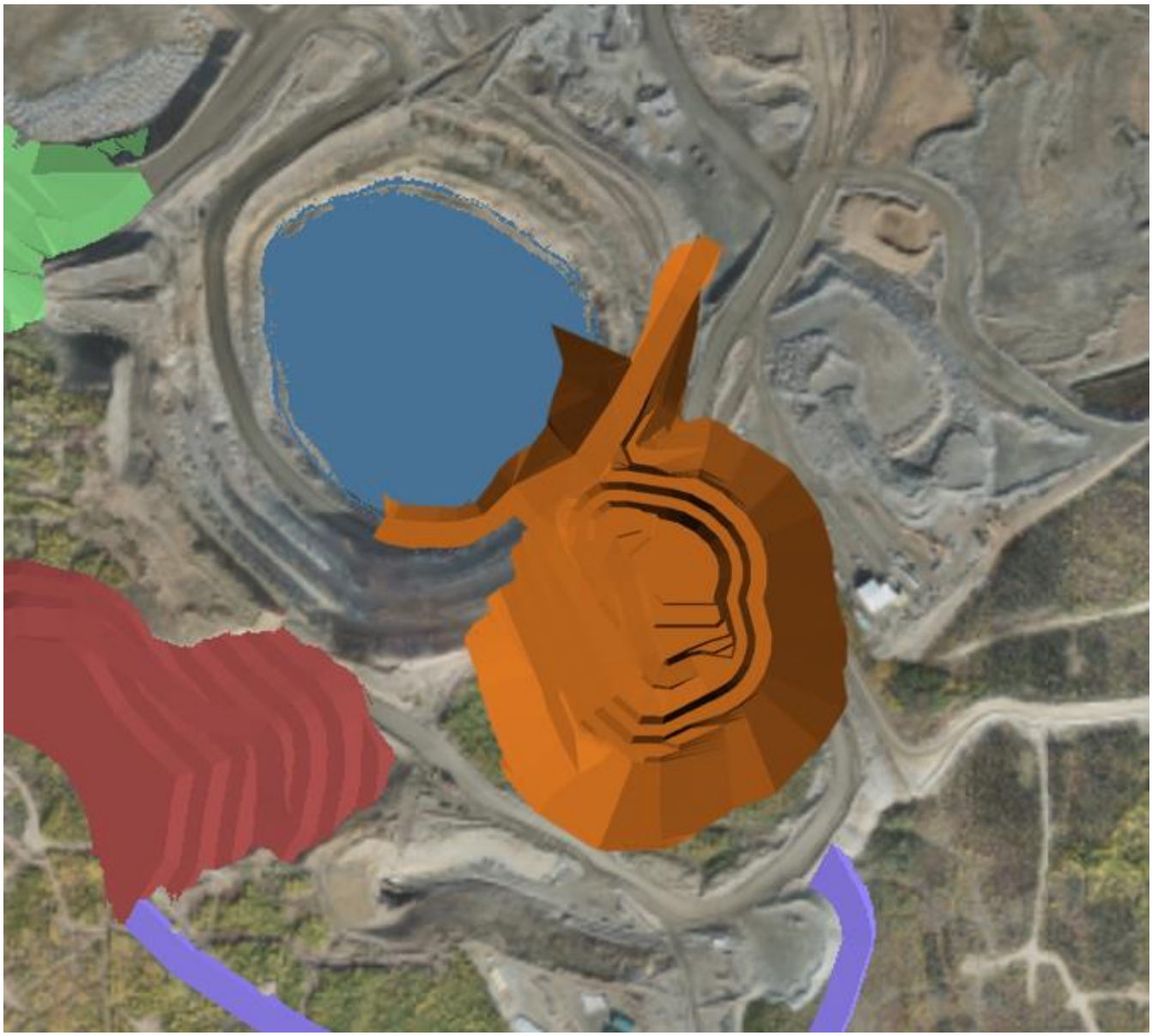

Figure 5: Area 2 Stage 3 Pit Expansion

4.1.2 Access

Approximately 25% of the material is contained in or above the 799m bench and will therefore be accessed from an existing haul road encircling the pit. Approximately 50% of the pit's volume will be accessed via the existing Area 2 Stage 3 ramp. This ramp will be developed from the 757m elevation to the final pit elevation of 715m, to mine the remaining 25% of the Area 2 Stage 3 Expansion. This compares to the pit floor of 680m reached in Area 2 Stage 2.

4.1.3 Wall Design and Overburden Stability

Wall design and stability assessments are summarized in Section 1.2.

4.1.4 Ground Movement Monitoring

Minto uses a radar-based slope monitoring device manufactured and supported by GroundProbe. This provides continuous monitoring of highwalls with sub-millimeter accuracy. The device is limited to scanning the portions of the wall visible from its setup point; therefore, it is typically placed such that it monitors the highest or most critical wall under which personnel are actively working.

In the event of a movement rate increase, the radar issues automated alarms to the mill control room operator, as this position is staffed continuously. The control room operator will communicate with the pit foreman, operation supervisor, and geotechnical engineer/EIT, as outlined in the Safe Work Practice, to address the alarm or cease work in the affected area.

All pit walls are inspected during weekly detailed inspections, performed by the Mine Technical Department. These inspections check all exposed walls for signs of instability or changing conditions such as raveling, crack formation, overhangs, and major or unfavorably oriented structures. The reports issue guidelines for safe work and can order corrective actions, if required. These can include:

- More frequent inspections;
- Rockfill berms at bench-level to arrest raveling material;
- Delineators at bench level restricting access to areas;
- Instrumentation such as prisms or survey hubs;
- Mandatory use of a spotter for work underneath certain areas;
- Completion of a Job Hazard Analysis (JHA) process prior to commencing work; and/or
- Highwall redesign and blasting / excavation of structural units that present a risk of failure.

An inspection by an external consulting geotechnical engineer is also performed annually.

4.1.5 Blasting and Wall Control

Wall control is achieved by means of trim blasting and pre-shear.

Trim blasting is the practice of firing dedicated wall control blasts along the perimeter of the pit, no more than five rows deep. This allows material to move freely away from the wall, minimizing the amount of energy transferred into the wall itself. Wall blasts are always fired independently of production blasts and are always shot to free faces; that is, all previously blasted material is mined out along the perimeter of a trim blast. To further minimize the amount of energy transferred into the wall, blasts are tied-in such that the direction of movement is parallel to the wall instead of perpendicular to it.

Minto continues to use pre-shear drilling to further enhance wall control. This is a technique in which closely-spaced small-diameter holes, drilled to follow the final contour of the wall, are loaded with decoupled charges. Groups of holes are fired simultaneously, encouraging the formation of a fracture plane between them. Much of the strain energy from production / buffer blastholes, upon meeting this discontinuity, will be reflected back, instead of continuing into the wall where it would result in back-break.

4.1.5.1 Explosives

For production blasts, the mine uses mini-prill ANFO with a bulk density of 1050 kg/m^3 as its default product; it is used wherever ground conditions are dry or holes can be dewatered and lined. Failing that, a water-resistant 70/30 emulsion/prill product is used. The decision to switch to an emulsion blend is at the blaster's discretion in the field.

Dry product is preferred; however, groundwater conditions are variable and, when high influx of water is encountered, emulsion use can increase to 100% of total bulk product.

4.1.5.2 Typical Wall Design Parameters

The following figure shows Minto's wall drilling standards for 6.0m and 12.0m benches. All of Minto's pit designs have catch benches at 24m intervals. Every fourth bench is therefore shot above a catch bench, and the standards are modified to prevent damage to the crest by eliminating subgrade and laying out the holes such that they do not fall directly over the crest.

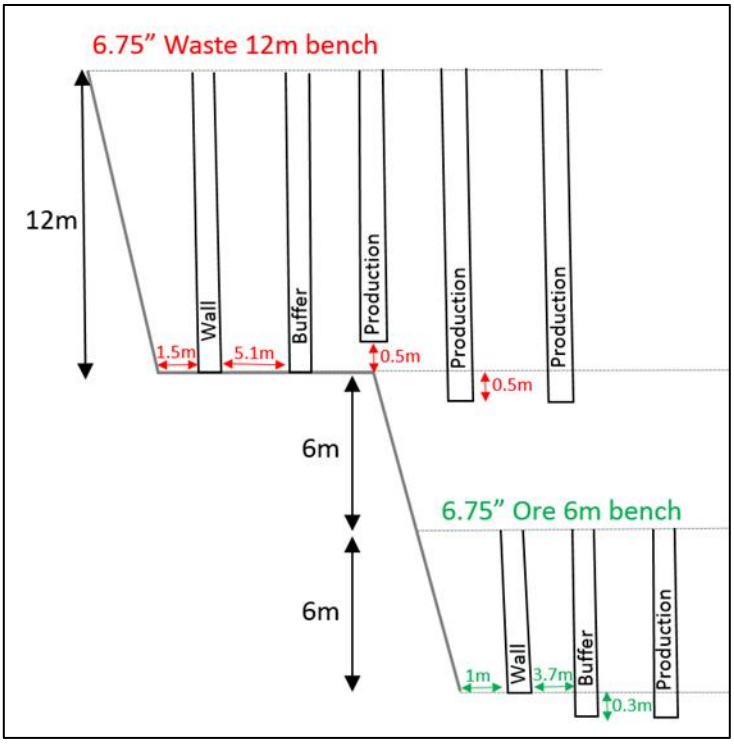

Figure 6: Design constraints for wall shots – both 12.0m and 6.0m.

4.1.6 Haul Roads

Haul roads at Minto are typically designed to accommodate Cat 777 haul trucks in dual or single lane configurations. Road widths are based on the requirements of Yukon WCB regulation 15.43(1)(a):

i. not less than three times the widest haulage vehicle used where dual lane traffic exists, or
ii. not less than two times the widest haulage vehicle used where only single lane traffic exists.

Berms are designed to be 75% of the trucks' tire height, as per Yukon WCB regulation 15.43(1)(b).

Allowance is typically made for an approximately one meter wide ditch on one side of the road, where conditions dictate.

These factors yield the following dual lane road design characteristics:

Table 8: Haul road design parameters.

Parameter	Dual Lane Width	Single Lane Width
Truck width	6.5 m	6.5 m
Road surface width	19.5 m	13.0 m
Tire height	2.7 m	2.7 m
Berm height	2.0 m	2.0 m
Berm width	5.0 m	5.0 m
Total road width, against highwall (one berm, one ditch)	25.5 m	19.0 m
Total road width, two berms, one ditch	30.5 m	24 m

Design grade is 10%. Grade limits are applied to the inside corner of a turn.

A speed limit of 50 km/h is in effect on mine roads. Minto has a light-vehicle training and sign-off program intended to ensure that personnel are familiarized with the mine site prior to driving. All personnel and all types of vehicles are required to announce their presence at certain call points, which are marked with roadside signs: these are typically busy intersections or areas with limited visibility.

Minto's Safe Work Procedure for vehicle operation specifies the following priorities for right-of-way:

1. Emergency vehicles;
2. Explosive trucks;
3. Crew busses;
4. Loaded haul trucks;
5. Empty haul trucks;
6. Service equipment (fuel, water, and heavy maintenance trucks);
7. Light vehicles.

Passing of haul trucks is not permitted.

4.2 Fleet

Minto's fleet is largely contractor-owned and operated, except for a blasthole drill used for both production and pre-shear drilling. The following table summarizes the available equipment.

Table 9: Open-pit equipment fleet for Phase V/VI mining

Equipment Type	No. of units
Hitachi EX2500 front shovel	1
Hydraulic Excavators, Hitachi EX1200 or similar	3
100-ton Haul Trucks, Cat 777	10
60-ton Haul Trucks, Cat 773	4
Front-end loaders, Cat 990 / Cat 992	2
Small Hydraulic Excavators, Cat 330 or similar	2
D11-class dozer	2
D10-class dozers	2
Graders, 16' blade	2
Contractor blast hole drills, 9 7/8" hole diameter	2
Contractor blast hole drills, 6 ¾" hole diameter	2
Minto blast hole drill, Sandvik DR560, 4 to 8" hole diameter	2

5 Closure

This document presents the mine development and operations plan for Area 2 Stage 3 open pit mining at Minto Mine. This plan will be updated as required based on ongoing mine planning and optimization.

6 References

Minto Explorations Ltd. (2012) *Phase VI Preliminary Feasibility Report, Minto Mine.*

Minto Explorations Ltd. (2014) *Mine Development and Operations Plan.*

Minto Explorations Ltd. (2016) *Underground Mine Development and Operations Plan.*

SRK Consulting Inc. (2009) *Pre-Feasibility Geotechnical Evaluation, Phase IV, Minto Mine.*

SRK Consulting Inc. (2015) *Pit Slope Evaluation, Minto Mine, Area 2 Pit – Stage 3.*

Yukon Water Board/Yukon Energy, Mines and Resources (2013) *Plan Requirement Guidance for Quartz Mining Projects.*