RAMBLER METALS & MINING CANADA LIMITED

MING COPPER-GOLD MINE

TECHNICAL REPORT UPDATE

APRIL 2018

wsp

Thibault & Associates Inc.
Applied Process Chemical Engineering

GEMTEC
Consulting Engineers and Scientists

MING COPPER-GOLD MINE

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RAMBLER METALS & MINING CANADA LIMITED

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WSP
SUITE 300
93 CEDAR STREET
SUDBURY, ON, CANADA P3E 1A7

T: +1 705 674-0119
WSP.COM

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SIGNATURES

PREPARED BY

Original signed and stamped by

Todd McCracken, P.Geo.
Manager - Mining
WSP Canada Inc.

Original signed and stamped by

Aubrey Sargeant, P.Eng.
Principal Mining Engineer
WSP Canada Inc.

Original signed and stamped by

Joanne Robinson, P.Eng.
Principal Mining Engineer
WSP Canada Inc.

Original signed and stamped by

J. Dean Thibault, P.Eng.
Lead Plant Design Engineer
Thibault & Associates Inc.

Original signed and stamped by

James Powell, M.Eng., P.Eng.
Senior Project Engineer, VP Mining
GEMTEC Limited

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ABBREVIATIONS

Units of Measure

above mean sea level	amsl
acre	ac
ampere	A
annum (year)	a
billion	B
billion tonnes	Bt
billion years ago	Ga
British thermal unit	BTU
Centimetre	cm
cubic centimetre	cm^3
cubic feet per minute	cfm
cubic feet per second	ft^3/s
cubic foot	ft^3
cubic inch	in
cubic metre	m^3
cubic yard	yd^3
Coefficients of Variation	Cvs
day	d
days per week	d/wk
days per year (annum)	d/a
dead weight tonnes	DWT
decibel adjusted	Ba
decibel	dB
degree	°
degrees Celsius	°C
diameter	ø
dollar (American)	US$
dollar (Canadian)	CAN$
dry metric ton	mt
foot	ft
gallon	gal
gallons per minute	gpm
Gigajoule	GJ
Gigapascal	GPa
Gigawatt	GW
Gram	g
grams per litre	g/L
grams per tonne	g/t
greater than	>
hectare (10,000 m^2)	ha
hertz	Hz
horsepower	hp
hour	h
hours per day	h/d
hours per week	h/wk
hours per year	h/a
inch	in
kilo (thousand)	k
kilogram	kg
kilograms per cubic metre	kg/m^3
kilograms per hour	kg/h
kilograms per square metre	kg/m^2
kilometre	km
kilometre	km
kilometres per hour	km/h
kilopascal	kPa
kiloton	kt
kilovolt	kV
kilovolt-ampere	kVa
kilowatt	kW
kilowatt hour	kWh
kilowatt hours per tonne	kWh/t
kilowatt hours per year	kWh/a
less than	<
litre	L
litres per minute	L/m
megabytes per second	Mb/s
megapascal	MPa
megavolt-ampere	Mva
megawatt	MW
metre	m
metres above sea level	masl
metres Baltic sea level	mbsl
metres per minute	m/min
metres per second	m/s
microns	µm
milligram	mg
milligrams per litre	mg/L
millilitre	mL
millimetre	mm
million	M
million bank cubic metres	Mbm^3
million bank cubic metres per annum	Mbm^3/a
million tonnes	Mt
minute (plane angle)	'
minute (time)	min
month	mo
ounce	oz
pascal	Pa
centipoise	mPa·s
parts per million	ppm
parts per billion	ppb
percent	%
pound(s)	lb
pounds per square inch	psi
revolutions per minute	rpm

second (plane angle).. "
second (time) .... s
short ton (2,000 lb)... st
short tons per day .... st/d
short tons per year ....st/y
specific gravity..SG
square centimetre .... cm^2
square foot ....ft^2
square inch.. in^2
square kilometre... km^2
square metre .... m^2
three-dimensional 3D
tonne (1,000 kg) (metric ton)............................. t
tonnes per day .... t/d
tonnes per hour.. t/h
tonnes per year .... t/a
tonnes seconds per hour metre cubed .... ts/hm^3
volt...V
week..wk
weight/weight .... w/w
wet metric ton...wmt

Acronyms

ABA ....Acid-Base Accounting
Actlabs .... Activation Laboratories Ltd
ARD .... Acid Rock Drainage
Au ....Gold
CDA .... Canadian Dam Association
CEAA .... Canadian Environmental Assessment Act
CIM ....Canadian Institute of Mining, Metallurgy and Petroleum
CIP ....Carbon-in-Pulp
COMEX ....New York Mercantile Exchange
CRML ....Consolidated Rambler Mines Limited
Cu .... Copper
DEXRT ....X-Ray Transmission
DFO ....Department of Fisheries and Oceans
DMS .... Dense Media Separation
DOEC .... Department of Environment and Conservation
DSI ....Dam Safety Investigation
DSR .... Dam Safety Review
EA.. Environmental Assessment
Eastern .... Analytical Ltd.
ECCC ....Environment and Climate Change Canada
EDGE ....Economic Diversification and Growth Enterprises
EEM ....Environmental Effects Monitoring
EIS ....Environmental Impact Statement
EM .... Electromagnetic
EPA .... Environmental Protection Act
EPR .... Environmental Preview Report
ETP ....Effluent Treatment Plant
FS ....Feasibility Study
GAP .... Gas and Associated Products
GRG ....Gravity Recoverable Gold
LFZ ....Lower Footwall Zone
LME .... London Metals Exchange
MIBC ....Methyl Isobutyl Carbinol
MMER .... Metal Mining Effluent Regulations

MMS .... Ming Massive Sulphide
MNDP .... Ming North Down Plunge
MSDP .... Ming South Down Plunge
MSUP .... Ming South Up Plunge
NL .... Newfoundland and Labrador
NLDECC .... Newfoundland and Labrador Department of Environment and Climate Change
NLDMAE .... Newfoundland and Labrador Department of Municipal Affairs and Environment
NLDNR .... Newfoundland and Labrador Department of Natural Resources
NPRI .... National Pollutant Release Inventory
NSR .... Net Smelter Revenue
ORCT .... Old Rambler Consolidated Tailings
PAG .... Potentially Acid Generating
PCB .... Polychlorinated Biphenyls
PFS .... Pre-Feasibility Study
PLC .... Programmable Logic Controller
QA/QC .... Quality Assurance and Quality Control
QP .... Qualified Person
RDC .... Research and Development Corporation
RMM .... Rambler Metals & Mining Canada
ROM .... Run-of-Mine
SAG .... Semi-Autogenous Grinding
SCC .... Standards Council of Canada
TCLP .... Toxicity Characteristic Leaching Procedure
TMF .... Tailings Management Facility
UCS .... Unconfined Compressive Strength
UFZ .... Upper Footwall Zone
VEC .... Valued Ecosystem Components

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1 SUMMARY

1.1 INTRODUCTION

The Ming Copper-Gold Mine Project ('the Project' or 'the Property') is comprised of the Ming Mine site; Nugget Pond milling facility; and the Goodyear's Cove port. The Project is located on the north coast of Newfoundland and Labrador, Canada.

WSP Canada Inc. (WSP) in conjunction with Thibault & Associates Inc. (Thibault) and GEMTEC Consulting Engineers and Scientists (GEMTEC), has prepared this technical report on the Project at the request of Rambler Metals & Mining Canada Limited ('Rambler' or RMM'). This report meets the standards set in National Instrument 43-101 (NI 43-101) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) guidelines. All information contained within has been compiled by independent consulting firms for inclusion in this report.

The issue date of this report is April 19, 2018. The effective date of the Ming Massive Sulphides (MMS) resource statement is October 23, 2017, the effective date of the LFZ resource estimate is December 31, 2017, and the effective date of the Technical Report Update is December 31, 2017.

1.2 PROPERTY LOCATION AND DESCRIPTION

The Project in located in Newfoundland and Labrador, Canada, and consists of three sites, the Ming Mine, the Nugget Pond milling facility and the Goodyear's Cove port (Figure 1.1).

The Ming Mine site is located approximately 17 km by road east of the town of Baie Verte, on the north coast of Newfoundland, geographic coordinates 49°54' N latitude and 56°05' W longitude. The site is approximately 360 km by air northwest of St. John's, and 165 km by road northeast of Deer Lake.

The Nugget Pond milling facility is located approximately 6 km west of the community of Snook's Arm in the provincial district of Baie Verte, Green Bay, geographic coordinates 49°50' N latitude and 55°45' W longitude. The facility is located 44 km by an all-weather road from the Ming Mine site.

The Goodyear's Cove port situated at the head of Halls Bay, Newfoundland, is located approximately 1.4 km west of the community of South Brook in the Green Bay District, geographic co-ordinates 49° 25' N latitude, and 56° 05' W longitude. The facility is located 142 km by an all-weather road from the Nugget Pond milling facility.

All permits and approvals to conduct operations at the mine, mill and port sites and the required Financial Assurance for rehabilitation and closure are currently in place.

1.3 GEOLOGY

The mineral resources presented herein are reported in accordance with the Canadian Securities Administrators National Instrument 43-101 and have been estimated in conformity with generally accepted Canadian Institute of Mining (CIM) 'Estimation of Mineral Resource and Mineral Reserves Best Practices Guidelines'. Mineral resources are not mineral reserves and have not demonstrated economic viability.

Figure 1.1 Project Location Map

The resource estimation work for the Ming Massive Sulphides (MMS) was completed by Rambler staff under the supervision of Larry Pilgrim P. Geo, Chief Geologist for Rambler, and reviewed and verified by Todd McCracken, P. Geo. of WSP. The resource estimation for the Lower Footwall Zone (LFZ) was completed by Rambler staff under the supervision of Larry Pilgrim P. Geo, Chief Geologist for Rambler, and reviewed and verified by Todd McCracken, P. Geo. of WSP.

The classified resources for all copper zones are defined at a 1.0% Cu cutoff grade. The 1806 Zone, which is primarily a gold zone, is characterized by a cutoff grade of 1.25 g/t Au. In the unmined and remnant pillars resource the grades applied by Consolidated Rambler Mine Ltd. (CRML) on original documents was also used in the resource calculations.

Table 1.1 summarizes the Ming Mine Resource statement, Table 1.2 Ming Mine Reserve statement and Table 1.3 is the detailed Ming Mine Reserve statement.

Table 1.1 Mineral Resource Summary

Classification	Quantity ('000) t	Grades			Contained Metal		
		Copper (%)	Gold (g/t)	Silver (g/t)	Copper (M lbs)	Gold (K oz)	Silver (K oz)
Measured Total	19,328	1.60	0.25	2.31	682.8	156.3	1438.5
Indicated Total	4,120	1.83	0.62	3.50	166.4	82.2	463.8
M&I Total	23,448	1.64	0.32	2.52	849.3	238.6	1902.3
Inferred Total	2,873	1.78	0.42	2.78	113.1	38.8	256.4

Note: *All figures are rounded to reflect the accuracy of the estimate; numbers may not total due to this rounding. Resource is based on a 1% copper cut-off.*

Table 1.2 Mineral Reserve Estimate Summary

Classification	Quantity (tonnes)	Grades			Contained Metal		
		Copper (%)	Gold (g/t)	Silver (g/t)	Copper (M lbs)	Gold (K oz)	Silver (K oz)
Total Proven Reserve (undiluted, unrecovered)	3,452,600	1.87	0.44	3.05	143	49	338
Total Probable Reserve (undiluted, unrecovered)	4,968,500	1.81	0.44	3.13	198	71	500
Unplanned Dilution (all sources)	1,263,100	0.64	0.06	0.73	18	2	30
Reserve (diluted and recovered)	8,715,800	1.71	0.41	2.98	329	114	835

Note: *All figures are rounded to reflect the accuracy of the estimate; numbers may not total due to this rounding. This reserve statement reflects changes to reserves in the massive sulphides based on depletion due to mining and additions due to new exploration drilling results. The NSR for the reserve material was calculated using an all-in costs of US$72 (CAN$ 90 per tonne) per tonne.*

Table 1.3 Ming Mine Reserve Summary

Classification	Quantity (tonnes)	Grades			Contained Metal		
		Copper (%)	Gold (g/t)	Silver (g/t)	Copper (M lbs)	Gold (K oz)	Silver (K oz)
MMS - Total Proven Reserve	503,600	2.00	2.52	13.49	22	41	218
LFZ - Total Proven Reserve	2,949,000	1.85	0.08	1.26	120	8	120
(undiluted, unrecovered)							
TOTAL	**3,452,600**	**1.87**	**0.44**	**3.05**	**143**	**49**	**338**
MMS - Total Probable Reserve	724,700	2.00	2.52	13.49	32	59	314
LFZ - Total Probable Reserve	4,243,800	1.78	0.09	1.36	166	12	185
(undiluted, unrecovered)							
TOTAL	**4,968,500**	**1.81**	**0.44**	**3.13**	**198**	**71**	**500**
MMS - Dilution (all sources)	184,200	0	0	0	-	-	-
LFZ - Dilution (all sources)	1,078,900	0.75	0.07	0.86	19	2	30
TOTAL	**1,263,100**	**0.61**	**0.06**	**0.7**	**17**	**2**	**28**
Total MMS Reserve (diluted and recovered)	1,271,300	1.74	2.19	11.73	49	89	480
Total LFZ Reserve (diluted and recovered)	7,444,500	1.71	0.10	1.48	280	25	355
Combined Total Reserve (diluted and recovered)	**8,715,800**	**1.71**	**0.41**	**2.98**	**329**	**114**	**835**

1.4 METALLURGY AND MINERAL PROCESSING

The Nugget Pond concentrator includes a conventional crushing, grinding and flotation process that recovers a copper-gold concentrate for sale to smelters. There is also a hydrometallurgical plant on site for leaching of gold ores and production of doré, but this part of the process is not currently in use for the Ming Mine ore. The Nugget Pond concentrator began processing reserve material from the MMS at a typical rate of 600 to 800 mtpd in 2012. Over the last two years, the feed to the concentrator has transitioned to a blend of LFZ and MMS ore, and the throughput is ramping up to 1,250 mtpd. The throughput increase has been achieved with the installation of a secondary crusher, new grinding classification cyclones and pumps, and allowing a coarser grind size in the flotation feed compared to the original grind specification. Process upgrades anticipated in this study include tailings distribution to and process water reclaim from proposed new tailings management areas.

Based on a review of plant data in 2016 and 2017, the typical average metallurgical performance for processing a blend of MMS and LFZ feedstock has been as follows: recovery of 96.0% Cu, 65.4% Au, and 66.2% Ag at a concentrate grade of 27.7% Cu, 10.9 g/t Au, and 83.5 g/t Ag.

1.5 MINING

The mineral reserve estimate was calculated by WSP. The mineral reserves presented herein are reported in accordance with the Canadian Securities Administrators National Instrument 43-101 and have been estimated in conformity with generally accepted CIM Estimation of Mineral Resource and Mineral Reserves Best Practices Guidelines.

Five mining areas were identified in the Ming Mine for the mine design. These are identified as the 1806 Zone, 1807 Zone, Ming North Zone (MNZ), Ming South Zone (MSZ), and Lower Footwall Zone (LFZ).

Mineable development and production shapes were prepared using Surpac^{TM} software. Mining dilution and recovery were then applied to the raw resource tonnes and grade. The summary of mineable tonnes is presented in Table 1.4.

Table 1.4 Ming Mine Reserve Summary

Classification	Quantity	Grades		
	(tonnes)	Copper (%)	Gold (g/t)	Silver (g/t)
MMS - Total Proven Reserves (undiluted, unrecovered)	503,600	2.00	2.52	13.49
LFZ - Total Proven Reserves (undiluted, unrecovered)	2,949,000	1.85	0.08	1.26
TOTAL	**3,452,600**	**1.87**	**0.44**	**3.05**
MMS - Total Probable Reserves (undiluted, unrecovered)	724,700	2.00	2.52	13.49
LFZ - Total Probable Reserves (undiluted, unrecovered)	4,243,800	1.78	0.09	1.36
TOTAL	**4,968,500**	**1.81**	**0.44**	**3.13**
MMS - Dilution (all sources)	184,200	-	-	-
LFZ - Dilution (all sources)	1,078,900	0.75	0.07	0.86
TOTAL	**1,263,100**	**0.61**	**0.06**	**0.70**
Total MMS Reserves (diluted and recovered)	**1,271,300**	**1.74**	**2.19**	**11.73**
Total LFS Reserves (diluted and recovered)	**7,444,500**	**1.71**	**0.10**	**1.48**
Combined Total Reserves (diluted and recovered)	**8,715,800**	**1.71**	**0.41**	**2.98**

The Technical Report is based upon the life of mine of the current operation with blending of LFZ ore with MMS as production ramps up to 1,250 mtpd.

Mining of the LFZ has commenced in Block 1 using a combination of post pillar cut and fill and longhole mining methods, and backfilled with unconsolidated waste rock. The majority of the planned tonnes will come from longhole bulk mining of the LFZ from year 2023 onwards. Paste backfill augmented with waste rock from underground development will be the primary filling mechanism for the longhole stopes.

Access to each one of the zones is made possible through extensions of the existing ramps and raises and new development where required. With the increase in production supplemental ventilation has been installed in the mine.

The LFZ reserves were designed on resources achieving a Net Smelter Revenue (NSR) of US$72 or higher, which includes mining, ore haulage to the mill, general and administration, milling, port operations, and royalties. Both internal and external dilution was applied to all of the longhole stopes.

Paste backfill augmented with waste rock will be required in Year 2023. Prior to that, mill feed from the majority of the LFZ will be mined from ore development and post pillar cut and fill mining where unconsolidated rock fill will be used as backfill.

The current underground mobile equipment fleet, will support the steady state production of 1,250 mtpd.

1.6 ENVIRONMENT

The current operations are authorized under two key authorizations associated with the Project:

1. NL Environmental Protection Act Certificate of Approval (C of A) No. AA13-035580; and
2. NL Mining Act Mill Licence.

RMM has, and continues to operate these sites in accordance with the required Federal and Provincial Acts, Regulations, and Guidelines, and maintains an Environmental Management System which includes a number of environmental protection and response plans (e.g., Waste Management, Contingency, MMER Emergency Response, and others), environmental monitoring programs, and other environmental protection measures.

Based on the increase in mineral resources, and as part of RMM's ongoing operational reviews and planning studies, it has been determined that a number of operational and infrastructure changes are required over the life-of-mine (LOM). The key project change that will require further environmental assessment and permitting is the need for further tailings storage capacity to accommodate LOM tailings production. Other, less significant changes to buildings, infrastructure, and operational protocols may require some environmental assessment or permitting, however these requirements are expected to be relatively minor.

Mining projects and changes to existing mining projects in NL may be subject to environmental assessment under the NL Environmental Protection Act (EPA) and the Environmental Assessment Regulations. Further EA review may be required when current operating mines propose to increase production significantly beyond their original operating approval limit or when new components, such as a new Tailings Impoundment, are added to the mining footprint. Federally, the Canadian Environmental Assessment Act (CEAA 2012) is triggered if a proposed activity appears on the Schedule of Physical Activities under the Regulations Designating Physical Activities.

Following release from the EA process for any phase of the project expansion, the Project will require new or updated permits, approvals and authorizations, to reflect any changes in the mine operation.

The phased approach to tailings expansion will likely require an approach to EA and permitting divided in two phases as follows.

— Expansion to include Camp Pond as a new Tailings Impoundment with the effluent being treated within the existing TMF. Camp Pond has been shown to have no fish present and therefore it is anticipated that the EA and permitting requirements are relatively straightforward. The process to obtain the necessary EA Release, approvals, and permits commenced in mid-2017 and is ongoing.
— Potential Expansion to include Horseshoe Pond and The Steady as a new Tailings Impoundment and Polishing Pond, respectively. The regulatory timeline for this Phase will be substantially longer (3 to 4 years) as these two waterbodies are known to be productive fish habitat.

Other relatively minor changes to RMM's Project have been presented to the NLDMAE Divisions and NLDNR, and approvals for these changes have either been obtained, or are in progress, and are expected in early 2018. These changes include:

— An increase in permitted production from 850 mtpd to 1,250 mtpd.
— An expansion to the existing ore pad at the Nugget Pond Mill to allow for additional storage and space to blend ores from the mine.
— A small dam raise (estimated to be 4 m) at the existing Tailings Impoundment Dam.
— Upgrades to the mine ventilation infrastructure to improve air flow for underground mine expansion.
— The future installation (2020) of a paste backfill plant at the Boundary Shaft.

Other work associated with the EA and permitting process will include baselines studies, continued environmental management and monitoring, and stakeholder engagement.

Rambler's existing Rehabilitation and Closure Plan (the Plan) addresses the physical stability aspect of the site components which remain after operations have ceased. In the case of the Ming Copper-Gold Mine project, these components generally include the TMF; underground workings and mine openings; the waste rock stockpile and ore pads; and construction features associated with buildings and site infrastructure. The Plan considers the deterioration of rehabilitated site components over the long term, by perpetual forces such as precipitation, wind, chemical weathering, and seismic events.

Under the Newfoundland and Labrador Regulation 42/00, Mining Regulations under the Mining Act 42(/00, Section 8), a Financial assurance based on the Rehabilitation and Closure Plan shall be submitted to DNR. The Financial Assurance proposal is included with the Rehabilitation and Closure Plan, and shall include costs for ongoing monitoring and site maintenance. The closure cost estimate does not account for any residual (salvage) value of equipment, building, structure, land, etc.

Rambler's Financial Assurance currently place with NLDNR for the existing and approved Rehabilitation and Closure Plan has been updated to reflect the modifications in the Updated 2017 Rehabilitation and Closure Plan, dated December 5, 2017. Additional updates will be required as the TMF expansion proceeds, and if any other substantive changes to the Project are proposed.

1.7 ECONOMICS

A LOM cash flow model was constructed based on the LOM production schedule for the MMS and LFZ of the Ming Copper-Gold Mine using a discounted cash flow approach. The key outcomes of the economic evaluation for 100% of the Project are presented in Table 1.5. All costs are estimated in US dollars (US$) and referenced as '$', unless otherwise stated.

Table 1.5 Summary of Project Economics

Item	Units	Value (CAN$)	Value (US$)
Assumptions			
Average copper price	$/lb	3.74	2.99
Average gold price	$/oz	1626	1301
Average silver price	$/oz	21.38	17.10
Average $US/$CAN exchange rate		1:0.8	1:0.8
Production			
Copper	M lbs	312	312
Gold	oz	57,000	57,000
Silver	oz	210,000	210,000
Mine life	years	2018 – 2037 20	2018 – 2037 20
Net revenue	M$	1,265	1,011
Net cash flow from operations	M$	347	277
Total capital cost, over LOM	M $	150	120
Net cash flow, before tax	M$	244	195
Net cash flow, after tax	M$	197	157
Discount rate		7%	7%
Net present value, before tax	M$	125	100
Net present value, after tax	M$	104	83

A before-tax sensitivity analysis was conducted on the economic model to test changes in key economic assumptions, namely commodity prices, operating cost, capital cost, exchange rate, and head grade to the mill. The Project's before-tax Net Present Value (NPV) was most sensitive to commodity pricing and exchange rate and least sensitive to capital expenditures.

1.8 OPPORTUNITIES

1.8.1 HAULAGE OPTIMIZATION

The Project envisages all of the reserve material being hauled to surface with 42-tonne capacity trucks. As there is a decommissioned shaft (the Boundary Shaft) on the Property, there may be an opportunity to reduce mine operating costs by re-activating the shaft with hoisting capacity.

1.8.2 ADDITIONAL LOWER GRADE LFZ M&I RESOURCES

Significant tonnages of lower grade LFZ measured and indicated resource exist outside of the planned reserves defined in this study. The majority of this material has not been sterilized as a result of future mining, and as a result is available for extraction should future economic conditions warrant.

1.8.3 INCLUSION OF LFZ BLOCK 2 MATERIAL

There is an opportunity to further defer capital requirements (construction of the pastefill plant, capital development to set up LFZ Block 3) by optimizing the LFZ material in Block 2 to be mined earlier in the mine schedule using longhole bulk mining.

1.8.4 ORE PRE- CONCENTRATION

The mineralization of the LFZ consists of dense, narrow copper rich stringer sulphides hosted within lighter weight un-mineralized chlorite schist. The initial phase of bench scale and mini-pilot processing, developed with the assistance of the Research & Development Corporation of Newfoundland and Labrador (RDC), has revealed that physical separation of the denser mineralization from the lighter rock using Dense Media Separation (DMS) is possible. Bench scale and pilot testing indicates that technically the DMS process could increase the grade of copper in the LFZ by removing 30 per cent to 40 per cent of the lighter waste host rock with copper recoveries averaging 95 per cent. In terms of grade improvement, the mini-pilot testing using run of mine material from the LFZ grading 1.39 per cent copper returned a pre-concentrate grade of 2.27 per cent copper (an upgrade ratio of 1.63). This technology could be used to extend the reserve base of the operation by upgrading lower grade resources adjacent to existing reserves.

1.8.5 MINERALIZED ZONES OPEN IN MULTIPLE DIRECTIONS

The Ming Mine orebodies remain open in all directions and have been proven to return significant copper and gold intersections with ongoing diamond drill delineation and exploration programs. By expanding on these programs the company is confident that new resources may be added in both the MMS and LFZ. Recent surface exploration drilling completed in 2017 has extended the MNZ and LFZ 550 m down plunge.

1.8.6 TMF REQUIREMENTS ASSESSMENT

Further study of the LOM tailings requirements is recommended to assess the future storage requirements (considering the need for tailings for paste backfill, ARD potential for LFZ tailings, etc.) with respect to potential storage options and their associated costs. This assessment should include a full life cycle analysis of the tailings management options that includes the potential costs associated with environmental assessment and permitting, as well as closure and long-term monitoring requirements.

1.8.7 NUGGET POND HYDROMETALLURGICAL PLANT

The Nugget Pond mill site has a 500-tonne per day gold hydrometallurgical plant located next to the copper concentrator that is not being utilized in this study. With any expansion of Rambler’s gold resources or participation in another gold play near to the Nugget Pond milling facility, the idle hydrometallurgical plant could take advantage of any deposit outside the Ming Mine area, and operate independently. With the addition of an independent grinding circuit at the copper concentrator, the facility would have the ability to process both copper and gold ores simultaneously.

1.9 RISKS

1.9.1 PROJECT FINANCING

As with all resource development projects there is an inherent risk that the Project will not be able to raise the necessary capital to fund any new construction. While Rambler is operating and generating cash flow from the current phase, there is no guarantee that additional capital funding can be raised for further expansion.

1.9.2 PRECIOUS AND BASE METAL COMMODITY PRICING

This project is exposed to commodity pricing on the world markets and shows its greatest sensitivity to copper pricing. Tight control on capital and operating spending will alleviate some of the sensitivity to copper pricing, but there does exist a risk that under an extended period of depressed copper markets the LFZ would be marginal to uneconomical. To combat this commodity price risk exposure, the company has the ability to switch between copper production and gold production at its Nugget Pond mill and has exposure to gold resources through interests in other companies in the region.

2 INTRODUCTION

2.1 TERMS OF REFERENCE AND PURPOSE OF THE REPORT

This report was prepared as a National Instrument 43-101 (NI 43-101) Technical Report, for Rambler Metals and Mining Canada Limited, (Rambler) by WSP Canada Inc. (WSP) in conjunction with Thibault & Associates Inc. (Thibault), and GEMTEC Consulting Engineers and Scientists, (GEMTEC) on the Property located approximately 17 km east of the town of Baie Verte on the north coast of Newfoundland. This report has been prepared in accordance with NI 43-101, Form 43-101F1, and Companion Policy 43-101CP.

Rambler is the Property owner/operator and is currently operating the mine and mill ramping up to 1,250 mtpd. The mineral claims and mining leases are currently owned 100% by Rambler. Rambler is a London, England-based company, trading on the London AIM, and Toronto Stock Exchange Venture under the symbols RMM and RAB, respectively.

The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in WSP's services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This report is intended for use by Rambler subject to the terms and conditions of its contract with WSP and relevant securities legislation. The contract permits Rambler to file this report as a Technical Report with Canadian securities regulatory authorities pursuant to NI 43-101, Standards of Disclosure for Mineral Projects. Except for the purposes legislated under provincial securities law, any other uses of this report by any third party is at that party's sole risk. The responsibility for this disclosure remains with Rambler. The user of this document should ensure that this is the most recent Technical Report for the Property as it is not valid if a new Technical Report has been issued.

The purpose of this report was to update the previous Pre-feasibility Study on the Property by continued mining of the Massive Sulphides (MMS) while incorporating material from the Lower Footwall Zone (LFZ), at a production rate of 1,250 mtpd and using updated costs. The work covered the following key activities.

- Generate an update of the MMS mineral resource estimate using the most recent diamond drilling data and geological interpretation.
- Generate an update of the LFZ mineral resource estimate using the most recent diamond drilling data and geological interpretation.
- Generate a mine design and schedule
- Declare Proven and Probable Mineral Reserves including understanding the geotechnical conditions of the operation and the depletion due to mining.
- All supporting infrastructure including ventilation, power, paste plant, buildings, tailings management facility, etc.
- Summarize the environment permitting requirements.
- Compile capital expenditure and operating expenditure estimates for the Project.
- Build a financial model and perform an economic analysis of the Project.

This report provides Mineral Resource and Mineral Reserve estimates, and a classification of resources and reserves prepared in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves: Definitions and Guidelines, May 10, 2014.

The mineral resource statement in this Technical Report includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves. The Mineral Reserves in this Technical Report do not include any Inferred Mineral Resources.

2.2 QUALIFICATION OF CONSULTANTS

The Consultants preparing this technical report are specialists in the fields of geology, exploration, Mineral Resource and Mineral Reserve estimation and classification, mining, geotechnical, environmental, permitting, metallurgical testing, mineral processing, processing design, civil, mechanical, electrical, capital and operating cost estimation, and mineral economics.

None of the Consultants or any associates employed in the preparation of this report has any beneficial interest in Rambler. The Consultants are not insiders, associates, or affiliates of Rambler. The results of this Technical Report are not dependent upon any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings between Rambler and the Consultants. The Consultants are being paid a fee for their work in accordance with normal professional consulting practice.

The following individuals, by virtue of their education, experience, and professional association, are considered Qualified Persons (QP) as defined in the NI 43-101 standard, for this report, and are members in good standing of appropriate professional institutions:

— Todd McCracken, P. Geo., Manager – Mining, WSP Canada Inc.

— Aubrey Sargeant, P. Eng., Principal Mining Engineer, WSP Canada Inc.

— Joanne Robinson, P. Eng., Senior Mining Engineer, WSP Canada Inc.

— J. Dean Thibault, P. Eng., Principal / Senior Process Chemical Engineer, Thibault & Associates Inc.

— James Powell, M.Eng, P. Eng., Senior Geotechnical and Mining Engineer, GEMTEC Consulting Engineers and Scientists.

2.3 DETAILS OF INSPECTION

The following Qualified Persons (QPs) have recently visited the Property:

— Todd McCracken, P. Geo. visited the site from November 22 to 26, 2014 inclusive and again from January 12 to 17, 2015 inclusive and June 2 to 3, 2016 inclusively.

— J. Dean Thibault, P. Eng. visited the Nugget Pond and Ming Mine sites on several occasions from 2009 to 2017 and the most recent site visit was on March 22, 2017.

— James Powell, M.Eng., P.Eng. visited Rambler's mine, mill, and port sites from June 8 to 10, 2016, June 2, 2017, and September 13 and 14, 2017.

2.4 SOURCES OF INFORMATION

The sources of information include data and reports supplied by Rambler personnel as well as documents cited throughout the report and referenced in Section 27. The electronic database was compiled and transmitted by Rambler.

2.5 UNITS OF MEASURE

The metric system has been used throughout this report. Tonnes are dry metric of 1,000 kg, or 2,204.6 lb. All currency is in US dollars (US$), and referenced as '$', unless otherwise stated.

2.6 EFFECTIVE DATE

The issue date of this report is April 19, 2018. The effective date of the Ming Massive Sulphides (MMS) resource statement is October 23, 2017, the effective date of the LFZ resource estimate is December 31, 2017, and the effective date of the Technical Report is December 31, 2017.

3 RELIANCE ON OTHER EXPERTS

The Qualified Persons (QP) who prepared this report relied on information provided by experts who are not QPs. The relevant QPs believe that it is reasonable to rely on these experts, based on the assumption that the experts have the necessary education, professional designations, and relevant experience on matters relevant to the technical report.

— Todd McCracken, P. Geo., relied upon Larry Pilgrim of Rambler for matters pertaining to mineral claims and mining leases as disclosed in Section 4 and confirmed on the Newfoundland and Labrador Department of Natural Resources website.

— Todd McCracken, P. Geo., relied upon Peter Mercer of Rambler for matters pertaining to royalties as disclosed in Section 4 and confirmed on the Newfoundland and Labrador Department of Natural Resources website.

— Aubrey Sargeant, P. Eng., relied upon Tim Sanford of Rambler for matters pertaining to the reserves and schedule of the MMS as disclosed in Sections 15 and 16.

— Joanne Robinson, P. Eng., relied upon Peter Mercer of Rambler for information and analysis on tax portions of the economic analysis described in Section 22 of this Pre-feasibility Study.

4 PROPERTY LOCATION AND DESCRIPTION

4.1 LOCATION

The Ming Copper-Gold Mine Project (‘the Project’ or ‘the Property’) is comprised of the Ming Mine site; Nugget Pond milling facility; and the Goodyear's Cove port. The Project is located on the north coast of Newfoundland and Labrador, Canada.

The Ming Mine site is located approximately 17 km by road east of the town of Baie Verte, on the north coast of Newfoundland, geographic coordinates 49°54’ N latitude and 56°05’ W longitude (Figure 4.1). The site is approximately 360 km by air northwest of St. John’s, and 165 km by road northeast of Deer Lake. The surface outcrop of the Ming deposit is at UTM coordinates 565,910 m E, 5,529,370 m N (NTS 12H/16 Baie Verte; NAD 83, Zone 21) (Figure 4.2).

The Nugget Pond milling facility is located approximately 6 km west of the community of Snook’s Arm in the provincial district of Baie Verte, Green Bay, geographic co-ordinates 49°50’ N latitude and 55°45’ W longitude (Figure 4.2). The surface facilities are concentrated in a 10 hectare area. The ground surface is mostly rocky with moderate forest coverage, moderately rough terrain and elevations ranging from 90 to 140 m above sea level.

Access to the Nugget Pond site is via the La Scie Highway to Snook’s Arm (Highways 414 and 416). From the Snook’s Arm Highway junction, the site can be reached by gravel road running generally west for a distance of approximately 5 km. The facility is located 44 km by an all-weather road from the Ming Mine site.

The Goodyear’s Cove Port, situated at the head of Halls Bay, Newfoundland, is located approximately 1.4 km west of the community of South Brook in the Green Bay District, geographic co-ordinates 49° 25’ N latitude, and 56° 05’ W longitude. All surface facilities are concentrated in a one hectare area. Ground surface is rocky and moderately flat with sparse vegetation and elevations rising a maximum of 12 m above sea level (Figure 4.2). The facility is located 142 km by an all-weather road from the Nugget Pond milling facility.

There are no serious environmental liabilities associated with the Properties. The site contains a fully permitted tailings facility. New tailings storage capacity is required at Nugget Pond and will be staged over the life of the Project.

Figure 4.1 Project Location Map

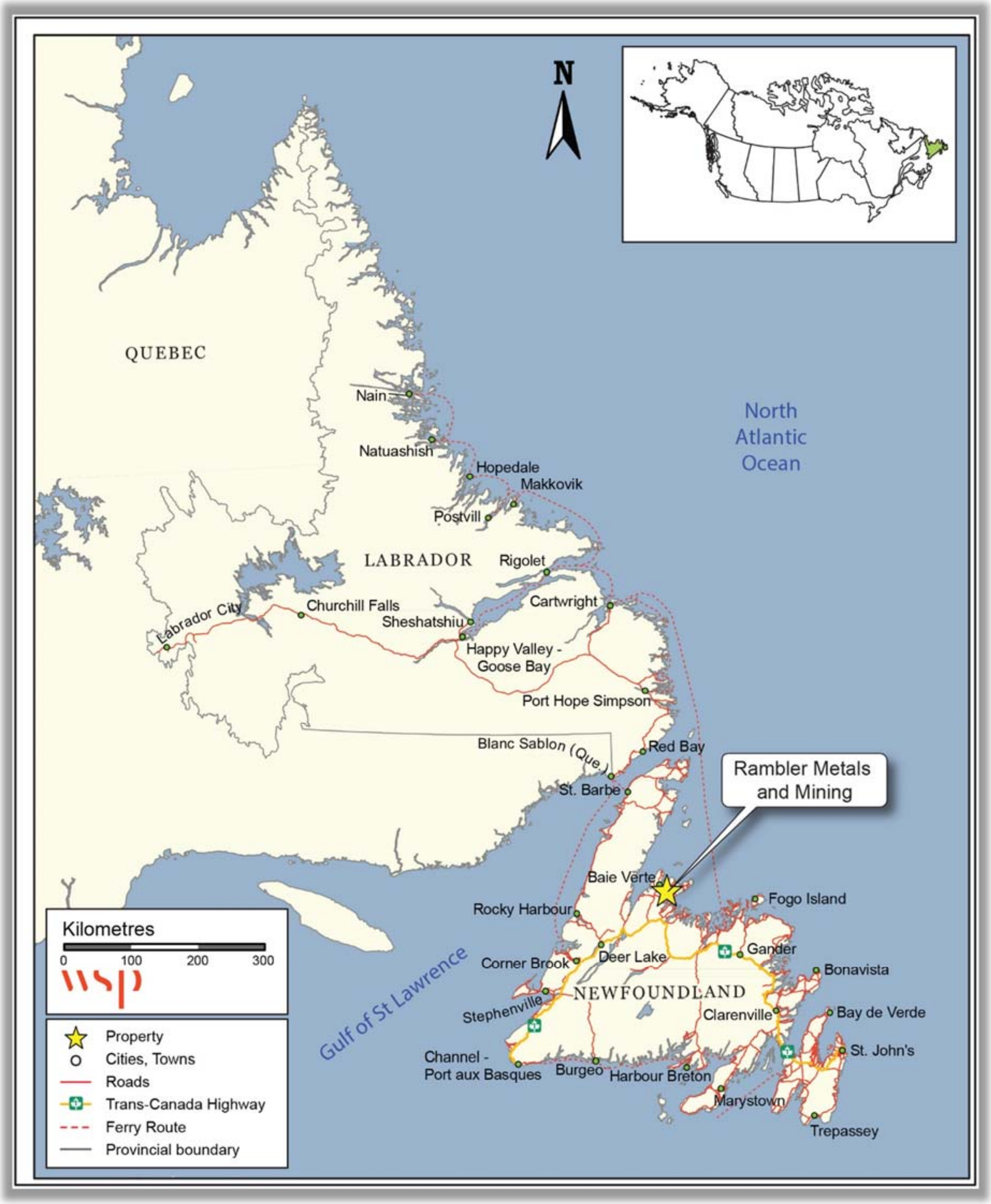
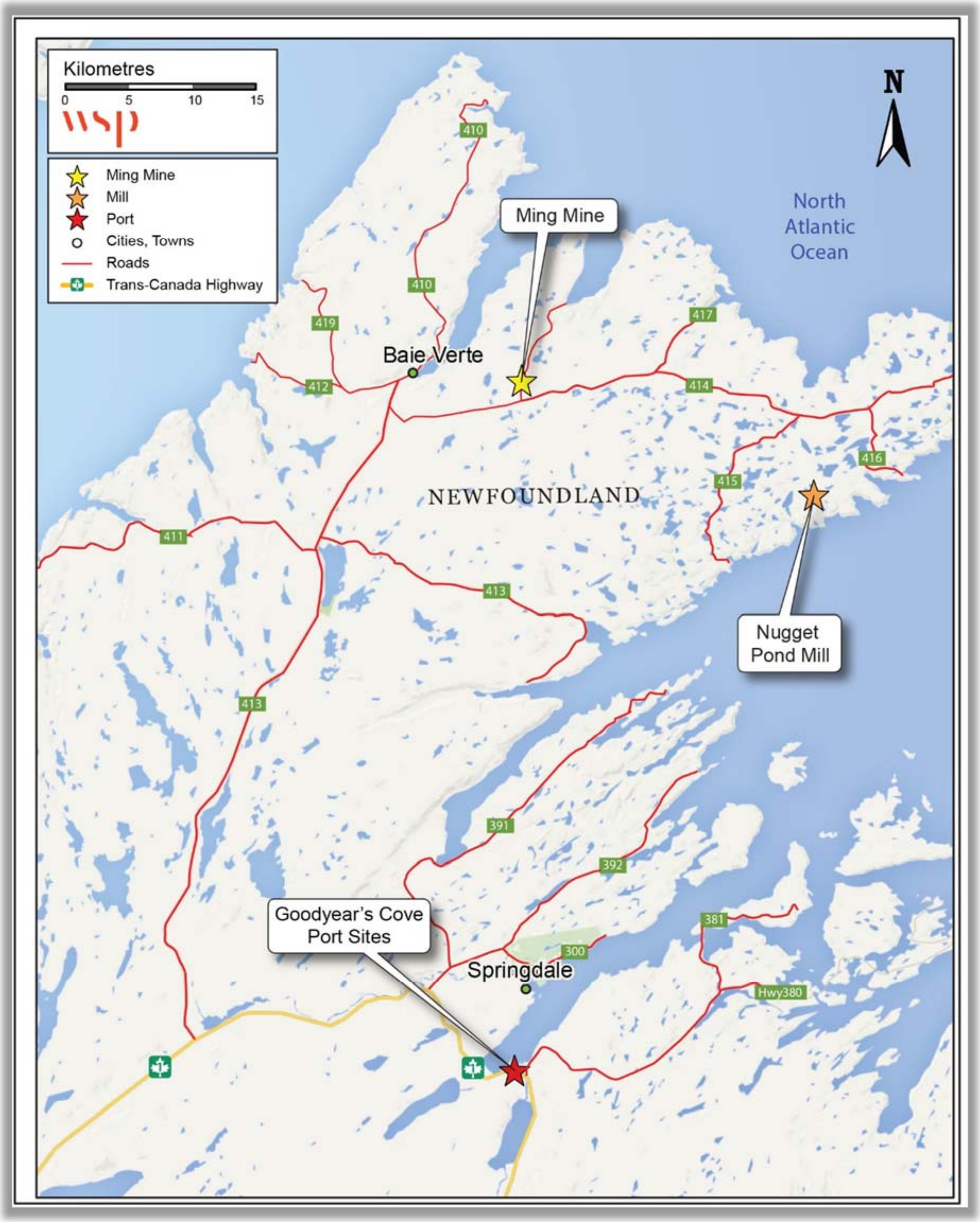


Figure 4.2 Ming Mine, Nugget Pond, and Goodyear's Cove Port Sites



4.2 MINERAL DISPOSITION AND TENURE RIGHTS

4.2.1 MING MINE SITE

For the Project Rambler owns a mineral land assembly consisting of one map-staked mineral license (023175M) and two mining leases (141L and 188L) totaling 955.4 ha and registered in the name of Rambler Metals & Mining Canada Limited, a wholly owned subsidiary of Rambler Metals and Mining PLC (Table 4.1). All of these mineral lands are contiguous and in some cases overlapping and are located in the area of the former Ming and Ming West mines (Figure 4.3). In early 2015 the mineral license 023175M replaced the original license 014692M by claim reduction as requested by Rambler. All lands are in good standing with the Provincial Government, and Rambler is up to date with respect to lease payments (for leases) and required exploration expenditure (for licenses).

4.2.2 NUGGET POND MILL SITE

Rambler holds the surface rights for the Nugget Pond Milling Facility and tailings management facility through a lease with the Crown. The Nugget Pond Facility is also covered by mining lease 140 (4444) and mineral license (022791M) shown on Figure 4.4.

4.2.3 GOODYEAR'S COVE PORT SITE

The Goodyear's Cove Port site is owned by the Town of South Brook. Rambler leases the facility from the town and a private land owner, and is responsible for the site while loading concentrates during the lease period.

Table 4.1 Claim and Lease Summary

Name	License/Leases	# Claims	Hectares	NTS Map
Rambler North Mineral License	023175M	13	325	12H/16
L5 Property Mineral License	023968M	21	525	12H/16
L5 Property East Mineral License	023971M	6	150	12H/16
Rambler South Mineral License	022885M	30	750	12H/16
Ming Mining Lease	0141L (4532)		280	12H/16
Ming Mining Lease	0188L (10241M)		350.4	12H/16
Ming Mine Crown Lands Lease	121		47.033	12H/16
Ming Mine Crown Lands Lease	122		192.436	12H/16
Nugget Pond Mineral License	022791M	4	100	2E/13
Nugget Pond Mining Lease	140 (4444)		131.2	2E/13
Mill and Mine Nugget Pond	CL108691		19.85	2E/13
Gate House Nugget Pond	CL103388			2E/13
Power Line Nugget Pond	CL108189			2E/13
Access Road Nugget Pond	CL103359		19.19	2E/13

Figure 4.3 Ming Mine Claim and Lease Map

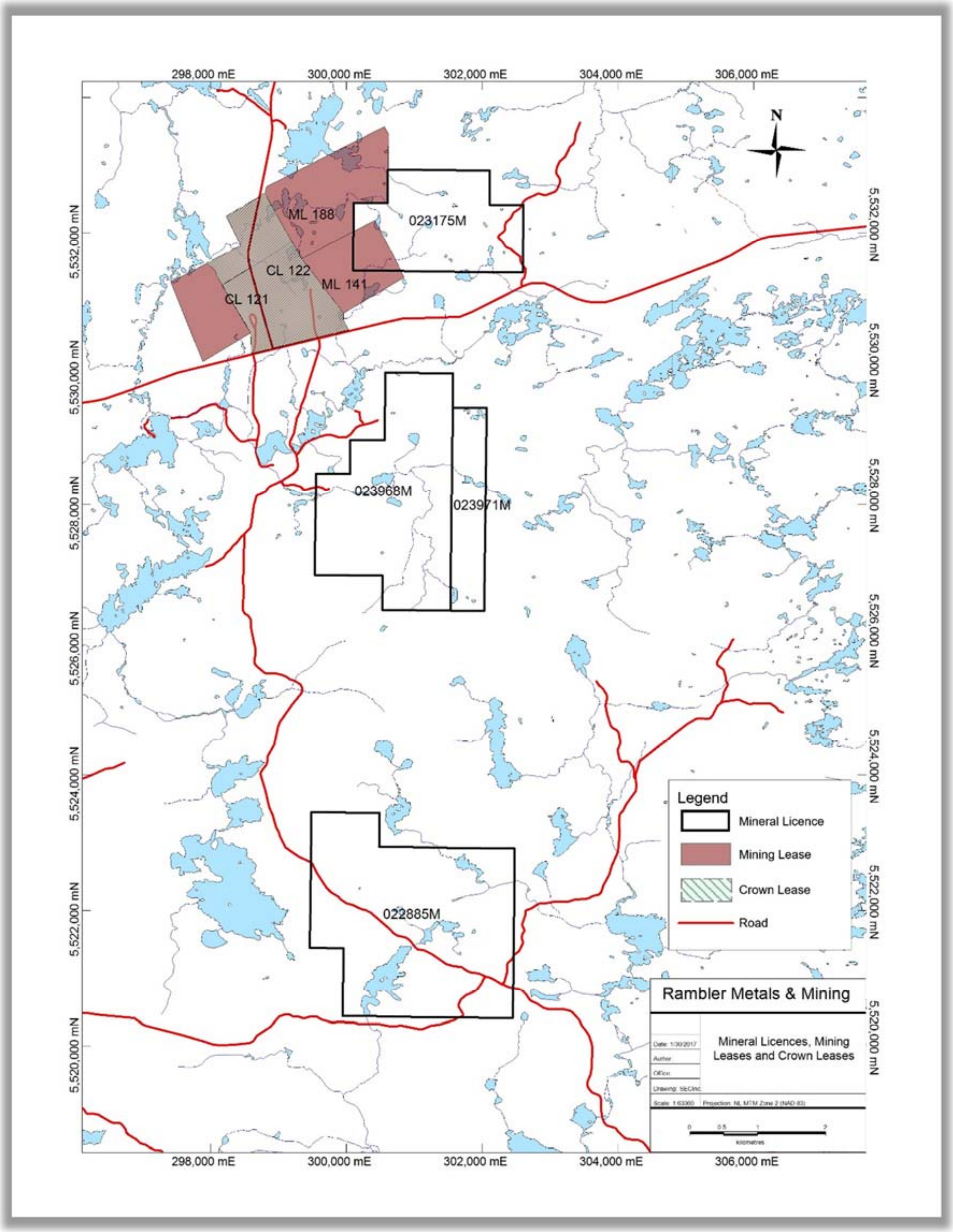
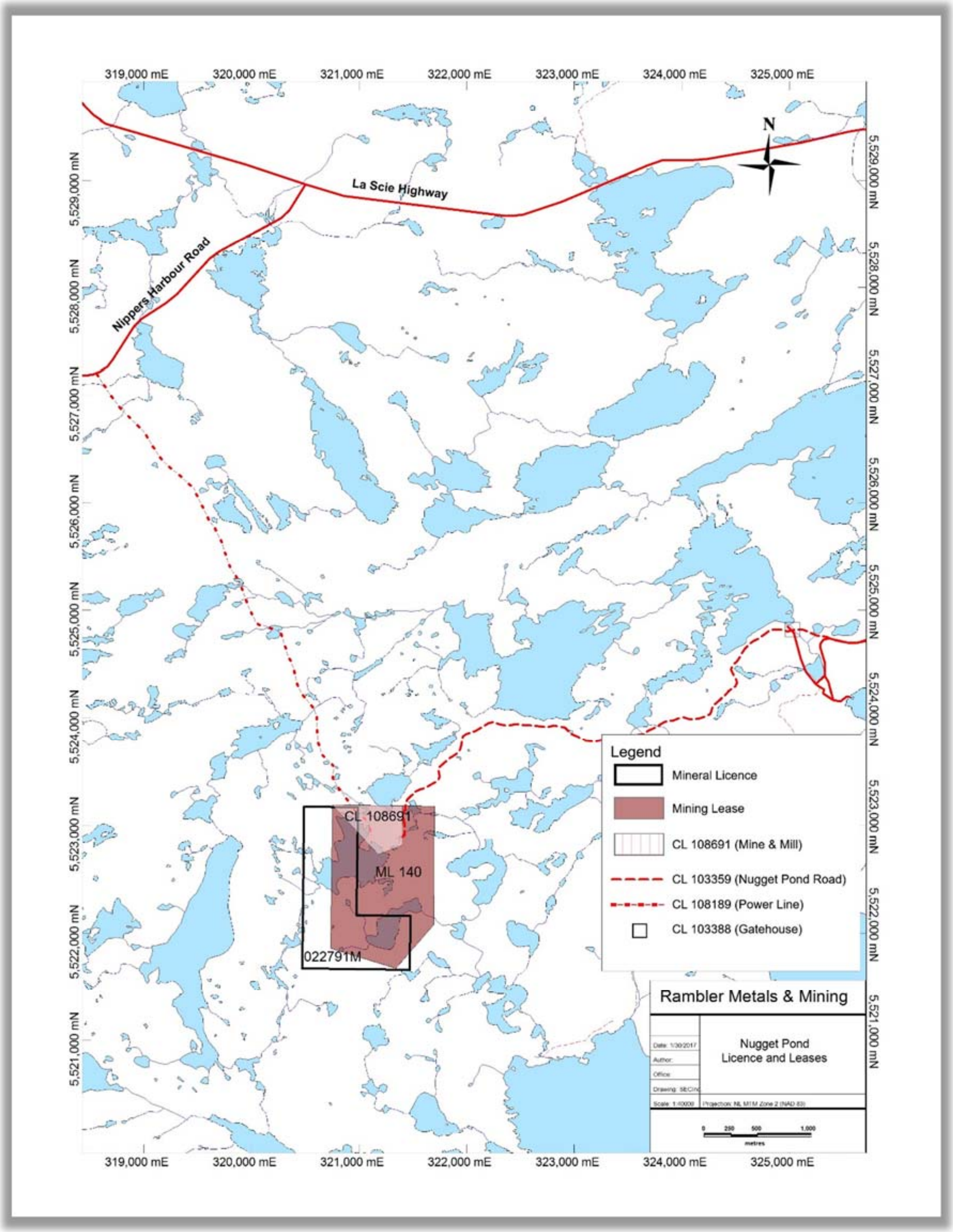


Figure 4.4 Nugget Pond Lease Map



4.3 ROYALTIES AND RELATED RIGHTS

4.3.1 TRANSAMINE – OFF-TAKE AGREEMENT

On January 9, 2012 Rambler announced that it had signed its first off-take agreement for the copper concentrate production from its Ming Mine with Transamine Trading SA (Transamine), a well-known international trading company. The agreement includes a ninety percent provisional payment to Rambler for concentrate as it arrives at the Goodyear's Cove Port facility. To date over 100,000 tonnes of concentrate has been delivered to Transamine. The original off-take agreement has been amended on occasion and currently covers all concentrate production from the Ming Mine until December 31, 2021.

4.3.2 MING MINE SITE ROYALTIES

- Royal Gold Canada Inc. 1% on mining lease 188L.
- Peter Dimmell 0.5% on mining leases 141L and 188L.
- Sandstorm Gold Ltd. ~30% of the payable gold reducing to ~12% from the date the Ming Mine produces total payable gold ounces of 175,000.

4.4 ENVIRONMENTAL LIABILITIES

All discussions related to environmental permits and any liabilities are disclosed in detail in Section 20 - Environmental Studies, Permitting, and Social and Community Impact of this technical report.

4.5 PERMITS

Rambler holds all the permits required to operate the Ming Mine, Nugget Pond Mill, and Goodyear's Cove Port facilities; all permits are in good standing up to a maximum production rate of 1,250 mtpd. Updated Development and Reclamation and Closure Plans are being reviewed and pending approval by the ministry for the 1,250 mtpd LOM.

4.6 OTHER RELEVANT FACTORS

There are no other relevant factors that would impact the Project.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 ACCESS

5.1.1 MING MINE SITE

Access to the Baie Verte Peninsula is provided via Route 410 (Dorset Trail) exiting the Trans-Canada Highway. The Property is accessed via the La Scie Highway (Route 414) and Ming's Bight Road (Route 418). The north-south trending Ming's Bight Road transects the western half of the Property. All surface facilities are located adjacent to this road. A gravel road exits Route 414 and extends northwards for a short distance to the Boundary Shaft. Several old trails and drill roads, as well as recent logging roads provide limited access to the interior of the Property (Figure 5.1).

Regularly scheduled passenger air service and charter flights are available at the town of Deer Lake located 165 km to the southwest on Highway 1.

5.1.2 NUGGET POND MILL SITE

Access to the Nugget Pond Mill site is via the La Scie Highway to Snook's Arm (Highways 414 and 416). From the Snook's Arm Highway junction, the site can be reached by a gravel road running generally west for a distance of approximately 5 km (Figure 5.2). The mill is 44 km from the mine site.

5.1.3 GOODYEAR'S COVE PORT SITE

Access to Goodyear's Cove Port is via the Trans-Canada Highway. A gravel access road runs north for approximately 500 m to the site (Figure 5.3). The port site is 142 km from the mill site.

Figure 5.1 Ming Mine Access Map

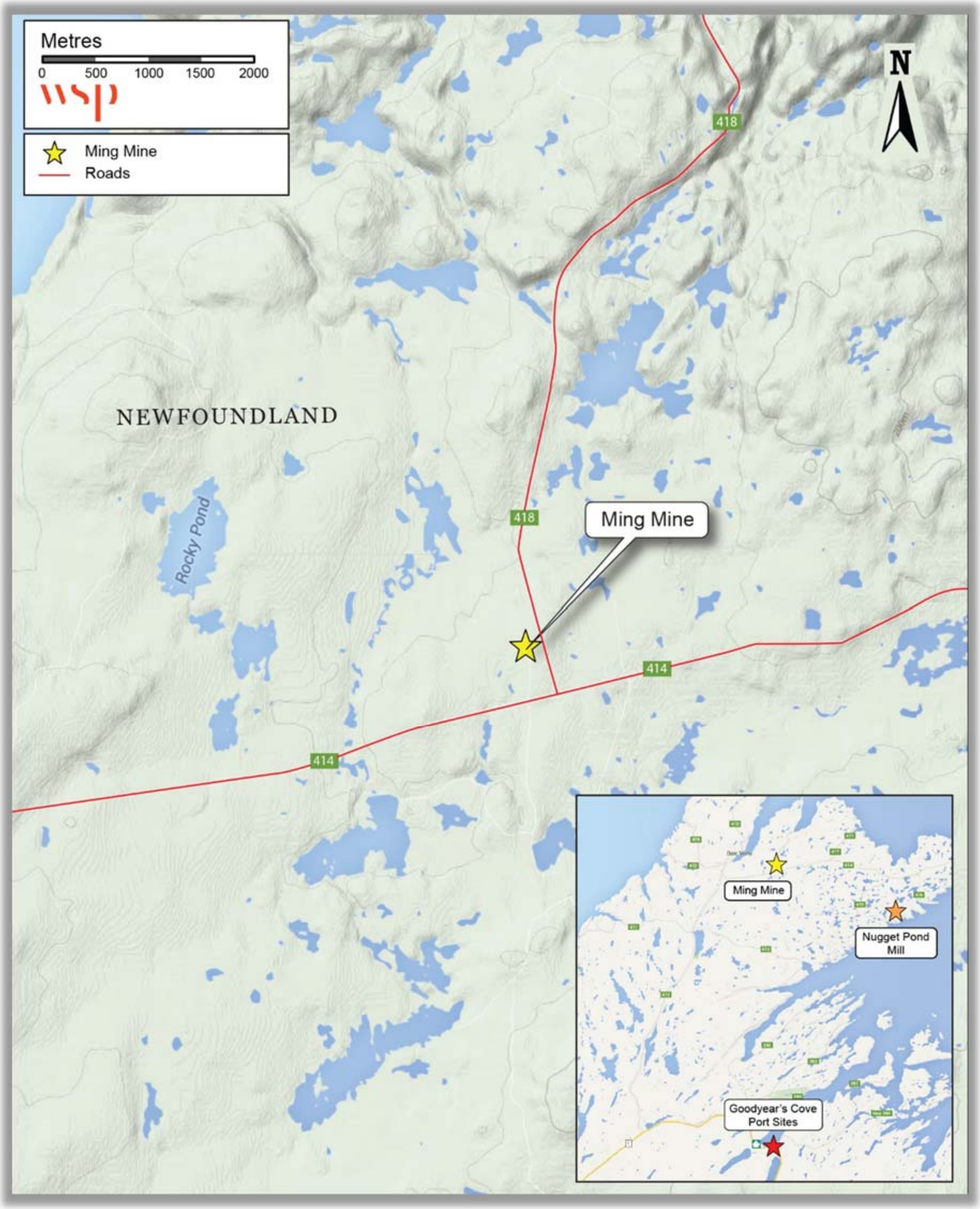


Figure 5.2 Nugget Pond Mill Access Map

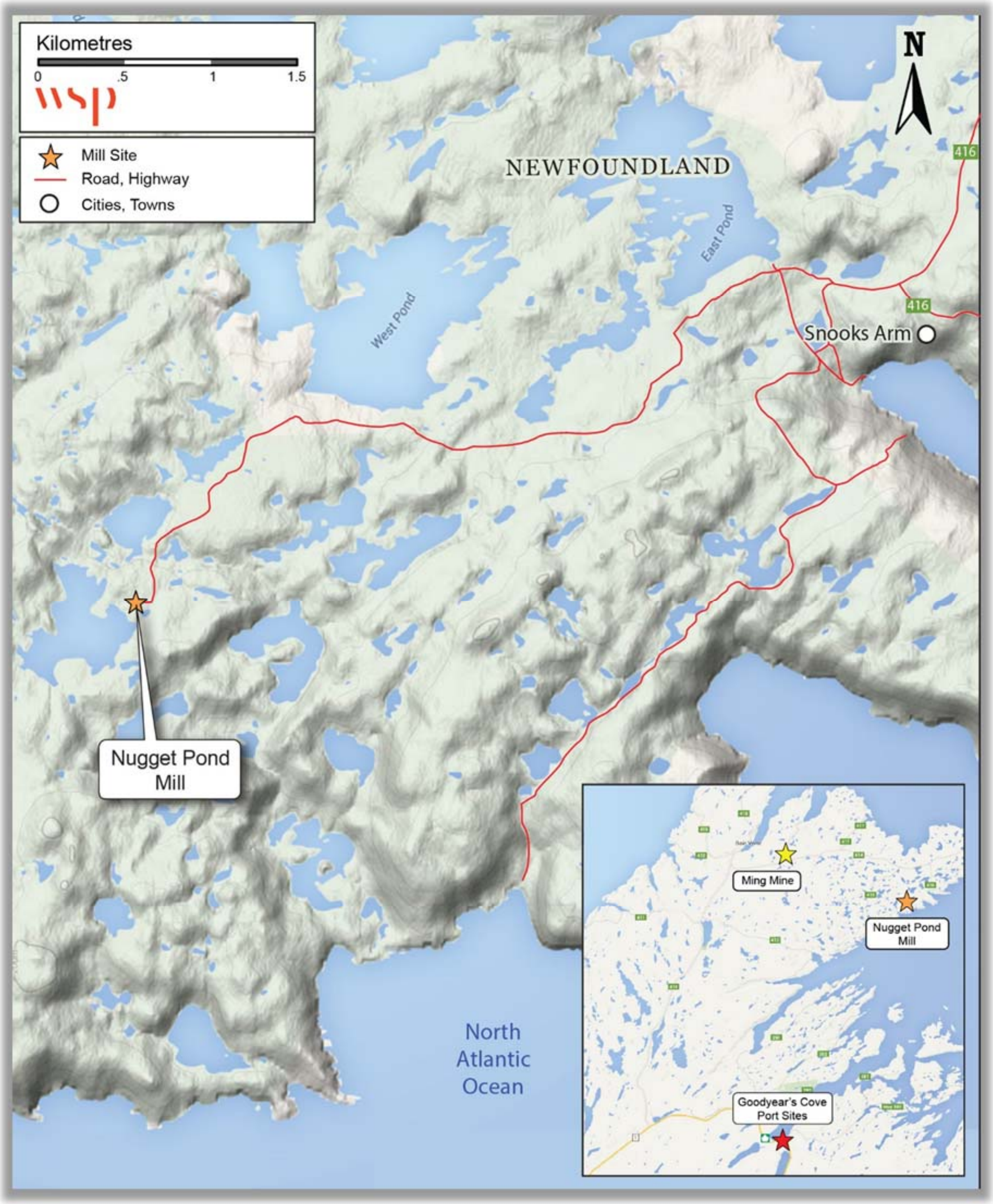
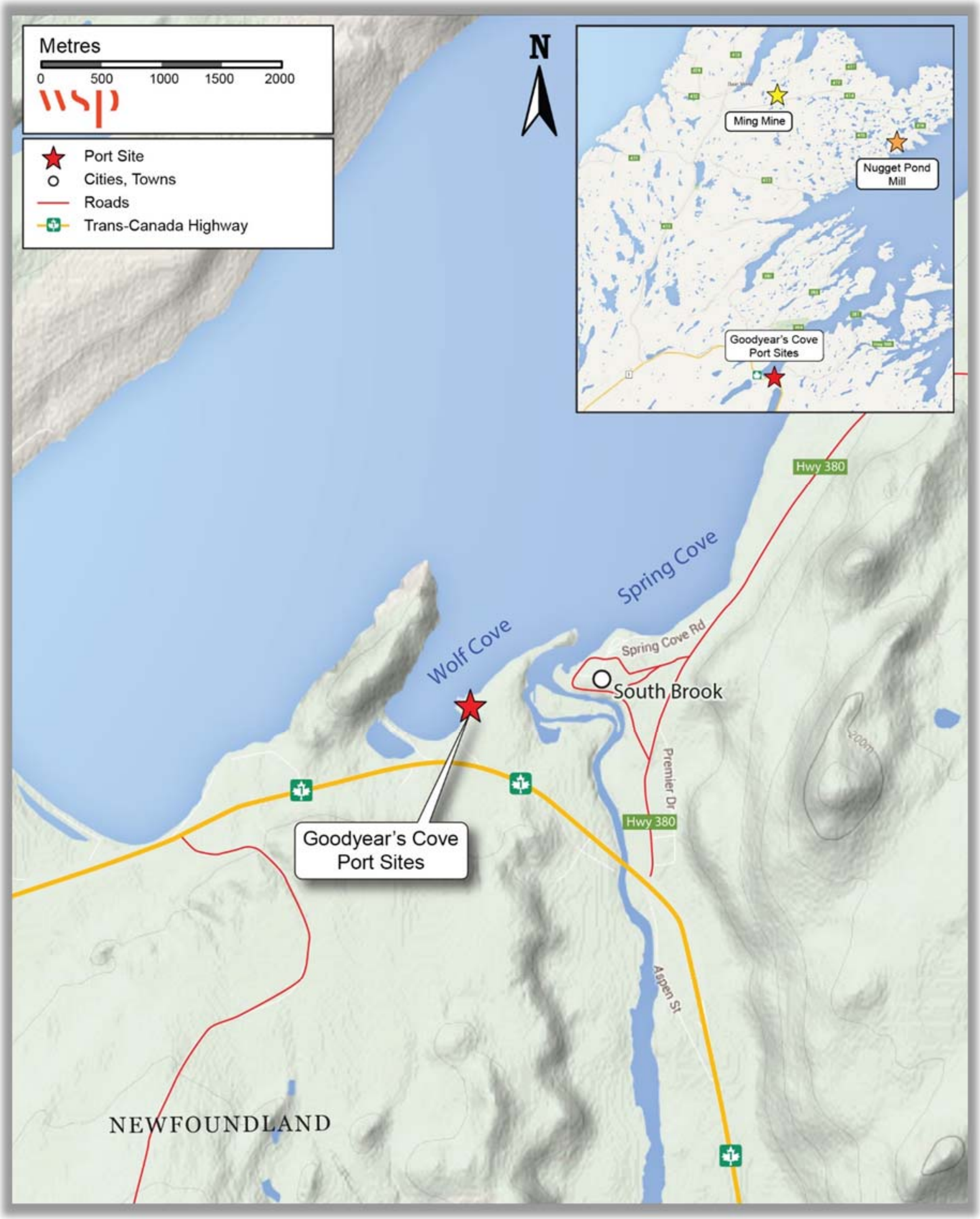


Figure 5.3 Goodyear's Cove Port Site Access Map



5.2 CLIMATE

The climate in this area is considered northern maritime. The mean summer temperatures are 16°C and mean winter temperatures are -8°C (www.worldweatheronline.com). Lakes and ponds freeze over in early December and are ice-free in mid-April. Annual precipitation can exceed 1,000 mm, primarily in the form of rain. To date, concentrate shipping has not been interrupted in late winter-early spring when the Labrador Current moves pack ice and icebergs south from Greenland. Ice breaker service is provided by the Canadian Coast Guard when required.

Access to all the facilities is available year round.

5.3 INFRASTRUCTURE

The area has a history and culture of mining asbestos, gold, copper, and industrial minerals dating from the 1800s. The major center for the region is the town of Baie Verte (population 1,275), which offers several mining and exploration service providers, hotels, schools, shopping, medical facilities, firefighting, construction, and recreational facilities. Baie Verte and the nearby communities have an experienced mining work force.

5.4 PHYSIOGRAPHY

5.4.1 MING MINE SITE

Ming Mine lies at an elevation approximately 150 masl. Topography is gently rolling, rising to a series of north-west trending ridges with elevations at 180 to 190 masl in the north near Three Corner Pond. Outcrop exposure ranges from 0.5% to 5% owing to a persistent blanket of overburden averaging two metres in thickness. The Property is dominated by mature black spruce and hardwood. Logging operations have been ongoing since the early eighties, and both clear cut and new growth forests are present. Small bogs and ponds associated with low lying depressions are common, and constitute parts of the South Brook and England’s Pond watersheds that flow northward to the coast.

5.4.2 NUGGET POND MILL SITE

Nugget Pond is located on the east side of the Baie Verte Peninsula which is an undulating plateau. The coast line of Betts Cove-Tilt Cove area is bounded by sheer cliffs rising rather abruptly to the plateau level approximately 150 masl. The shoreline is indented by many fjord-like coves and inlets, the largest of which, Snook’s Arm, is three kilometres long. The dissected plateau to the west is marked by parallel ridges and rounded hills. Soil is absent or extremely thin on the plateau, and the amount of drift present, even in the valleys, is small. To the north of the site and on much higher elevations, a thin layer of moss/lichen is common on the upland barrens. The larger areas, especially those underlain by granite and ultramafics, are devoid of vegetation. Locally and to the south of the site, the valley slopes support a thick, but low growth of spruce, birch, fir, aspen, and alder. The area is well drained and dotted with a myriad of small ponds and streams.

The Nugget Pond facility lies within the heart of the Fly Pond, Bobby's Cove watershed. This drainage basin is roughly an area of some 740 hectares. It is oriented southward and drains into the head of Bobby's Cove. The system comprises four main ponds: Fly Pond, Rocky Pond, Horseshoe Pond, and Bobby's Cove Pond. Camp Pond and approximately ten smaller unnamed ponds are also located within the drainage basin.

5.4.3 GOODYEAR'S COVE PORT SITE

Goodyear's Cove is situated at the head of Halls Bay, and is approximately 1.4 km west of the community of South Brook in the Green Bay District, approximately 142 km from the mill. All surface facilities are concentrated in a one hectare area. Ground surface is rocky and moderately flat with sparse vegetation and elevations rising to a maximum of 12 masl.

6 HISTORY

Exploration of the Project dates back to the early 1900s with the discovery of auriferous sulphide mineralization. Tables 6.1 to 6.3 summarize the significant activities on the Project from the date of discovery.

Table 6.1 Significant Activities – Ming Mine

Year	Area	Company	Activity
1905	Ming Mine	Enos England	Auriferous sulphide discovered.
1907	Ming Mine	Enos England	Shaft sunk 20 m with a 15 m cross-cut.
1935	Ming Mine		Main Mine sulphide zone discovered 182 m north of the England discovery.
1940	Ming Mine	Newfoundland Government	Diamond drilled 18 holes totaling 1,524 m.
1944	Ming Mine	Rambler Mines Corp.	Optioned the Property, no recorded work.
1945	Ming Mine	Gold Mines	Optioned the Property. Diamond drilled 31 holes totaling 207.6 m. Optioned the Property to Falconbridge Nickel Mines.
1951	Ming Mine	Rambridge Mines	Acquired the Property. Diamond drilled a total of 4,359 m in an unknown number of holes.
1955 - 1956	Ming Mine	Rambridge Mines	Airborne electromagnetic survey flown over an undisclosed number of line km.
1960	Ming Mine	Newfoundland Government	Property reverted to the Crown under the Undeveloped Mineral Act.
1960	Ming Mine	Consolidated Rambler Mines Ltd.	Acquired the Property.
1961	Ming Mine	Consolidated Rambler Mines Ltd.	Started development of the Main Mine and commenced production
1970	Ming Mine	Consolidated Rambler Mines Ltd.	Ming Mine discovered by helicopter-borne AEM system. Deposit delineated with 36 diamond drillholes.
1982	Ming Mine	Consolidated Rambler Mines Ltd.	Ming Mine ceased production due to low copper price and mineralization crossing on to land held by BP Selco. Mined 4.1 million short tons averaging 2.17% Cu with gold, silver and zinc credits.
1987	Ming Mine	Newfoundland Government	Property reverted to the Crown under the Undeveloped Mineral Act.
1987	Ming Mine	Inco Ltd.	Acquired the Rambler Mill from Consolidated Rambler Mines in an anticipation of acquiring the mineral rights from the Crown.
1988	Ming Mine	Rambler Joint Venture Group	A consortium of Teck, Petromet Resources, and Newfoundland Exploration Company acquired the Property. Ming West discovered from ground geophysics and soil geochemistry. Diamond drilled 48 holes totaling 7,783 m. Attempted to acquire the Rambler Mill from Inco, which was sold to International Corona Corporation, who held the BP Selco extension of the Ming deposit.
1993	Ming Mine	Newfoundland Government	Property reverted to the Crown under the Undeveloped Mineral Act.
1993	Ming Mine	Ming Minerals Inc.	Ming Minerals formed with Sam Blagdon and Peter Dimmell as equal partners. Acquired the Rambler Mill and mineral rights to the BP Selco property from Homestake (formally Corona).
1994	Ming Mine	Ming Minerals Inc.	Acquired the Rambler Property minus the Ming Mine in a staking rush, then later acquired the Ming Mine from the Crown. First time all key Properties are consolidated under one ownership.
1995	Ming Mine	Ming Minerals Inc.	Ming West deposit accessed via the Ming ramp.

(table continues on next page)

Year	Area	Company	Activity
1996	Ming Mine	Ming Minerals Inc.	Ming West production ceased due to low copper prices and exhausting of near surface reserves. 142,200 short tons mined at a grade of 3.98% Cu, 0.17 opt Au and 0.44 opt Ag.
1997	Ming Mine	Ming Minerals Inc.	A feasibility study completed on the Rambler Property which concluded the resources would not support an economic operation and the Property was placed on care and maintenance.
2001	Ming Mine	Altius Mineral Corp.	Optioned the Rambler Property from Ming Minerals. Geochemical surveys and re-logging of historic diamond drill core.
2003	Ming Mine	Altius Mineral Corp.	Completed 2 diamond drillholes totaling 3,849 m and used down-hole geophysics to identify new mineralization 500 m beyond previous mining limits.
2004	Ming Mine	Altius Mineral Corp.	Drilled 2 diamond holes totaling 2,684 m and down-hole geophysics to identify the mineralization associated with the LFZ.
2005	Ming Mine	Rambler Metals & Mining	Purchased the interests on the Rambler Property from Altius Minerals. Completed 12 diamond drillholes totaling 12,947 m to test the MMS and LFZ. Downhole Pulse electromagnetic survey completed on 11 drillholes.
2006	Ming Mine	Rambler Metals & Mining	Completed 27 diamond drillholes totaling 29,401 m.
2007 - 2008	Ming Mine	Rambler Metals & Mining	Drilled 209 diamond drillholes totaling 58,789 m from surface and underground.
2008	Ming Mine	Rambler Metals & Mining	Bench scale lock cycle tests completed on material collected from the 1600 L MMS material. Thin section study completed 1806 zone by Dr. Piercey. Completed Titan-24 Deep geophysical survey over the Property; a total 77 anomalies were identified.
2009	Ming Mine	Rambler Metals & Mining	Second lock cycle test completed on material collected from 1600 L and 1807 zone to test variability on the ore. Drill tested titan anomaly A18-1 with two diamond drillholes totaling 1,062 m; the holes failed to explain the anomaly. 3D inversion of the Titan data was completed.
2010 - 2011	**Ming Mine**	**Rambler Metals & Mining**	**Began construction of the Phase I operation. Drilled 6 diamond drillholes totaling 500 m on the MMS zones.**
2012*	Ming Mine	Rambler Metals & Mining	Announced commercial production in November. Milled 137,400 tonnes at 3.60% Cu, 1.31 g/t Au.
2013*	Ming Mine	Rambler Metals & Mining	Milled 215,500 tonnes at 3.68% Cu, 1.59 g/t Au
2014*	Ming Mine	Rambler Metals & Mining	Milled 215,535 tonnes at 2.53% Cu, 1.18 g/t Au
2015*	Ming Mine	Rambler Metals & Mining	Milled 241,080 tonnes at 2.12% Cu, 1.40 g/t Au
2016*	Ming Mine	Rambler Metals & Mining	Milled 267,347 tonnes at 1.79% Cu, 1.14 g/t Au
2017	Ming Mine	Rambler Metals & Mining	Milled 339,631 tonnes at 1.27% Cu, 0.58 g/t Au

**Note*: Production based on the Rambler fiscal year for August to July, not the calendar year. Calendar year accounting implemented for 2017.*

Table 6.2 Significant Activities - Nugget Pond

Year	Area	Company	Activity
1987 - 1990	Nugget Pond	Bitech Energy Resource Ltd.	Diamond drilling 116 holes totaling 2,200 m.
1992 - 1993	Nugget Pond	Bitech Energy Resource Ltd.	Resource estimation completed and bulk sample collected and development of the Project.
1995	Nugget Pond	Richmont Mines Inc.	Acquired 60% interest in the Nugget Pond project.
1996	Nugget Pond	Richmont Mines Inc.	Acquired the remaining 40% of the Project from Bitech Energy Resources.
1997	Nugget Pond	Richmont Mines Inc.	Completed construction of the mine, office, assay lab, hydromet mill, shop, and three warehouses.
2000	Nugget Pond	Richmont Mines Inc.	A 7,500 ton bulk sample from the Hammerdown deposit at King's Point was processed at the Nugget Pond mill.
2001 - 2004	Nugget Pond	Richmont Mines Inc.	Nugget Pond deposit was exhausted. Production from the Hammerdown deposit at King's Point commenced in the summer of 2001 and finished late 2004.
2005	Nugget Pond	Richmont Mines Inc.	The Nugget Pond mill is placed on care and maintenance.
2005	Nugget Pond	New Island Resources	Optioned the Nugget Pond mill and mining licenses from Richmont Mines.
2006	Nugget Pond	Crew Gold Corporation	Acquired the Nugget Pond mill and surface rights from New Island Resources.
2007	Nugget Pond	Crew Gold Corporation	Material from Crew's Nalunaq mine in Greenland was processed at the Nugget Pond mill.
2009	Nugget Pond	Crew Gold Corporation	Shipments of material from the Nalunaq mine stopped. Entered into a toll milling agreement with Anaconda Mining Inc. in June. Toll milling agreement was cancelled in December and plant placed on care and maintenance.
2009	Nugget Pond	Rambler Metals & Mining	Purchased the Nugget Pond mill from Crew for CAN$ 3.5 million.
2010 - 2011	Nugget Pond	Rambler Metals & Mining	Construction expansion of the Nugget Pond site to allow copper and gold rich sulphide ores from the Ming Mine to be processed.
2012	Nugget Pond	Rambler Metals & Mining	Announced commercial production in November. Milled 137,400 tonnes at 3.60% Cu, 1.31 g/t Au
2013	Nugget Pond	Rambler Metals & Mining	Milled 215,500 tonnes at 3.68% Cu, 1.59 g/t Au
2014	Nugget Pond	Rambler Metals & Mining	Milled 215,535 tonnes at 2.53% Cu, 1.18 g/t Au
2015	Nugget Pond	Rambler Metals & Mining	Milled 241,080 tonnes at 2.12% Cu, 1.40 g/t Au
2016	Nugget Pond	Rambler Metals & Mining	Milled 267,347 tonnes at 1.79% Cu, 1.14 g/t Au
2017	Nugget Pond	Rambler Metals and Mining	Milled 339,631 tonnes at 1.27% Cu, 0.58 g/t Au

Table 6.3 Significant Activities - Goodyear's Cove

Year	Area	Company	Activity
1965 - 1972	Goodyear's Cove	Gullbridge Mining Company Inc.	Port site improved to with concentrate sheds to allow copper concentrate from the Gullbridge Mine to be shipped to smelters on the Gaspe region of Quebec.
1972	Goodyear's Cove	N.A.	Concentrate sheds sold to company that built fiberglass boats. Sheds eventually removed leaving the concrete pads.
2006	Goodyear's Cove	Crew Gold Corporation	Leased the port facility to import material from the Nalunaq mine in Greenland to be processed at the Nugget Pond mill.
2007 - 2008	Goodyear's Cove	Crew Gold Corporation	Material from the Nalunaq mine was off-loaded from ships and stored on the existing concrete pads before being shipped to Nugget Pond for processing.
2009	Goodyear's Cove	Crew Gold Corporation	All material was removed and the area fully reclaimed.
2012 - 2017	Goodyear's Cove	Rambler Metals & Mining	Quarterly shipments of high-grade copper concentrate to international markets.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 REGIONAL GEOLOGICAL SETTINGS

The geology of the island of Newfoundland presents a cross-section through the northern portion of the Appalachian Orogen. Four major tectonostratigraphic zones, based on pre-carboniferous geology, have been identified and termed from west to east as Humber, Dunnage, Gander, and Avalon.

Together these zones represent volcano-sedimentary assemblages of oceanic suprasubduction zone (ophiolitic) and mature-arc derivations respectively (Szybinski and Jenner 1989; Kean et al. 1995) accreted to the ancient North American (Laurentian) continental margin during the Taconian Orogeny (Ordovician to Silurian) and further deformed during the Silurian-Devonian, post accretion, Acadian Orogeny.

The Dunnage is the floor of the Lapetus Oceanic Basin. More specifically the Dunnage consists of volcanic and sedimentary rocks of back-arc and island-arc affinity as ophiolitic sequences created during the opening and subsequent closure of Lapetus. It also includes post-accretion, epicontinental volcanic, and molasses sequences sedimentation of Silurian age and a variety of Devonian intrusive rocks (Thurlow et al., 2005).

The Baie Verte region is located in the Dunnage Zone along the western margin of the predominantly volcanic, Lower Paleozoic, Central Mobile Belt of Newfoundland. At this location the Dunnage is separated from the Humber by the Baie Verte lineament, a steep dipping regional structure that trends north to northeast up the centre of the Baie Verte Peninsula, where in the Baie Verte area it turns eastward and dissipates into a series of southerly dipping thrust faults.

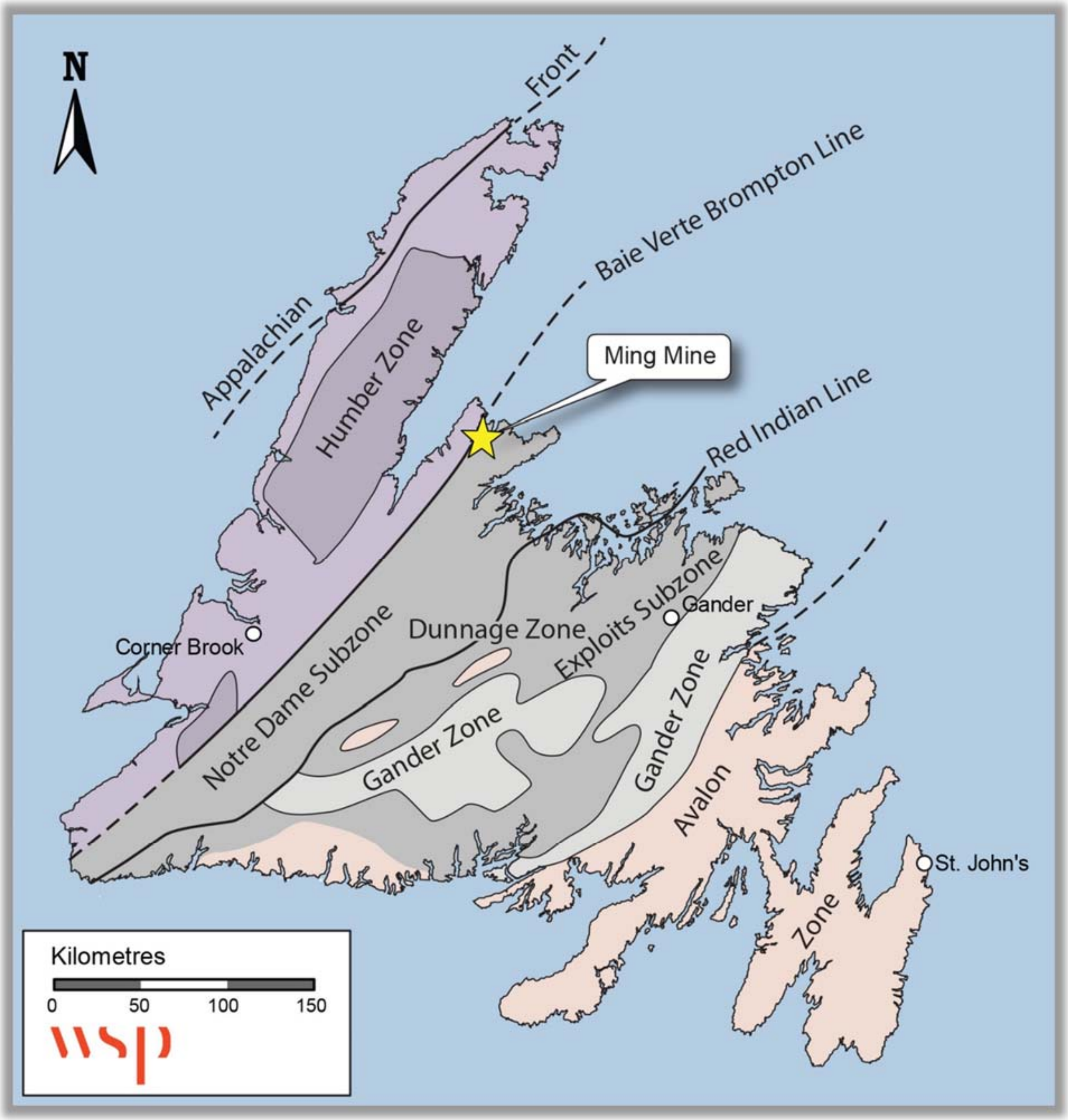
The Baie Verte Peninsula regional geology was first mapped by Hibbard (1983). The Baie Verte Peninsula is underlain by two distinct structural and lithological belts, separated by a major arcuate referred to as the Baie Verte Line. Rocks to the west of the Baie Verte Line belong to the Fleur de Lys, structural zone, Belt of the Humber Zone. Rocks lying to the east of the Baie Verte Line belong to the Baie Verte Belt of the Dunnage Zone.

The Baie Verte Belt is comprised of four main lithological elements:

- Cabro-ordovician ophiolitic sequences of the Advocate, Point Rousse and Betts Cove Complexes, and the Pacquet Harbour Group;
- Ordovician volcanic cover sequences of the Snook's Arm and Flat Water Pond Groups;
- Silurian terrestrial volcanic and sedimentary rocks of the Micmac Lake and Cape St. John Groups; and
- Siluro-devonian intrusive rocks, namely the Burlington Granodiorite and Cape Brule Porphyry.

Figure 7.1 presents the regional geology of the island of Newfoundland.

Figure 7.1 Regional Geology



The Pacquet Harbour Group is the main geological element of the Rambler Property. The Pacquet Harbour Group is an incomplete early Ordovician ophiolite consisting dominantly of a moderately to steeply north dipping sequence of variably deformed and metamorphosed mafic volcanic rocks, lesser felsic volcanic rocks, mixed mafic and felsic volcaniclastics rocks, and shallow level intrusive rocks. The maximum outcrop width across the Group is approximately 15 km, but its base and top are not exposed so that true thickness is not known. Along its southern margin, the Pacquet Harbour Group is unconformably overlain by, and in extensional fault contact with, sub-aerial felsic volcanic rocks of the Silurian Cape St. John Group. In its southern portion the Pacquet Harbour is intruded by Silurian to Devonian, felsic plutonic rocks of the Burlington Granodiorite and Cape Brule Porphyry. Regional metamorphism in the Group is lower greenschist with the exception of rocks proximal to the Burlington where grades are upper greenschist to amphibolite in deformed lithologies.

Plutonic rocks in the region include the Burlington Granodiorite, Dunamagon Granite, and Cape Brule Porphyry which intrude the Pacquet Harbour on all sides. The largest intrusion to the south is the Middle Ordovician Burlington dated at 460 Ma. The Dunamagon Granite to the north has also been dated at the same age. Exposures of the Cape Brule Porphyry that intrude the Pacquet Harbour occur on the east side of the Group that includes igneous bodies that intrude the Burlington and extrusive lithologies elsewhere. The Cape Brule Porphyry has been dated at 404 Ma giving it a Late Silurian to Early Devonian age. Sangster and Thorpe (1975) have reported a 460 Ma age for the Pacquet Harbour Group based on sulphide isotope data obtained from galena samples collected from the Ming Mine. A similar Ordovician age seems reasonable for the volcanic or thermal event that generated regional felsic plutons, the host felsic volcanic and volcaniclastic rocks and related VMS mineralization in the Rambler area.

Structure in the Pacquet Harbour Group near the Ming Mine is complex. Sequences in the Rambler area have undergone four phases of deformation (Table 7.1) (*Tuach and Kennedy, 1978*). The second phase, identified as D2 produced an intense, penetrative, transposition schistose fabric parallel to primary layering accompanied by a parallel extension lineation which resulted in northeast trending mineral, clast and pillow elongation with a plunge of 35 degrees towards an azimuth of 35 degrees northeast. This linear fabric has affected all the ore deposits and prospects in the Rambler area causing the deposits to elongate to ribbon-like forms parallel to the extension lineation.

Table 7.1 Deformation Phases

Deformation Phase	Fabric	Mesoscopic Folds
D4	NE Strike crenulation	NE plunge, open, upright
D3	NW Strike, strain slip, dips generally NE	Open, NE plunge, overturned
D2	NW striking L-S fabric, dips NE, strike E-W in central and southern parts, compressional banding	Tight to isoclinal, NE plunge, reclined
D1	L-S flattening preserved between 52 surfaces	No folds noted

The D2 structural fabric contains minor, tight to isoclinal, northeast plunging folds with axial planes parallel to D2 planar fabrics and fold axes parallel to the D2 extension lineation direction. The existence of larger scale D2 folds is thought to be probable, but the location of these structures has not been defined. The D2 structures are overprinted by a late, moderate to shallow northeast dipping crenulation cleavage interpreted as D4 which is parallel to the axial planes of planar to open, recumbent, shallow plunging folds that affect the main schistosity and primary layering *(Hibbard, 1983*).

In the Rambler area, the Pacquet Harbour Group has been further subdivided into the Uncles' and Rambler Sequences which are juxtaposed along a prominent east-west to northwest-southeast trending low angle (25° to 30°) thrust fault identified as the Rambler Brook Fault (*Coates, 1990*). The Uncles' Sequence, located approximately six kilometres southwest of the Ming Mine is dominated by mafic volcanic with lesser felsic and intermediate volcanic rocks where it is host to the past producing East Mine.

The Rambler Sequence is host to the Main, East, Ming, Ming Footwall, and Ming West massive ± stringer sulphide deposits (*Thurlow et al, 2005*). The felsic pile attains a maximum thickness of approximately 1,500 m south of the Rambler area pinching out further south. Along its flanks the felsic volcaniclastic units either pinch out or grade laterally to mixed felsic to intermediate or mixed felsic to mafic volcaniclastics rocks. Magnetite chert, sulphide impregnated chert, and banded polymetallic massive sulphides are noted locally. Within the pile, hydrothermally altered felsic volcaniclastics rocks occur as quartz-sericite and quartz-chlorite-sericite schists. These contain mineralization consisting of disseminated and stringer sulphide which occur proximal to massive sulphide.

7.2 GEOLOGY AT MING MINE

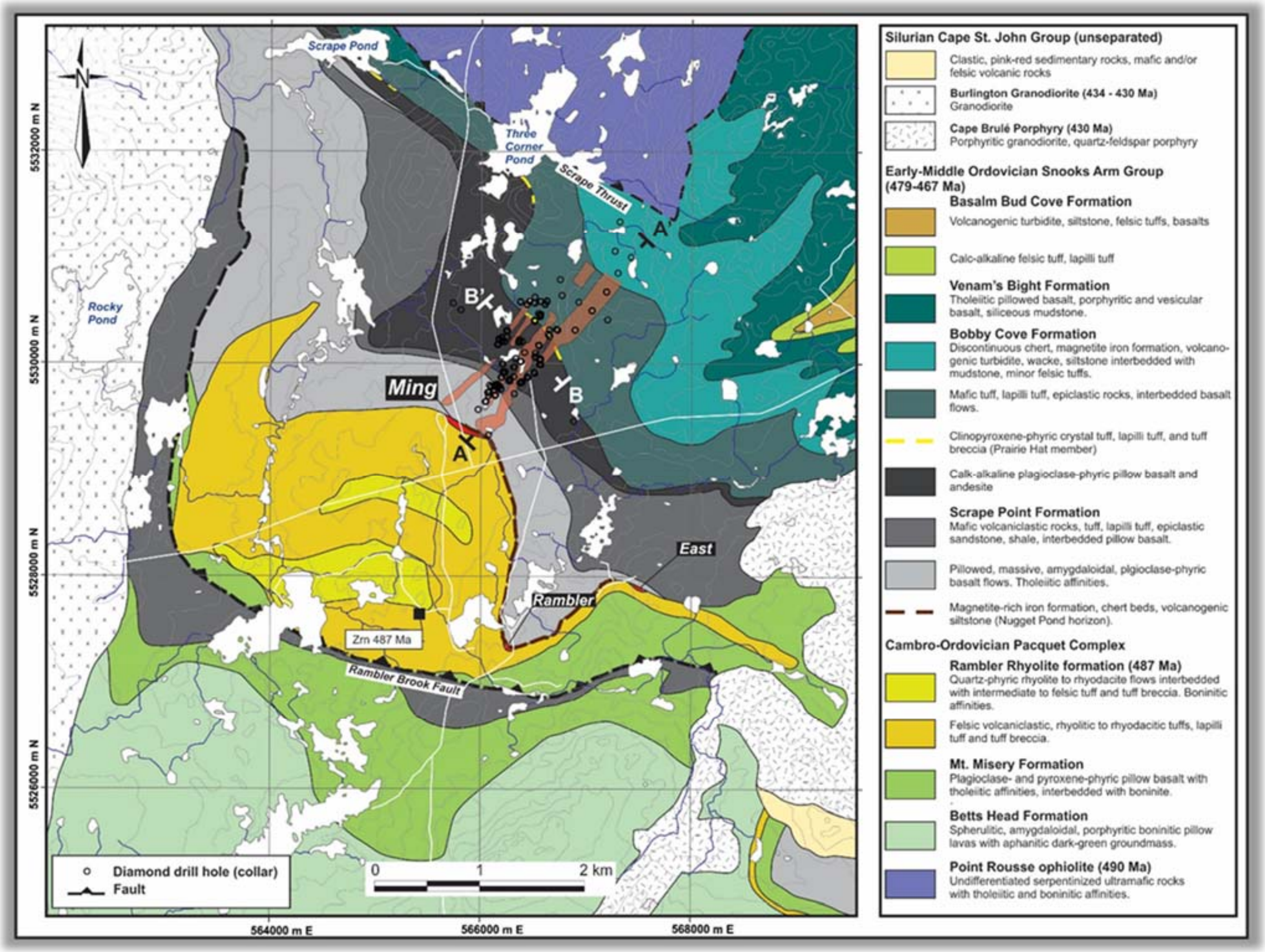
Geology at Rambler has been resolved as two major lithological packages, the Hanging Wall Sequence, and the underlying Mineralized Sequence. The contact between the two is a metre scale zone of significant brittle-ductile shearing which is parallel to the strong C-S fabric in the rocks below. The Hanging Wall Sequence consists mainly of basaltic flows with lesser volcaniclastic and volcanogenic sediments, including minor magnetic iron formation. The underlying Mineralized Sequence consists dominantly of altered and locally mineralized, quartz-phyric felsic volcanic rocks with minor quantities of altered basalt. Local structural fabrics are developed more strongly in the altered rocks of the Mineralized Sequence. Both the Hanging Wall and Mineralized Sequences are cut by significant volumes of gabbroic sills and dykes.

Banded, pyritic massive sulphides on the Ming Massive Sulphide (MMS) Horizon occur directly below the sheared contact separating the Hanging Wall and Mineralized Sequences. More than one horizon of massive sulphide has been intersected in several holes; in these instances the massive sulphide zones are separated by altered, pyritized felsic volcanic or by gabbroic intrusive rocks. Immediately below the MMS there occurs a sericitized-pyritized felsic unit approximately 15 to 20 m thick.

This unit is characterized by the variable presence of green mica and higher than normal gold concentrations. Gold concentrations diminish moving deeper in the stratigraphy and away from the MMS horizon. Below this gold-enriched horizon there occurs a sequence of sericitized-pyritized felsic volcanics 100 m in thickness which separates the mineralization on the MMS horizon from that in the Lower Footwall Zone (LFZ).

The LFZ consists of nebulous zones of disseminated and stringer chalcopyrite-pyrrhotite cutting altered felsic and lesser mafic volcanic rocks. Alteration is dominantly sericitic in less mineralized areas of the zone and distinctly chloritic in areas that contain higher copper concentrations. The gold: copper ratio in the MMS at approximately 1:2. The local geological setting of the deposit in relation to other deposits in the area is shown on Figure 7.2.

Figure 7.2 Local Geology



(Source: Pilote, et al, 2015)

7.3 MINERALIZATION

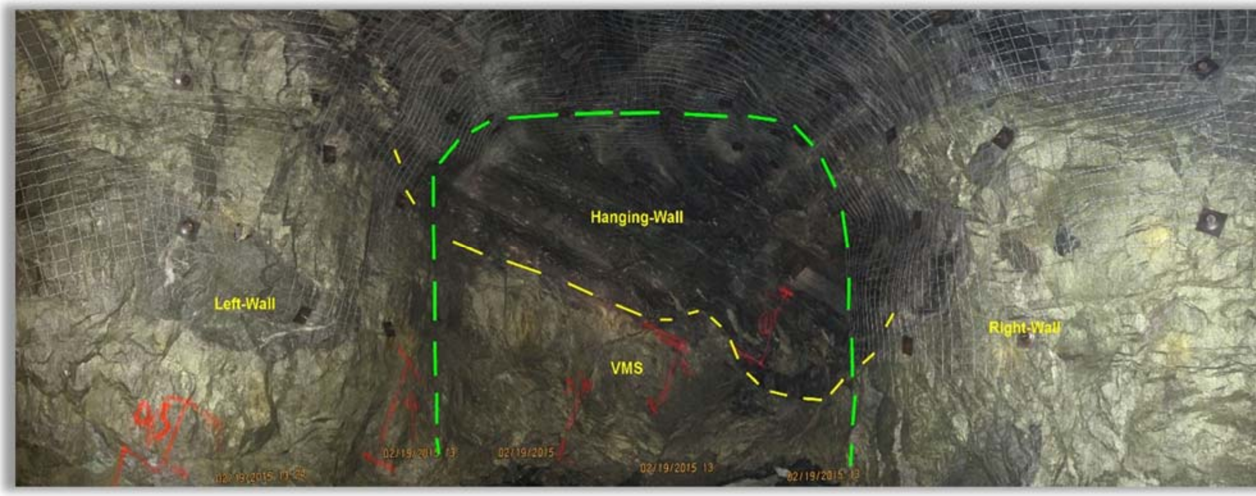
The polymetallic sulphide deposits in the Ming Mine area are known to contain copper, zinc and minor lead, gold and silver along with traces of other metals. Mineralization in the deposits has been classified in the past as either massive sulphide, footwall stringer, or disseminated ore.

More recent exploration on the Ming deposit has identified distinct zones of sulphide mineralization. This, in conjunction with ongoing academic studies, imply a somewhat greater complexity in orogeny of the Ming Mine and other deposits in the area based on distinct alteration and sulphide assemblages, mineralogical and textural variations and the structural setting of mineralization. For the current documentation there remain two dominant types of mineralization in the Ming deposit:

— Stratiform volcanogenic massive sulphide (MMS); and
— Disseminated stringers of sulphides (LFZ).

The MMS is recognized as a horizon which is open at depth, locally up to three metres in thickness with a strike length of at least 100 m. Like other deposits in the area, it follows D2 planar fabric and is roughly parallel to the D2 extension lineation plunging 30 to 35 degrees northeast to a vertical depth of at least 1,000 m. Several textural varieties of mineralization are recognized in the MMS horizon including massive pyrite ore, banded ore, massive chalcopyrite-pyrrhotite ore, and breccia ore (Figure 7.3).

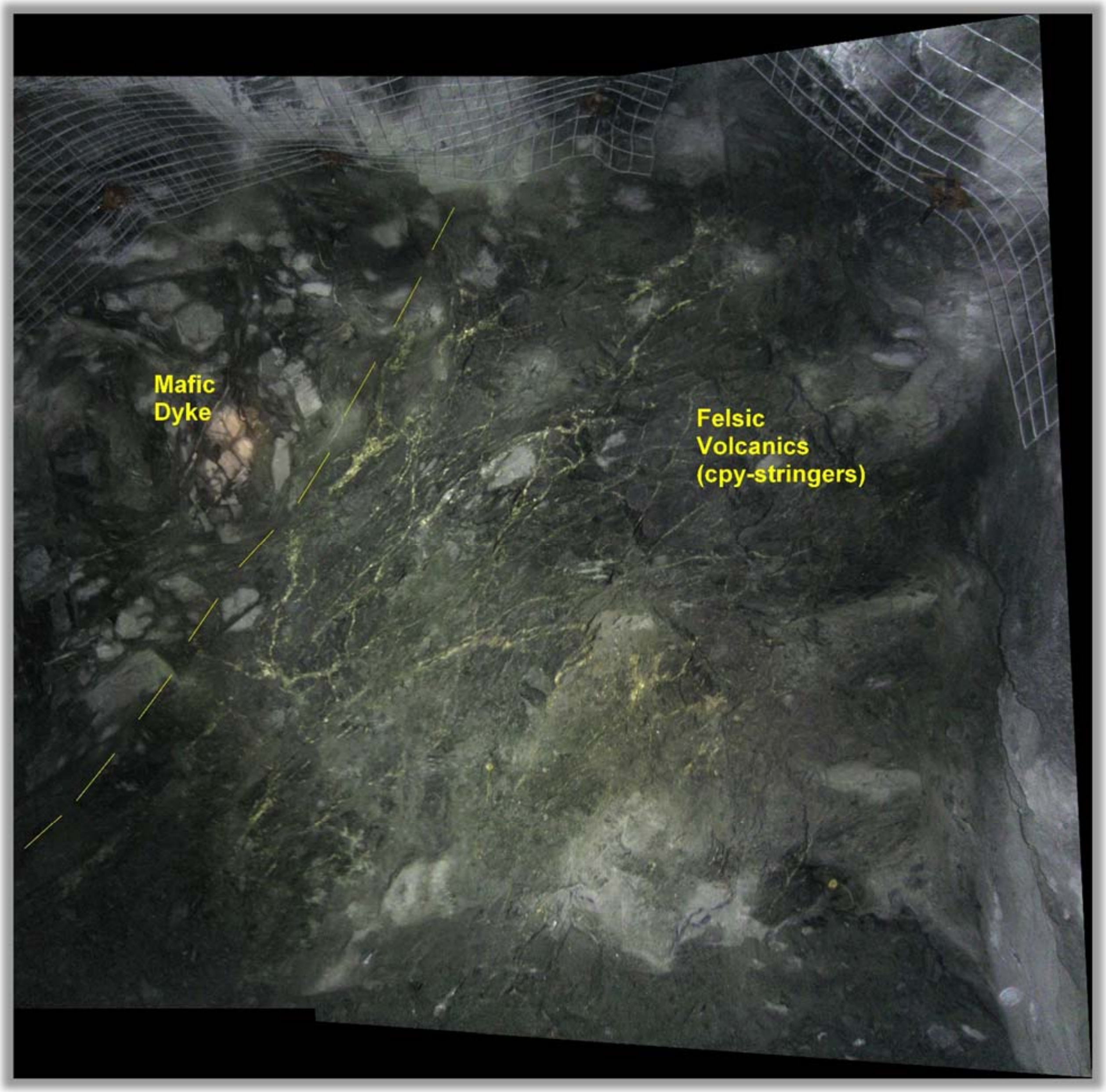
Figure 7.3 MMS Mineralization on 578L



The MMS has three different ore types. Massive pyrite ore, which is less than 70% pyrite, with chalcopyrite and minor amounts of galena, sphalerite, and silicate minerals. Banded ore consists of alternating bands of pyrite and chalcopyrite-quartz-actinolite-biotite. Massive chalcopyrite-pyrrhotite ore occurs as lenses and layers with up to 80% chalcopyrite. Minor amounts of arsenopyrite, galena, tetrahedrite, native gold, tennantite, and cubanite occur locally. There is up to 10% disseminated pyrite in the immediate footwall.

The LFZ is another mineralized horizon that lies approximately 100 metres below the MMS horizon. The LFZ strike length is approximately 1,700 m and has a thickness that varies from 200 m to 290 m. Base metal assays from drilling are variable indicating that there are clusters of chalcopyrite and pyrite / pyrrhotite stringers which are separated by less mineralized rock (Figure 7.4). Gold values in the LFZ are generally less than 0.5 g/t and only trace amounts of zinc have been reported. The LFZ is transected by fine to medium grained basic dykes interpreted as feeder dykes to a mafic sequence in the hanging wall above the MMS.

Figure 7.4 LFZ Mineralization on 1450 L



The LFZ is an alteration zone consisting dominantly of chloritic schist that contains varying percentages of chalcopyrite and pyrite which occur as stringers with lesser amounts of pyrrhotite and sphalerite. The LFZ is parallel to the D2 planar fabric and extension lineation, appears to be conformable to the overlying MMS and as such, can be interpreted as the feeder or stockwork alteration zone to the MMS a relationship consistent with the VMS model. The exact location of the hydrothermal conduit responsible for alteration in the LFZ and mineralization in the overlying MMS has been obscured through deformation; however in its plunge direction the LFZ itself may represent a structural conduit that allowed the ascent of hydrothermal fluid. The extent of the LFZ is unknown as it is open both up and down plunge. Recent drilling has traced mineralization 1,500 m down plunge.

8 DEPOSIT TYPES

The Property is a Noranda-type VMS hosted by Cambrian-Ordovician metavolcanic and metasedimentary rocks of the Pacquet Harbour Group. The style of mineralization, alteration, host rock, and tectonism most closely resembles other VMS deposits throughout the world. This deposit type is referred to as type G06 by the British Columbia Ministry of Energy, Mines and Petroleum Resources Deposit Profiles (www.empr.gov.bc.ca).

Examples of this deposit type include:

- Myra Falls, British Columbia;
- Kidd Creek, Ontario;
- Buchans, Newfoundland;
- Bathurst, New Brunswick;
- Kuroko, Japan.

This deposit type is characterized by the following geologic elements.

- Geological setting:
  - island arc;
  - typically in a local extensional setting or rift environment within, or perhaps behind, an oceanic or continental margin arc Marine volcanism;
  - commonly during a period of more felsic volcanism in an andesite (or basalt) dominated succession;
  - locally associated with fine-grained marine sediments;
  - also associated with faults or prominent fractures.
- Host rock types:
  - submarine volcanic arc rocks: rhyolite, dacite associated with andesite or basalt;
  - less commonly, in mafic alkaline arc successions;
  - associated epiclastic deposits and minor shale or sandstone;
  - commonly in close proximity to felsic intrusive rocks;
  - ore horizon grades laterally and vertically into thin chert or sediment layers called informally exhalites.
- Deposit forms:
  - concordant massive to banded sulphide lens which is typically metres to tens of metres thick and tens to hundreds of metres in horizontal dimension;
  - sometimes there is a peripheral apron of "clastic" massive sulphides.
- Ore mineralogy:
  - upper massive zone: pyrite, sphalerite, galena, chalcopyrite, pyrrhotite, tetrahedrite, tennantite, bornite, arsenopyrite;
  - lower massive zone: pyrite, chalcopyrite, sphalerite, pyrrhotite, magnetite.
- Alteration:
  - footwall alteration pipes are commonly zoned from the core with quartz, sericite or chlorite to an outer zone of clay minerals, albite and carbonate (siderite or ankerite).

9 EXPLORATION

There has been no Property-wide exploration conducted on the Property during the expansion and since the 2015 Technical report (*McCracken, et al, 2015*).

All exploration related to recent and ongoing diamond drilling is disclosed in Section 10 Drilling.

10 DRILLING

From 1977 to 2017 a total of 174,491 m of surface and underground exploration drilling have been completed at the Ming Mine. Historic drilling and more recent drilling completed by Rambler are summarized in Table 10.1.

Table 10.1 Summary of Drilling at Ming Mine

Year	Company	Target	Type	# Holes	Metres
1977-1981	CRML	LFZ	UG	38	7,206
2003	Altius	LFZ	Surface	2	2,838
2004	Altius	LFZ	Surface	2	2,684
2005	RMM	LFZ	Surface	9	10,846
2005	RMM	MS	Surface	3	2,101
2006	RMM	LFZ	Surface	27	29,401
2007	RMM	LFZ	Surface	12	15,151
2007	RMM	MS	Surface	27	18,164
2008	RMM	LFZ	Surface	1	1,263
2008	RMM	MS	Surface	7	4,765
2007	RMM	LFZ	UG	2	427
2007	RMM	MS	UG	6	450
2008	RMM	LFZ	UG	68	14,206
2008	RMM	MS	UG	92	7,512
2009	RMM	MS	Surface	2	1,062
2010	RMM	MS	UG	6	501
2011	RMM	LFZ	UG	2	382
2011	RMM	MS	UG	31	1269
2012	RMM	LFZ	UG	1	1966.2
2012	RMM	MS	UG	41	2,069
2013	RMM	MS	UG	135	8,381
2014	RMM	LFZ	UG	6	921
2014	RMM	MS	UG	63	4,330
2014	RMM	MS	Surface	1	403
2015	RMM	LFZ	UG	21	1,469
2015	RMM	MS	UG	101	8,652
2016	RMM	LFZ	UG	33	3,862
2016	RMM	MS	UG	38	2,680
2017	RMM	LFZ	UG	88	7,083
2017	RMM	MS	UG	94	9,128
2017	RMM	LFZ/MS	Surface	2	3,319
			TOTAL	**961**	**174,491**

10.1 PRIOR OWNERS

From 1977 to 1981 Consolidated Mines Limited (CML) completed 7,206 metres of un-surveyed drilling from underground platforms. There is little documentation available as to the procedures used in the drilling program.

Ming West production ceased due to low copper prices and exhausting of near surface reserves and produced 142,200 short tons at a grade of 3.98% Cu, 0.17 opt Au, and 0.44 opt Ag.

From 2003 to 2004, Altius Minerals drilled a total of 5,522 metres to delineate the down-plunge extensions of the Lower Footwall Zone (LFZ) as well as the Ming Massive Sulphide horizon (MMS).

10.2 RAMBLER METALS & MINING

From 2005 to 2017, Rambler has completed 919 diamond drillholes totaling 161,768 metres to explore and delineate the MMS and LFZ. Core sizes drilled on the Project is a mix of BQ (36.5 mm diameter) and NQ (47.8 mm diameter).

Drilling was completed by a variety of local diamond drilling contractors, based in Newfoundland and Labrador.

10.2.1 2017 SURFACE DRILL

In 2017, Rambler completed surface diamond drillhole with directional drilling technology. The purpose of the program was to test the down plunge extension of the LFZ. A parent hole was drilled to a depth of 1,771 m with a wedge branch drilled to a depth of 1,686 m. The drillhole intersected significant LFZ mineralization, demonstrating that the mineralization can be extended 550 m down plunge from the end of the current mineral resource. The 2017 holes have not been used in the LFZ resource model.

Drilling was completed by Cabo Drilling of Springdale, Newfoundland and Labrador. The directional drilling was completed by Tech Directional of Millertown, Newfoundland and Labrador. All holes were drilled NQ.

Figure 10.1 is an idealized view of the drillhole, the target area, and a summary of the results. Table 10.2 summarizes the results of the 2017 surface program.

Figure 10.1 2017 Surface Drillhole

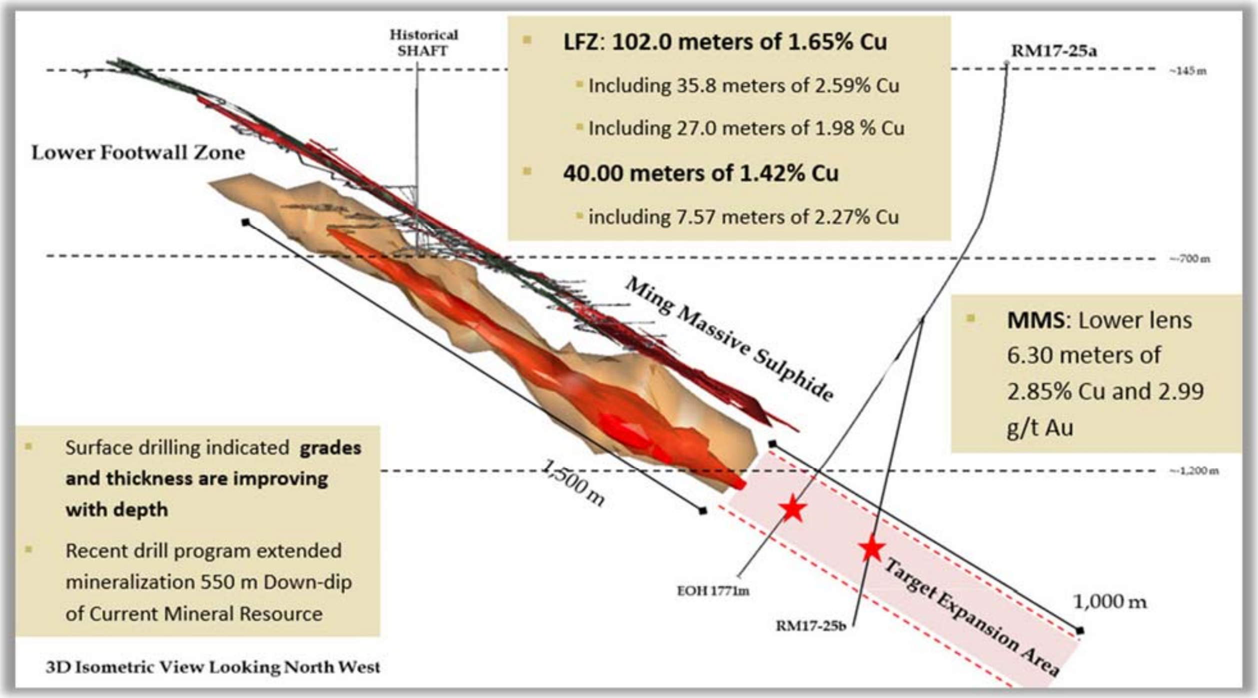


Table 10.2 Summary of Results - 2017 Surface Program

Drillhole	Zone	From (m)	To (m)	Length (m)	Copper (%)	Gold (g/t)	Silver (g/t)
RM17-25a	MMS	1325.11	1326.13	1.02	1.63	1.23	17.51
RM17-25a	MMS	1336.85	1343.15	6.30	2.85	2.99	21.13
RM17-25a	LFZ	1428.00	1433.72	5.72	1.46	0.08	1.25
RM17-25a	LFZ	1449.00	1489.00	40.00	1.42	0.06	1.18
RM17-25a	LFZ	1562.80	1566.54	3.74	1.87	0.13	3.77
RM17-25a	LFZ	1581.00	1591.00	10.00	1.35	0.05	1.84
RM17-25b	LFZ	1481.00	1583.00	102.00	1.65	0.07	1.76

10.3 SURVEYING

10.3.1 COLLAR SURVEY

Surface drill collars were surveyed by the Rambler mine survey crew upon completion of the drill program. The set-ups for the underground drill collars were marked by Rambler mine survey crew, and the drilling contractor were expected to set up properly on line. A Rambler geologist checked the underground drill set-up during the drilling program to ensure accuracy.

10.3.2 DOWNHOLE SURVEY

Downhole surveys are completed using a Reflex EZ-Shot® multi-shot instrument to provide azimuth and dip reading down the hole. Readings were collected on a time basis not distance, resulting in an almost continuous reading downhole. The Reflex EZ-Shot is calibrated at least once a year to ensure accuracy of results.

The entire drill campaigns used Reflex EZ-Shot® single-shot electronic instrument with readings collected at intervals of approximately every 30 m downhole plus a reading at the bottom of the hole.

Directional surface holes completed using Devico® technology could be optimally oriented to accommodate the 35 degree plunge of the MMS and LFZ at depth to provide true widths of mineralization tracing these zones to a vertical depth of at least 1,600 metres.

10.3.3 CORE DELIVERY

Core is placed in wooden core boxes close to the drill rig by the drilling contractor. The core is collected daily by the drilling contractor and delivered to the secure core logging facility on the Ming Mine site. Access to the core logging facility is limited to Rambler employees or designates.

10.3.4 CORE LOGGING PROCEDURE

The following steps are completed during the core logging procedure:

— Sample security and chain of custody start with the removal of core from the core tube and boxing of drillcore at the drill site.

— The boxed core remains under the custody of the drill contractor until it is transported from the drill to the secure onsite core facility (Figure 10.2).

— Core boxes are opened and inspected to ensure correct boxing and labeling of the core by the drill contractor.

— The drillcore is geologically logged, photographed, and then marked and tagged for sampling and splitting.

— Core logging describes variations in lithology, alteration, and mineralization.

— Data associated with core logging and related assay results and other downhole information including orientation surveys are recorded in Fusion™ by Century System.

— Measured parameters include structural orientation with respect to core axis, lost core as a percentage of recovered length, and fracture density which are determined by the intensity and thickness of mineralization at specific intervals.

— Each core sample is assigned a tag with a unique identifying number. Sample lengths are typically one metre, but can be more or less depending on zone mineralogy and boundaries.

— Sample core that is not mineralized is marked in 1.5 metre lengths.

— Wing samples are marked at 0.5 metres, and sampled at the extremities of mineralized intervals to ensure anomalous grades do not continue into the surrounding wall rock.

Figure 10.2 Core Logging Facility

10.3.5 CHIP SAMPLES

Underground sampling at the mine includes chip, channel, grab, and muck sampling as methods that are generally used during the measurement of the grade of rock material in un-mined pillars, rock faces, and the material being excavated as development of the mine continues.

For interval chip and channel sampling:

- Survey points are established at the beginning and end of the interval to accurately locate samples.
- Chip and channel intervals are generally marked perpendicular to the orientation of local geological contacts.
- Chip samples are collected directly from a rock face using a hammer to break off a representative sample of the rock over an interval.
- Channel samples are generally cut as parallel traces over an interval with a rock saw.
- The material between the traces is then chipped out with a hammer to provide a uniform and representative sample of the interval.
- Grab samples are collected as representative samples of material by a geologist to test grade at specific locations.
- Muck and rock samples are collected at a designated area either on surface or underground.

10.3.6 SAMPLING APPROACH

The following is a summary of the Rambler core sampling procedure.

- All sample collection, core logging, and specific gravity determinations are completed by Rambler personnel under the supervision of a professionally qualified registered geologist to meet the requirements of NI 43-101.
- Core marked for splitting is sawn using a diamond core saw with a mounted jig to assure the core is cut lengthwise into equal halves (Figure 10.3).
- Half of the cut core is placed in clean individual plastic bags with the appropriate sample tag.
- QA/QC samples are inserted into the sample stream at prescribed intervals. Full description of the QA/QC program is provided in Section 11.
- The samples are then placed in rice bags for shipment to the offsite laboratories' facility.
- The remaining half of the core is retained and incorporated into Rambler's secure, core library located on the Property.

Figure 10.3 Core Cutting Facility

10.4 QP'S OPINION

It is WSP's opinion that the drilling and logging procedures put in place by Rambler meet acceptable industry standards and that the information can be used for geological and resource modelling.

11 SAMPLE PREPARATION, ANALYSES, AND SECURITY

Rambler follows best practices and methodologies described by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) for the collection of samples and preparation of data that is to be reported under National Instrument 43-101. All exploration that is conducted at the Ming Mine site is completed under the supervision of a registered professional geologist as a Qualified Person (QP) who is responsible and accountable for the planning, execution, and supervision of all exploration activity as well as the implementation of quality assurance programs and reporting.

The following is a summary of the sampling approach and methodology employed by Rambler from 2005 to 2017. The sampling methodologies employed by Consolidated Rambler Mines Limited (CRML) from 1977 to 1981 are not documented.

From 2003 to 2009, two analytical laboratories were used to undertake sample preparation and analytical analyses of Rambler sampled drillcore. Sample preparation and initial analytical analyses was completed by Eastern Analytical Ltd (Eastern) in Springdale, Newfoundland, whereas final analytical analyses were completed by Activation Laboratories Ltd. (Actlabs) of Ancaster, Ontario.

Sample rejects and pulps generated by Eastern during sample preparation are retrieved by Rambler personnel and brought back to the mine and stored on site as a physical record of the samples that were submitted for analysis. The sample pulps returned from Eastern are sent to Actlabs in Ancaster, Ontario for analysis. During the 2003 to 2009 period, Eastern was not ISO certified and could not be considered NI 43-101 compliant. However, quick results from a local laboratory were useful during drilling when grade estimates are required for planning, and the interpretation and generation of exploration targets. Data returned from the analysis of pulps sent to Actlabs were considered final for the purposes of resource calculation in compliance with NI 43-101 specification.

From 2009 to 2017, Eastern was the only laboratory utilized by Rambler for sample preparation and analytical analysis. The diamond drilling completed during this period was predominantly delineation drilling and represents only 4 % of the total drilling completed on the Project since 2003. Rambler's QA/QC program, as outlined further in this report, was strictly adhered to during this period. Since late 2013, the Eastern laboratory has been accredited in accordance with the International Standards ISO/IEC 17025:2005 for a defined scope of procedures. These scope of procedures covers the analytical methods required by Rambler for its operations and follow the best practices described by CIM for the collection of samples and preparation of data that is to be reported under National Instrument 43-101.

Since full production began in early 2012, Rambler has been utilizing both the Eastern laboratory and an in-house laboratory for sample preparation. In addition, the in-house laboratory has been used for base metal analysis for selective samples with the Rambler QA/QC program fully implemented.

11.1 SAMPLE PREPARATION, ANALYTICAL PROCEDURES, AND SECURITY

Samples are delivered to the in-house laboratory at Rambler by Rambler staff or the Eastern laboratory by bonded courier, where the samples are dried, crushed, and pulped. Samples are crushed to approximately -10 mesh and split using a riffle splitter to approximately 300 g. A ring mill is used to pulverize the sample split to 98% passing -150 mesh.

Sample pulps and rejects are picked up at Eastern by Rambler staff and returned directly to the Project site. During the period 2003 to 2009, sample pulps designated for Actlabs were checked, packed, and sent by bonded courier for final analyses. Sample rejects are securely stored at the Rambler site.

11.2 ANALYTICAL METHODOLOGY

Eastern applies a fire assay method followed by acid digestion, and analyses by atomic absorption finish for copper, lead, zinc, nickel, and cobalt analyses. The results received from Eastern during the 2003 to 2009 period were used for initial grade estimates only.

Actlabs used a fire assay fusion followed by acid digestion and analyses by atomic absorption for gold analyses (Actlabs - Code 1A2). If a gold assay exceeded 3,000 ppb and/or silver exceeded 100 ppm a re-analysis of a fire assay fusion with gravimetric finish was conducted (Actlabs - Code 1A3). Other metals were analyzed by applying an acid digestion and 34 element ICP analysis finish (Actlabs- Code 1E3).

The Actlabs Quality System is accredited to international quality standards through International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 17025 (ISO/IEC 17025 includes ISO 9001 and ISO 9002 specifications) with CAN-P- 1579 (Mineral Analysis) for specific registered tests by the Standards Council of Canada (SCC).

11.3 QA / QC PROGRAM

The quality assurance and quality control program and procedures in use at the Property guarantees that exploration data collected adheres to NI 43-101 quality criteria and requirements. Rambler maintains written field procedures and has had independent verifications of aspects such as drilling, surveying, sampling and assaying, database management and database integrity.

As part of the QA/QC program duplicate, blank and standard samples are inserted alternately, one per ten samples.

Analytical control measures in use at the Property involve both internal and external laboratory measures implemented to ensure that data received from outside sources are accurate and reliable. Rambler makes use of the database management program MX Deposit which is very effective and efficient at managing assay data as well as QA/QC tracking and reporting. A representative number of assay certificates were compared to digital assay database for the purposes of this report and no discrepancies were found.

Check assays for the Property are routinely conducted by both the in-house laboratory and Eastern.

A series of three certified copper and gold external standards have been inserted by Rambler staff. These standards and values have been tabulated in Table 11.1.

Table 11.1 Summary of Standard Reference Material

Standard	Cu%	Std Dev.	Au gpt	Std Dev.
CDN-CGS-15	0.451	0.02	0.57	0.06
CDN-CM-2	1.013	0.043	1.42	0.13
CDN-HC-2	4.63	0.26	1.67	0.12

The majority of data plots within two standard deviations of the certified value. Standards CDN-CGS-15 and CDN-CM-2 contain numerous samples that are more than two standard deviations below the accepted value. It is noted that a value average was calculated and demonstrates that copper values for this standard assay are consistently lower than the accepted value. Standard CDN-CGS-10, CDN-CGS-12, CDN-CGS-15, and CDN-HC-2 contained several gold values that exceed two standard deviations from the certified values. Given the high number of assays completed annually, Rambler does not consider the small number of exceedances significant.

Rambler submitted a total of 11,357 samples to both Eastern and Actlabs. The Eastern grades are used for initial reporting purposes, whereas the Actlabs certified results overwrite Eastern results when available and are used for resource estimation purposes. Plots showing the comparative results for copper and gold from Eastern and Actlabs are presented on Figures 11.10 and 11.11. As expected, copper grades compare well, whereas a higher variance exists for gold.

A total of 186 blanks were inserted into the sample stream. The laboratories performed satisfactorily against these blanks.

11.4 STANDARD REFERENCE MATERIAL

Three standards from CDN Laboratories of Vancouver have been purchased and used since 2008. The control charts show accuracy on the top (how close to the expected value) and precision on the bottom (repeatability from one sample to the next).

11.4.1 CDN-CGS-15

The expected copper value for CDN-CGS-15 is 0.451%. Rambler submitted 39 samples between 2008 and 2014, and averaged 0.452%. All samples returned within the acceptable accuracy range and two sample pairings exceeded the precision threshold (Sample 8 and Sample 23). There is an upward shift in the accuracy after Sample 16. There is an unexpected high variability on the precision chart, which is likely attributed to the analytical method and the grade of the standard.

The expected gold value for CDN-CGS-15 is 0.570 g/t. Rambler submitted 39 samples between 2008 and 2014, and averaged 0.563 g/t. All samples returned within the acceptable accuracy and precision range. There is a slight downward drift of the results in accuracy chart. There is an unexpected high variability on the precision chart.

11.4.2 CDN-CM-2

The expected copper value for CDN-CM-2 is 1.013%. Rambler submitted 86 samples between 2008 and 2014, and averaged 0.983%. Six of the samples were mislabelled and removed from the dataset. The first 18 samples in the dataset are biased low and are highly variable. Samples 24 to 30 are all biased high and almost all fail. There is a shift in the data after Sample 29 which is the start of a new batch and likely a recalibration of the analytical instruments.

The expected gold value for CDN-CM-2 is 1.42 g/t. Rambler submitted 86 samples between 2008 and 2014, and averaged 1.358 g/t. Several samples were removed due to mislabelling. There are four failures in the dataset, two at the beginning, which is not uncommon. There is considerable variation in the precision graph, which would indicate the laboratory is having some difficulty with this particular standard. This standard is no longer in use.

11.4.3 CDN-HC-2

The expected copper value for CDN-HC-2 is 4.63%. Rambler submitted 19 samples between 2008 and 2014, and averaged 4.63%. All samples returned within the acceptable accuracy range and one sample pairing exceeded the precision threshold (Sample 11 and Sample 12). Between 2016 and 2017, Rambler submitted an additional 19 samples with an average of 4.79 %. This is influenced by two samples that returned grades over 5%.

The expected gold value for CDN-HC-2 is 1.67 g/t. Rambler submitted 19 samples between 2008 and 2014, and averaged 1.62 g/t. All samples returned within the acceptable accuracy and precision range.

11.4.4 CDN-CM-18

The expected copper value for CDN-CM-18 is 2.42%. Rambler submitted 57 samples between 2016 and 2017, and averaged 2.45% when one of the failed samples (11.6%) is removed from the dataset.

11.5 BLANKS

A total of 83 samples were submitted as blanks from 2008 to 2014. A total of 69 samples were submitted between 2016 and 2017.

11.6 DUPLICATES

A total of 113 pulp duplicate samples were processed for copper between 2008 and 2014 and 69 duplicates were submitted between 2016 and 2017. There is a strong correlation between the original and duplicates with only one sample above 100 ppm exceeding the + /- 20% threshold resulting in a R^2 value of 0.998

11.7 QP'S OPINION

It is WSP's opinion that the sample preparation and analytical procedures used on the Property meet acceptable industry standards and that the information can be used for geological and resource modelling.

12 DATA VERIFICATION

Rambler carries an ongoing validation process of the diamond drill files. The Qualified Person (QP) has reviewed the process. The QP carried out an extensive internal validation of the diamond drillhole file against the original drillhole logs and assay certificates in 2015. Data verification was completed on collar coordinates, end-of-hole depth, down-the-hole survey measurements, lithology codes, and 'from' and 'to' intervals. Errors rates were generally less than 1%; any issues were identified to Rambler and corrected within the master database.

All assays entered in the database as being below detection limit with a "<" sign were converted to half the detection limit and were not considered to be errors in the data. Intervals with absent data remained as absent within the database.

The QP imported the drillhole data into the Geovia Surpac™ program, which has a routine that checks for duplicate intervals, overlapping intervals, and intervals beyond the end-of- hole. The errors identified in the routine were checked against the original logs and corrected.

The QP has visually observed the diamond drill set-ups underground.

The QP collected twenty-six independent samples of mineralized drill core were collected for check assaying representing typical mineralization grade ranges in 2015. The core was squared using a core saw and placed in plastic sample bag with sample numbers assigned by the QP. The samples were sent to ALS in Sudbury, Ontario for preparation and analysis. The same procedures used by Rambler for preparation and analysis were used by the QP.

ALS is accredited to international quality standards through ISO/IEC 17025 (ISO/IEC 17025 includes ISO 9001 and ISO 9002 specifications) with CAN-P-1579 (Mineral Analysis).

The results of the validation check samples for copper, gold, silver, and zinc indicate that the results of the check samples are mineralized and emphasize the highly variable nature of the grade distribution, which is typical for mineralization of this style. (Table 12.1).

12.1 QP'S OPINION

WSP believes the sampling practice of Rambler meets current industry standards. WSP also believes that the sample database provided by Rambler and validated by WSP is suitable to support the resource estimation.

Table 12.1 2015 LFZ Check Assay

BHID	From	To	Rambler					WSP				
			Sample ID	Cu (%)	Au (g/t)	Ag (g/t)	Zn (%)	Sample ID	Cu (%)	Au (g/t)	Ag (g/t)	Zn (%)
RMUG08-114	149.1	150.1	26822	0.937	0.075	1.00	0.0174	J350941	1.180	0.065	2.00	0.0250
RMUG08-114	168.4	169.4	26843	1.820	0.183	1.90	0.0525	J350942	2.660	0.324	3.00	0.0830
RMUG08-114	182.7	183.7	26859	1.450	0.213	1.70	0.0326	J350943	1.395	0.160	1.00	0.0420
RMUG08-33	82.3	83.2	20805	1.590	0.074	1.50	0.1430	J350944	1.335	0.073	1.00	0.1430
RMUG08-33	117.2	118.2	20839	2.540	0.151	1.70	0.0080	J350945	2.060	0.100	1.00	0.0080
RMUG08-33	128.9	129.9	20848	1.450	0.093	1.10	0.0093	J350946	2.060	0.105	2.00	0.0130
RMUG08-33	134.4	135.9	20855	1.890	0.109	1.50	0.0093	J350947	2.140	0.084	1.00	0.0110
RMUG08-47	150.8	151.8	22152	1.150	0.075	1.10	0.0233	J350948	0.807	0.099	1.00	0.0220
RMUG08-47	170.7	171.7	22173	1.500	0.112	1.50	0.0103	J350949	1.965	0.103	2.00	0.0140
RMUG08-47	182.6	183.8	22182	1.440	0.096	1.70	0.0116	J350850	1.525	0.106	1.00	0.0140
RMUG08-47	189.6	190.6	22189	2.930	0.243	3.60	0.0153	J350851	2.710	0.198	4.00	0.0160
RMUG08-79	220.8	221.8	24933	2.170	0.085	1.80	0.0094	J350852	1.820	0.082	2.00	0.0100
RMUG08-79	232.8	233.8	24946	1.230	0.131	1.10	0.0072	J350853	1.460	0.101	2.00	0.0090
RMUG08-79	238.8	239.8	24953	1.620	0.093	1.40	0.0104	J350854	1.480	0.085	2.00	0.0120
RMUG08-79	250.8	251.8	24966	3.730	0.662	3.60	0.0132	J350855	2.940	0.196	4.00	0.0140
RMUG12-185	34.5	35.5	64421	2.080	0.086	1.30	0.0600	J350856	2.850	0.120	2.00	0.0800
RMUG12-185	82.6	83.6	64472	6.100	0.307	4.40	0.0670	J350857	6.530	0.311	6.00	0.0740
RMUG12-185	86.6	87.6	64476	3.600	0.107	3.10	0.0210	J350858	4.820	0.166	4.00	0.0430
RMUG12-185	98.6	99.6	64489	2.140	0.102	1.60	0.0079	J350859	2.780	0.120	4.00	0.0150
RMUG12-190	63.0	64.0	62303	1.560	0.090	1.00	-	J350860	1.440	0.067	1.00	0.0070
RMUG12-190	92.0	93.0	62332	2.490	0.140	1.60	-	J350861	2.590	0.104	2.00	0.0170
RMUG12-190	100.0	101.0	62341	1.340	0.050	1.30	-	J350862	1.370	0.040	<1	0.0130
RMUG12-190	122.0	123.0	62365	1.840	0.130	1.80	-	J350863	1.845	0.184	2.00	0.0140
RMUG14-251	111.9	112.2	129359	1.130	-	-	-	J350864	1.055	0.066	1.00	0.0130
RMUG14-251	133.3	134.1	129375	1.260	-	-	-	J350865	0.633	0.131	<1	0.0140
RMUG14-251	157.0	158.0	129404	1.630	-	-	-	J350866	1.440	0.099	3.00	0.0110
RMUG14-251	193.0	194.0	129428	2.110	-	-	-	J350867	2.430	0.138	2.00	0.0190

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 INTRODUCTION

Bench scale metallurgical testing has been completed on the Ming Massive Sulphide (MMS) and Lower Footwall Zone (LFZ) of the Property. In addition, operational data from the Nugget Pond concentrator since 2012, processing both ore types is available and was used as the basis for concentrator metallurgical performance in this study.

13.2 MINERALOGY OF LOWER FOOTWALL AND MASSIVE SULPHIDE ZONES

In 2007, Rambler submitted three metallurgical samples to SGS Mineral Services for detailed mineralogical examination using the QEMSCANTM method (*SGS, 2007*).

The three samples were identified as 1807 Zone, MMS, and LFZ. The 1807 and MMS samples are dominated by massive sulphide mineralization, while the LFZ sample consists mainly of stringer sulphides in chlorite and quartz gangue.

In the 1807 and MMS samples, copper occurred almost exclusively as chalcopyrite ($CuFeS_2$) with trace enargite (Cu_3AsS_4). Trace tetrahedrite ($(Cu,Fe)_{12}Sb_4S_{13}$) was also identified in the 1807 Zone. Zinc occurred exclusively as sphalerite ((Zn,Fe)S) in the 1807 and MMS samples. Iron sulphides were the most abundant mineral group in the 1807 and MMS samples, occurring mainly as pyrite (FeS_2). Trace galena (PbS) was found in both the 1807 and MMS samples while trace arsenopyrite (FeAsS) occurred in the 1807 Zone sample. There were only small amounts of non-sulphide minerals observed in the 1807 and MMS samples including quartz with trace micas, chlorites and carbonates.

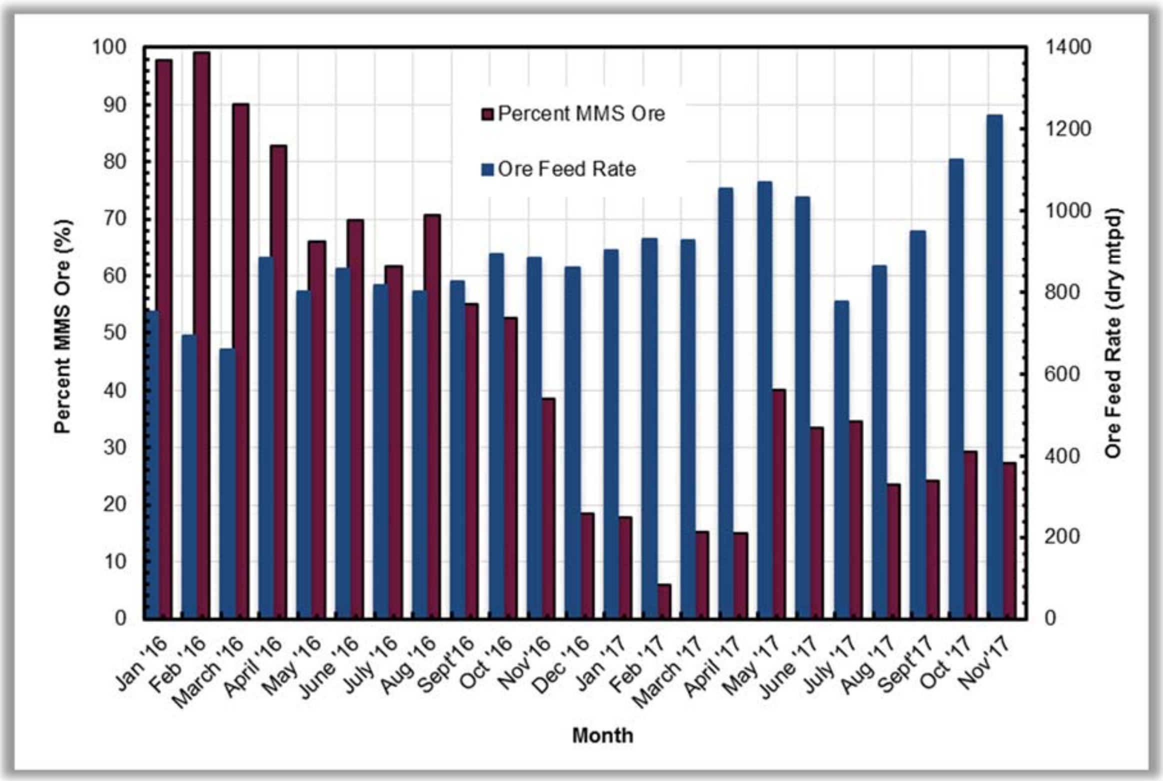
The LFZ sample contained copper exclusively as chalcopyrite. Iron sulphides made up only 3.5% of the LFZ sample occurring as roughly equal amounts of pyrite and pyrrhotite ($Fe_{1-0.8}S$). There was no significant sphalerite content in the LFZ sample and other sulphide minerals did not occur in significant amounts. The most abundant mineral in the LFZ sample was chlorites, followed closely by quartz. Other non-sulphides included minor feldspars, micas, oxides and trace amphiboles.

13.3 RECENT NUGGET POND CONCENTRATOR METALLURGICAL PERFORMANCE (2016 – 2017)

13.3.1 ORE BLEND AND FEED RATE

The timeframe of January 2016 to present was selected to assess the Nugget Pond concentrator grade-recovery performance, since this is when the feed to the mill transitioned from 100% MMS to a blend of MMS and LFZ feed. The assessment in this section is based on monthly average plant data. The transition to a blended ore feed and the increase in throughput is shown on Figure 13.1. The average ore blend over the entire 23-month period was 43% MMS and 57% LFZ, which is a reasonable representation of the anticipated upcoming average mill feed blend. Higher throughput tests were first conducted in April and May 2017 after commissioning mill upgrades including cyclone feed pumps, cyclones, process water distribution, and modified launders. During 2016 and 2017, the milling rate generally matched the rate at which the ore was mined. An increase in mine production in November 2017 allowed for mill operation near the target 1,250 dry tpd for most of the month.

Figure 13.1 Monthly Ore Blend Composition and Mill Feed Rate 2016-2017



13.3.2 MONTHLY RECOVERY TRENDS

Average monthly recoveries of copper, gold and silver are shown on Figures 13.2 and 13.3. The copper recovery was relatively consistent except for April and May 2017. During those two months, mill upgrade commissioning was in progress and an ore crush size of ¾" was being used. That crush size combined with higher throughputs caused a coarser than normal grind size and subsequent drop in recovery. After that, the crush size was reduced to ½" to feed the grinding circuit, leading to finer grind sizes and improved recoveries. An assessment of the average plant recovery and effect of variables on plant operation is shown on Figure 13.2, excluding the months of April and May 2017 that were affected by commissioning and the coarse crush size.

On Figures 13.2 and 13.3, there was no noticeable change in copper recovery as the ore blend changed over the period. The gold and silver recoveries dropped during the months when there was the least amount of MMS in the feed blend. There is less gold and silver available to recover in the LFZ. Figure 13.4 shows the correlation between gold and silver head grades and percentage of MMS ore in the feed blend.

Figure 13.2 Monthly Average Nugget Pond Recoveries in 2016

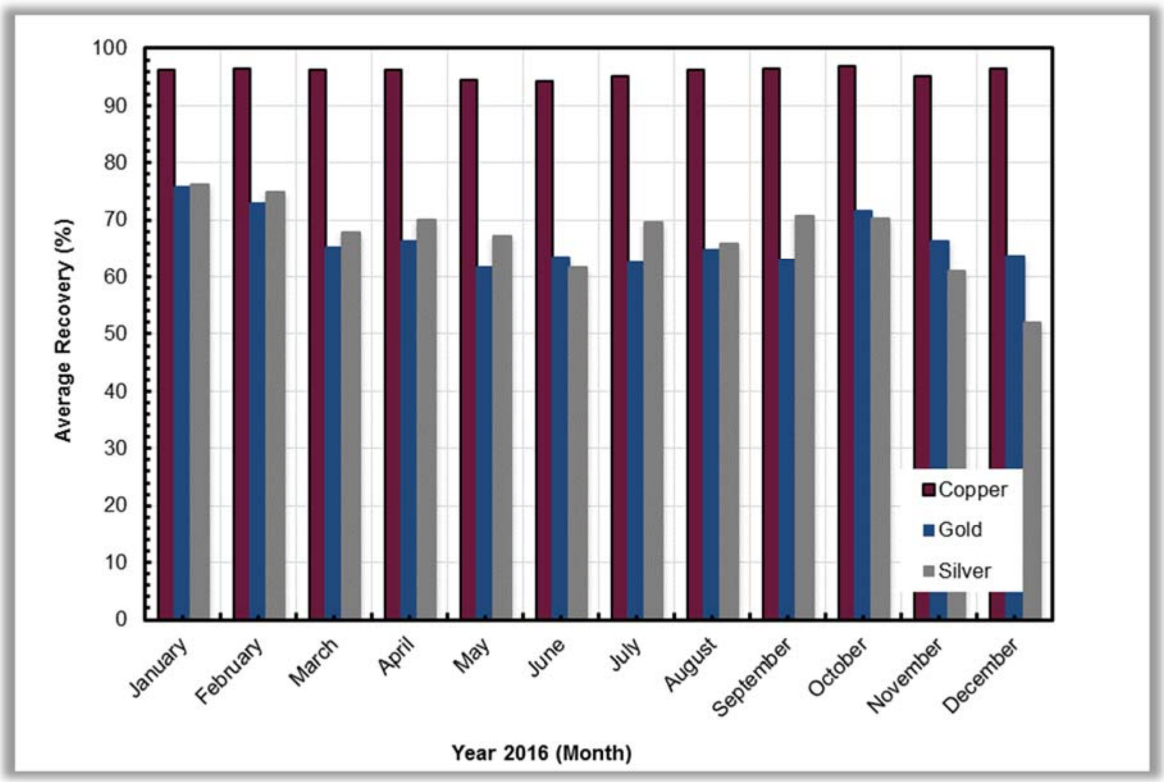


Figure 13.3 Monthly Average Nugget Pond Recoveries in 2017

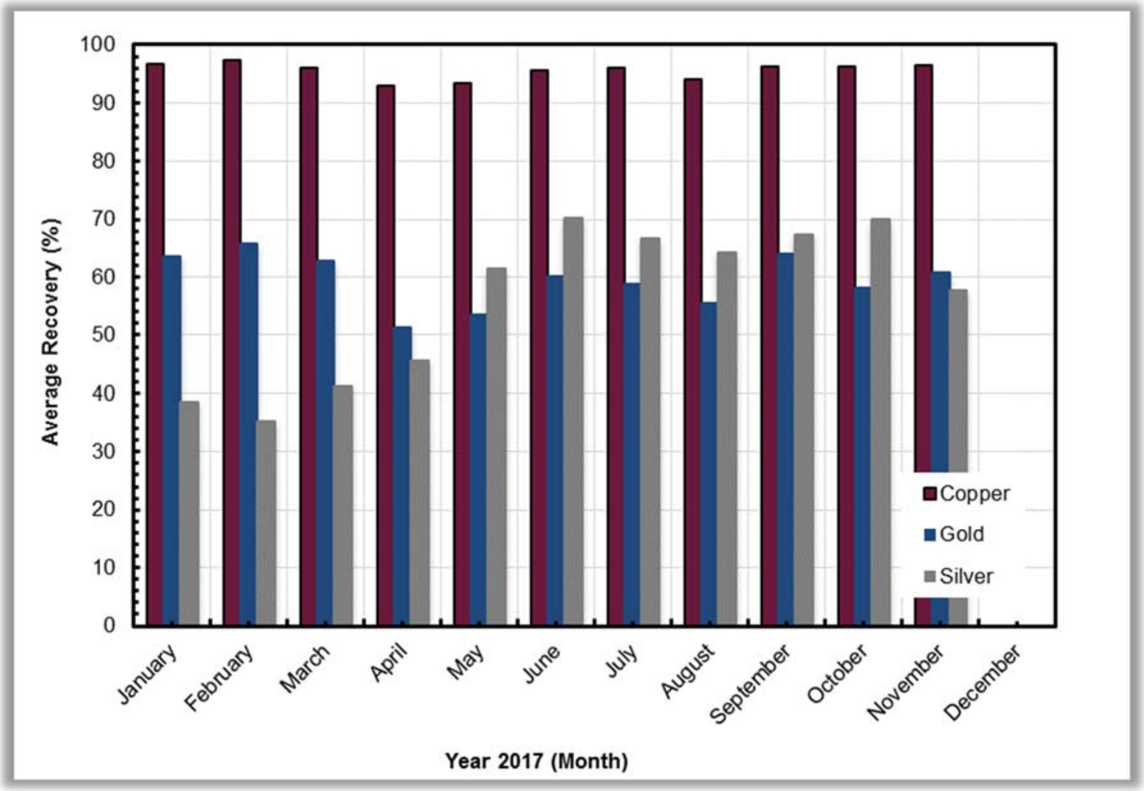
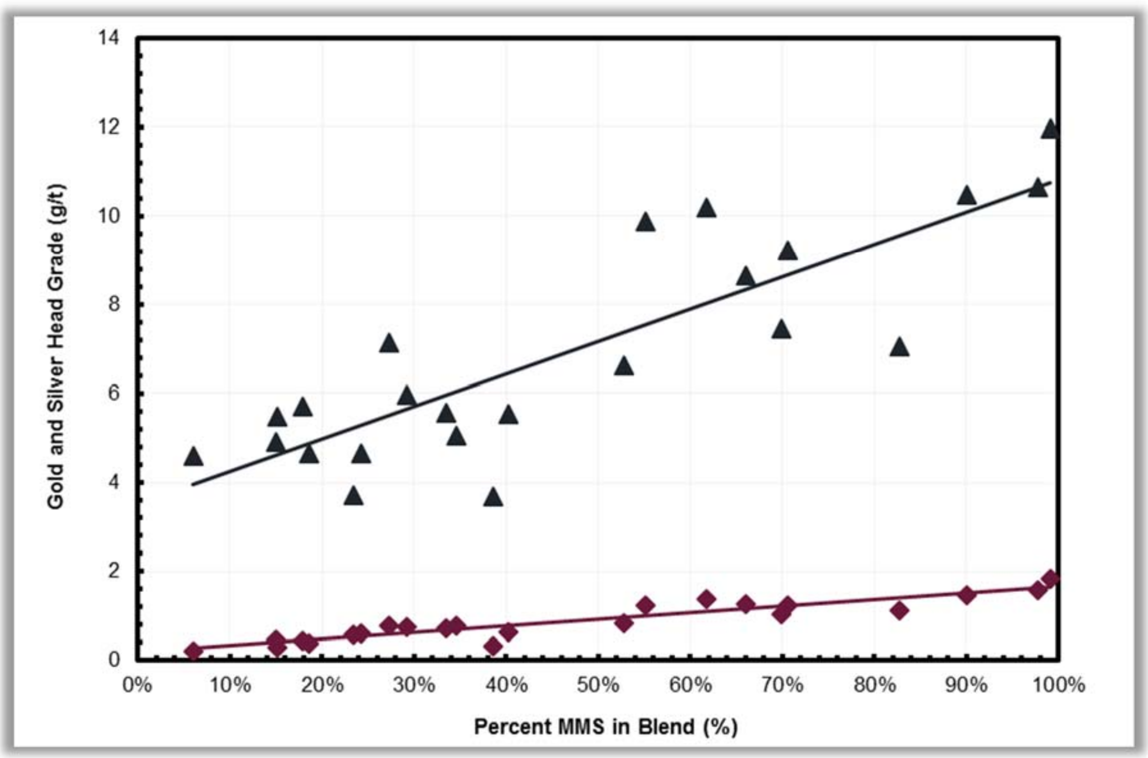


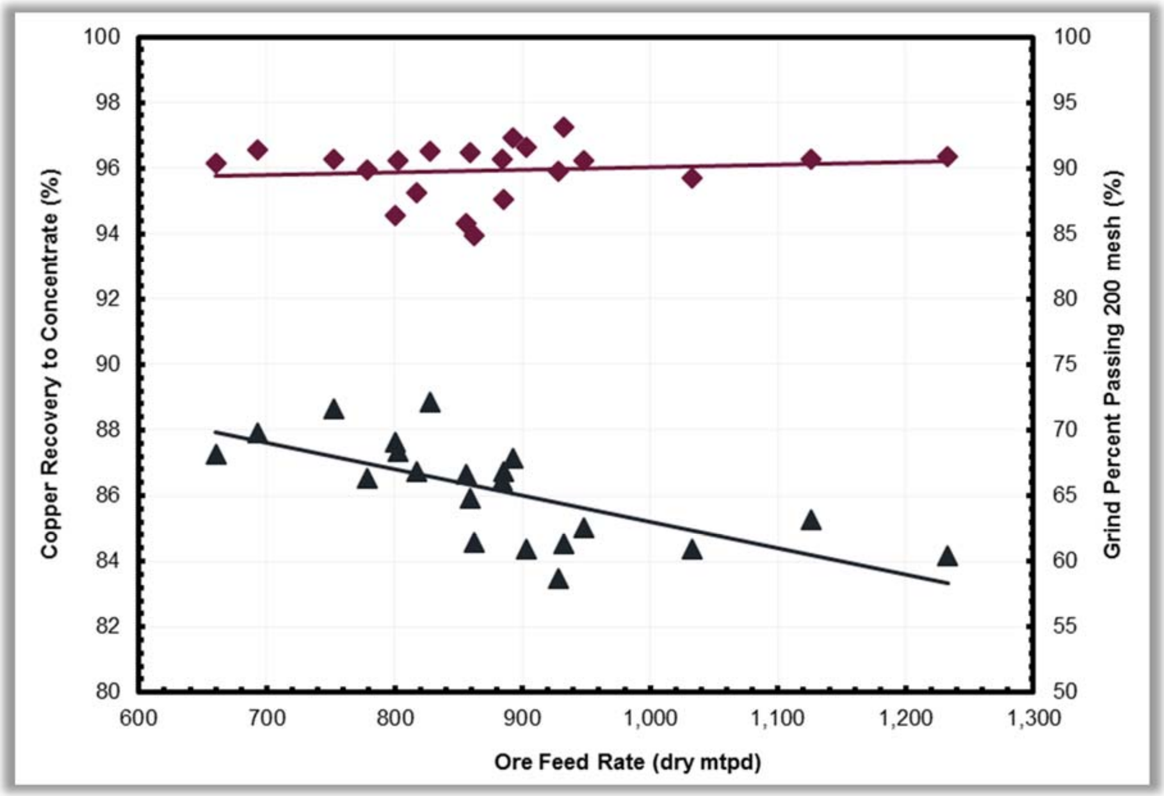
Figure 13.4 Relationship between Ore Blend MMS Content and Gold/Silver Grades 2016-2017



13.3.3 EFFECT OF THROUGHPUT AND HEAD GRADES ON RECOVERIES

Figure 13.5 shows that the grind became moderately coarser as the ore feed rate to the mill was increased, however, the copper recovery did not change. The grind size stayed finer than about 60% passing 200 mesh which is about equivalent to the target grind size of 80% passing 120 micron determined in bench scale testing.

Figure 13.5 Grind Size and Copper Recovery with Varying Ore Feed Rate 2016-2017



Figures 13.6 to 13.8 show the effect of head grades on recoveries in the Nugget Pond concentrator in 2016 and 2017. Copper recovery did not vary with head grade. Gold and silver recoveries increased as head grades increased. These relationships can be used to estimate gold and silver recoveries with varying feed grades to the mill.

Figure 13.6 Copper Recovery Variation with Head Grade 2016-2017

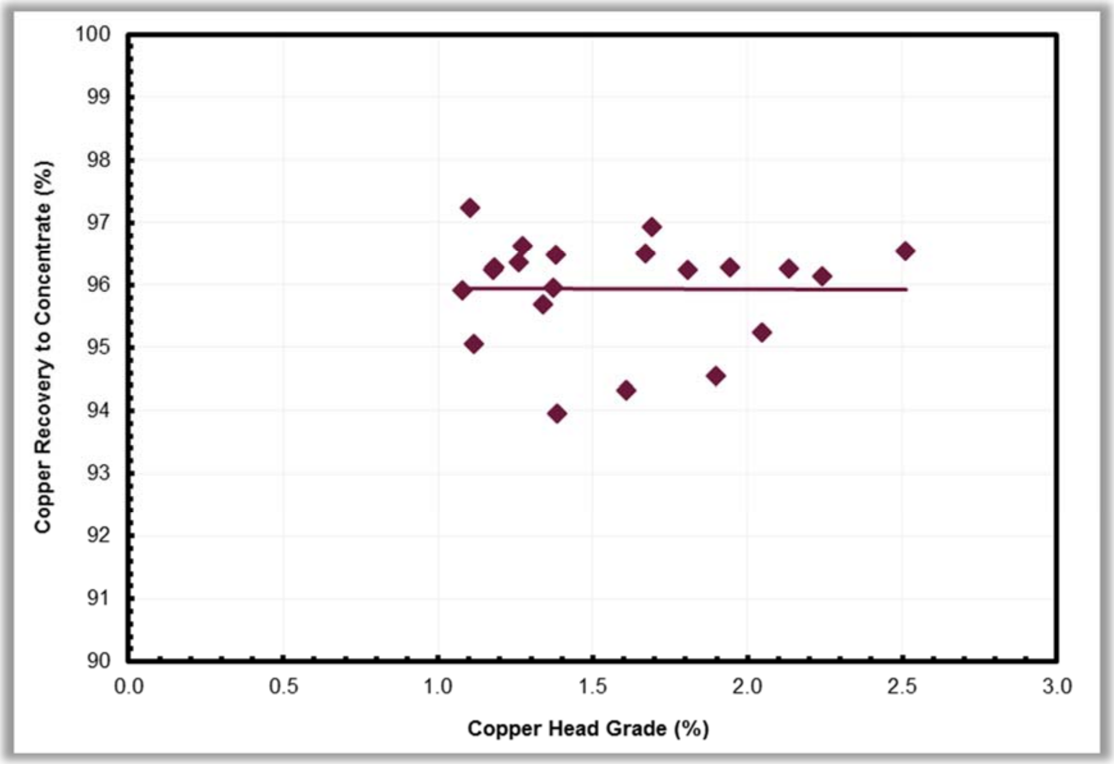


Figure 13.7 Gold Recovery Variation with Head Grade 2016-2017

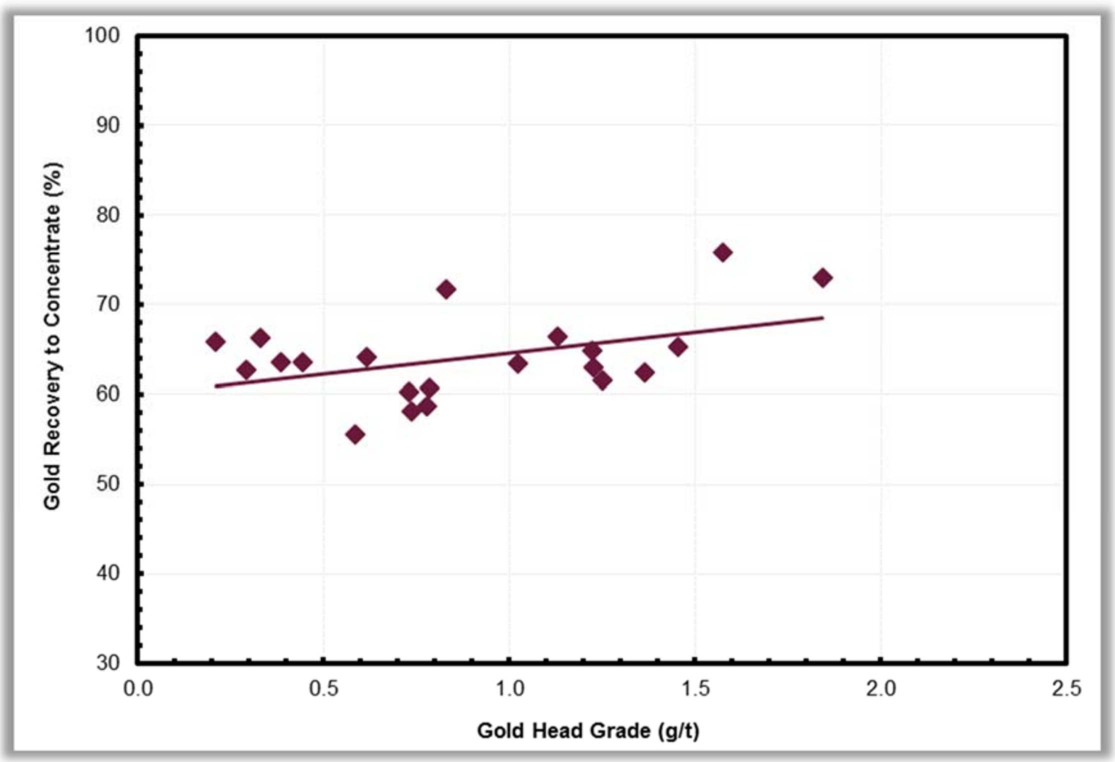
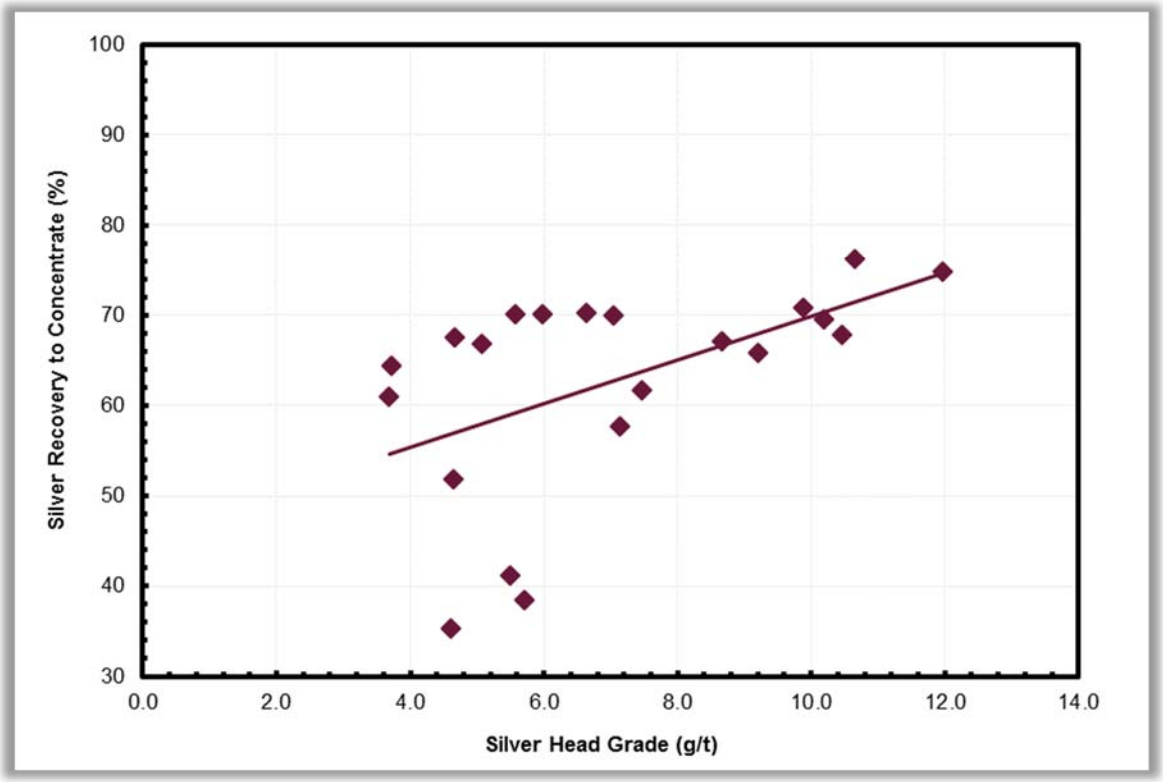


Figure 13.8 Silver Recovery Variation with Head Grade 2016-2017



13.3.4 AVERAGE CONCENTRATOR GRADE AND RECOVERY – BASIS FOR STUDY

Since the concentrator copper recovery performance was not observed to vary as the MMS/LFZ ore blend changed, or as the throughput increased up to 1,250 dry tpd, the weighted average grade and recovery performance was compiled for 2016 and 2017. The results presented in Table 13.1 are to be used as the basis for average metallurgical performance in this technical report.

Table 13.1 Average Grades and Recoveries - Nugget Pond Concentrator 2016-2017

Average Feed Grade			Average Concentrate Grade			Weighted Average Recovery		
Copper (%)	Gold (g/t)	Silver (g/t)	Copper (%)	Gold (g/t)	Silver (g/t)	Copper (%)	Gold (%)	Silver (%)
1.54	.86	6.90	27.7	10.9	83.5	96.0	65.4	66.2

***Note**: Gold and silver grades and recoveries in the concentrate will vary as the grade of gold and silver change in the feed.*

Although the concentrator has not operated for an extended period at 1,250 tpd, the daily data for November 2017 was compared to the 2016-2017 average performance in Table 13.1. During November 2017, the dry tonnes per day processed exceeded 1,200 tonnes for 22 days of the month, with an average throughput for the 22-day period of 1,261 dry tpd. The average copper recovery of the same period was 96.3% at a concentrate grade of 28.5%, for feed blends ranging from 25% to 50% MMS ore. The performance above 1,250 average tonnes per day in November 2017 is in good agreement with the longer-term averages of Table 13.1.

13.4 METALLURGICAL TESTING OF LOWER FOOTWALL ZONE AND MASSIVE SULPHIDE BLENDS (2016-2017)

13.4.1 BACKGROUND

A campaign of dense media separation (DMS) demonstration plant trials were conducted at the Nugget Pond site in the fall of 2016, as outlined in the Thibault & Associates Inc. report, *Assessment of 2016 DMS Demonstration Plant Trial at Nugget Pond*, January 20, 2017. A bench scale flotation test program was also conducted in the spring of 2017 to assess the effect of grind size on the rougher flotation of a blended LFZ/MMS feed, as reported in *Bench Scale Flotation Reagent and Grind Size Test Program*, August 24, 2017 by Thibault & Associates Inc.

13.4.2 DENSE MEDIA DEMONSTRATION PLANT TRIALS

For the purposes of this Technical Report update, dense media separation (DMS) is described as part of the metallurgical testing that has been completed on the ore materials produced from the Ming Mine. While the technical results of this testing have been positive, DMS is not a part of the metal recovery process or of the economic modelling herein, but remains as an opportunity that is discussed in Section 25.1. DMS testing programs are presented in this report in chronological order, from latest to earliest.

The DMS demonstration plant at Nugget Pond was operated from September 5 to December 1, 2016, and a total of 2,321 wet tonnes of feed was processed at an average feed rate of 5.1 wet mtph. Three different feeds were tested: LFZ ore, MMS ore from the 1807 Zone, and a 1:1 blend of LFZ and MMS. The results in Table 13.2 show that the upgrading performance was similar for the LFZ, 1807, and the blend of the two. Although the 1807 ore was considered massive sulphide, there was sufficient low-density dilution rock that could be rejected by DMS. The 2016 results are also comparable to the test results that were achieved during the initial operation of the DMS demonstration plant in 2015 (see Section 13.5.5).

Table 13.2 Overall DMS Demonstration Plant Results Various Feed Sources in 2016 compared to 2015

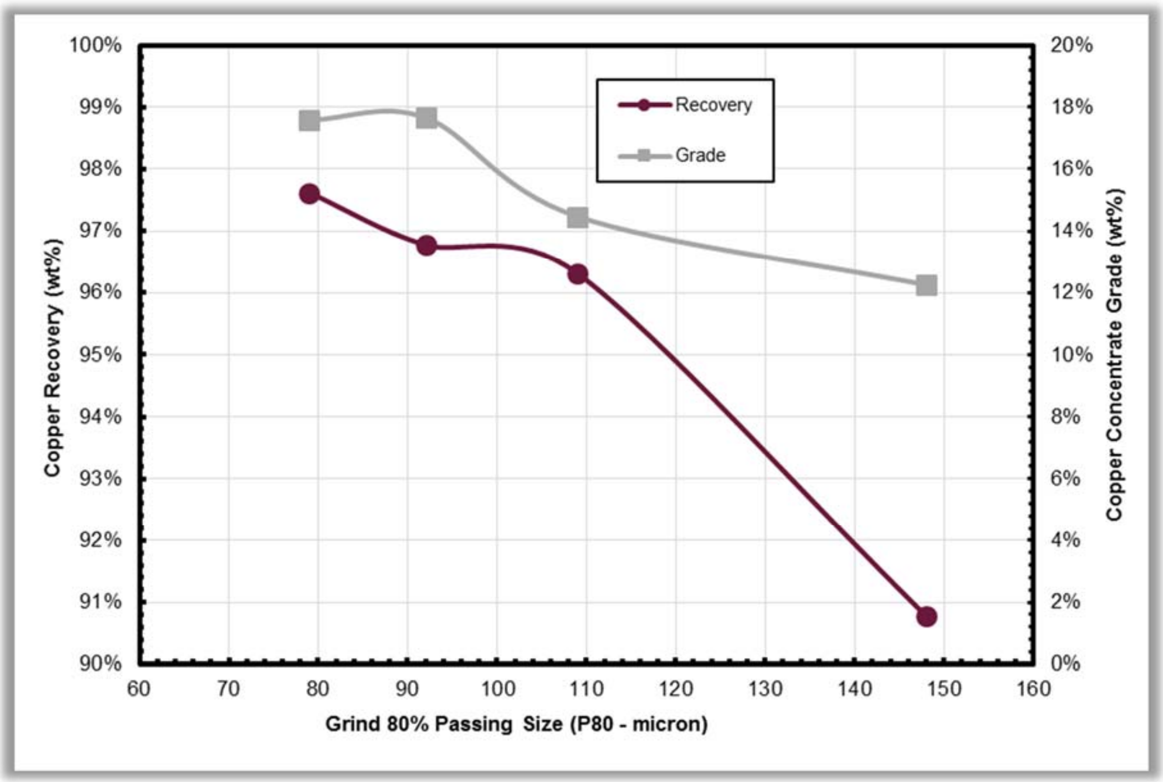
Ore Source (Zone)	Copper Head Grade (wt%) (Calc.)	Copper Pre-concentrate Grade (Sinks + Fines)	Overall Copper Upgrade Factor (Sinks + Fines)	Overall Copper Recovery (Sinks + Fines)	Overall Mass Recovery (Sinks + Fines)
LFZ (2016)	0.63%	0.91%	1.43	96.2%	67.6%
LFZ/1807 (2016)	0.90%	1.33%	1.46	92.3%	63.9%
1807 (2016)	0.70%	0.94%	1.32	94.2%	72.0%
Avg. 2016	0.80%	1.14%	1.42	93.6%	66.7%
LFZ (2015)	1.28%	1.80%	1.41	92.9%	66.9%

13.4.3 BENCH SCALE ROUGHER FLOTATION TESTS

In May of 2017, bench scale rougher flotation tests were conducted by Thibault & Associates Inc. on a sample of crushed ore feed from the Nugget Pond SAG mill feed. The sample was reported to be a blend of LFZ and MMS material. The purpose of the test program was to evaluate different grind sizes to determine when the grind size becomes too coarse to provide adequate liberation of minerals for efficient recovery by flotation.

The rougher flotation copper grade and recovery results are shown on Figure 13.9. The results show that with a grind size P_{80} of 120 micron or finer, the copper recovery in the rougher flotation stage was at least 95%. Rather than keeping the original design grind size target P_{80} of 75 micron, the strategy for a Nugget Pond throughput increase to 1,250 tpd was based on a coarser grind size P_{80} of 120 micron. Plant trials were subsequently conducted throughout 2017 (Section 13.3) to confirm copper grade and recovery at coarser grind sizes when operating the existing grinding circuit at higher throughput without expanding the available milling capacity.

Figure 13.9 Bench Scale Flotation Copper Grade and Recovery with Varying Grind Sizes



13.5 METALLURGICAL TESTING OF LOWER FOOTWALL ZONE SAMPLES (2007 – 2015)

13.5.1 BACKGROUND

In 2007, preliminary batch flotation testing was undertaken, including an initial characterization of a single sample from the LFZ. The testing was conducted by SGS Canada Inc. and the results were presented in a report titled, *An Investigation into the Recovery of Base Metals from Ore Samples of the Ming Deposit*, dated November 12, 2007. Testing of upgrading of a Lower Footwall metallurgical sample was conducted in 2012 using conventional gravity separation methods as described in the report entitled, *Ming Footwall Gravity Separation Circuit Phase 1: Bench Scale and Pilot Scale Characterization*, dated April 13, 2012 by Thibault & Associates Inc. In 2014, a test program was conducted to assess pre-concentration by dense media separation as well as flotation for copper recovery from the LFZ, as described in the report entitled, *Recovery of Copper from Rambler Footwall Zone Ores - Bench Scale Process Characterization and Economic Assessment*, dated September 16, 2014, by Thibault & Associates Inc. A 2015 test program for the LFZ included locked cycle flotation testing, demonstration scale assessment of dense media separation and sensor-based ore sorting testing, as described in the report by Thibault & Associates Inc., *Ming Mine Footwall Development Dense Media Separation Demonstration Program*, December 1, 2015.

13.5.2 BATCH FLOTATION TESTING (SGS 2007)

SAMPLE DESCRIPTION

Rambler selected and provided the LFZ sample for testing. Table 13.3 summarizes some of the key head assay data for the LFZ sample used in the test program, while a trace element scan of the sample is shown in Table 13.4.

Table 13.3 Head Assay Data for 2007 Lower Footwall Zone Test Program Metallurgical Sample

Head Analysis						
Fe (wt%)	Cu (wt%)	Pb (wt%)	Zn (wt%)	S (wt%)	Ag (g/tonne)	Au (g/tonne)
11.0	2.31	0.013	0.015	3.2	2.6	1.26

Table 13.4 Trace Element Analysis for 2007 Lower Footwall Zone Metallurgical Sample

Element	Units	Value	Element	Units	Value
Al	mg/kg	5300	**Mo**	mg/kg	5
As	mg/kg	< 30	**Na**	mg/kg	3900
Ba	mg/kg	53	**Ni**	mg/kg	49
Be	mg/kg	< 0.08	**P**	mg/kg	210
Bi	mg/kg	< 200	**Re**	mg/kg	0.2
Ca	mg/kg	5300	**Sb**	mg/kg	< 60
Cd	mg/kg	< 2	**Se**	mg/kg	42
Co	mg/kg	57	**SiO_2**	%	8.84
Cr	mg/kg	110	**Sn**	mg/kg	< 20
Hg	mg/kg	< 0.3	**Sr**	mg/kg	24

(table continues on next page)

Element	Units	Value	Element	Units	Value
In	mg/kg	< 200	**Ti**	mg/kg	1900
K	mg/kg	2600	**Tl**	mg/kg	< 30
Li	mg/kg	< 6	**U**	mg/kg	< 100
Mg	mg/kg	37000	**V_2O_5**	mg/kg	100
Mn	mg/kg	420	**Y**	mg/kg	4.2

The sampling and methodology employed by Rambler to obtain a representative sample for the metallurgical process testing is described in Section 11.

LOWER FOOTWALL ZONE BATCH FLOTATION TESTS

A single batch kinetic flotation test was conducted using the LFZ sample and the following reagents:

— Lime (pH control, iron suppression);

— Sodium Sulphite (activation of sulphides);

— Potassium Ethyl Xanthate (PEX - copper and gold collector);

— Cytec Aerofloat 208 (copper and gold collector);

— Methyl Isobutyl Carbinol (MIBC - frother).

The rougher flotation kinetics were fast with 97.9% of the copper recovered in three minutes of flotation time. Three open-circuit cleaner flotation tests were then conducted with rougher flotation and rougher scavenger flotation, followed by two stages of cleaner flotation. For the three tests, overall copper recovery to the final concentrate ranged from 97.8% to 98.3% in a final concentrate grading 27.8% to 28.6% copper. A metallurgical balance for one of the open circuit cleaner tests is presented in Table 13.5.

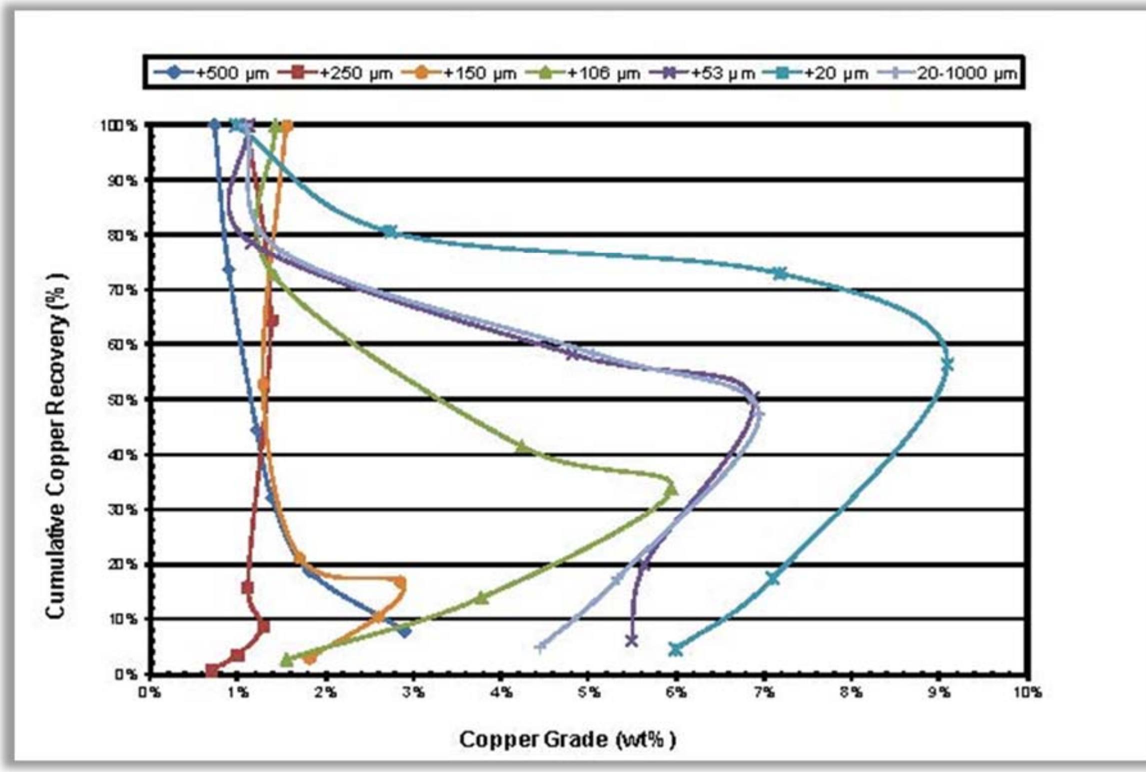
Table 13.5 Metallurgical Balance for 2007 Lower Footwall Zone Open Circuit Batch Flotation Test

Product	Weight Distribution (wt%)	Assays		
		Cu (wt%)	Au (g/tonne)	Ag (g/tonne)
2nd Cleaner Concentrate	7.6	28.6	0.90	34.7
2nd Cleaner Tailings	0.5	1.16	0.09	15.9
1st Cleaner Tailings	1.7	0.43	0.14	3.20
Rougher Scavenger Concentrate	0.7	0.71	0.34	5.90
Rougher Scavenger Tailings	89.5	0.029	0.02	< 0.01
Calculated Head	100.0	2.23	0.09	2.83
Product	**Weight Distribution (wt%)**	**Distribution**		
		Cu (wt%)	**Au (wt%)**	**Ag (wt%)**
2nd Cleaner Concentrate	7.6	98.0	74.8	93.7
2nd Cleaner Tailings	0.5	0.2	0.5	2.6
1st Cleaner Tailings	1.7	0.3	2.6	2.0
Rougher Scavenger Concentrate	0.7	0.2	2.6	1.5
Rougher Scavenger Tailings	89.5	1.2	19.5	0.3

13.5.3 BATCH GRAVITY SEPARATION TESTING (THIBAULT 2012)

A sample from the LFZ was provided by Rambler, grading 1.17% copper, 9.48% iron, and 28.7% silica. A gravity separation release test was conducted on a Mozley Laboratory Mineral Separator after grinding the head sample to 100% passing 1 mm and sieving into multiple size fractions. The resulting grade-recovery curves for copper in each size fraction tested are summarized on Figure 13.10. The results show that the best upgrading was achieved at relatively fine sizes (20 to 106 micron), however copper losses were substantial even at these fine sizes. Due to the low copper recoveries and fine sizes needed for liberation, it was concluded that conventional gravity separation was not a viable option for the LFZ mineralization.

Figure 13.10 Copper Grade-Recovery Relationship for LFZ Upgrading by Bench Gravity Separation



13.5.4 BATCH FLOTATION AND DENSE MEDIA SEPARATION (THIBAULT 2014)

SAMPLE DESCRIPTION

Rambler selected and submitted six separate samples for the test program as listed in Table 13.6. The samples were received as blasted ore from a working area being mined in the LFZ deposit, with the exception of sample VAR-05 which originated as quartered drill core from a different zone predominantly composed of massive sulphides. The intent of the variability samples VAR-01 through VAR-04 was to represent higher and lower copper grade areas of the LFZ. Sample VAR-05 was submitted to test the applicability of pre-concentration in a much different mineralization type than the LFZ.

Table 13.6 Average Head Assays for Test Program Samples – ROM and Variability

Head Sample	Description	Cu Assay (%)	Fe Assay (%)	Zn Assay (%)	Pb Assay (%)	Ag Assay (g/tonne)	Au Assay (g/tonne)
ROM	Close to run-of-mine grades	1.44%	7.26%	0.04%	<0.005%	<5	-
VAR-01	Higher grade	2.03%	8.30%	0.04%	<0.01%	0.85	0.11
VAR-02	Lower grade	1.10%	7.18%	0.12%	<0.01%	0.52	0.06
VAR-03	Lower grade	0.93%	7.18%	0.02%	<0.01%	0.45	0.06
VAR-04	Lower grade	0.74%	6.44%	0.02%	<0.01%	0.51	0.04
VAR-05	Ming South Down Plunge	1.74%	45.27%	0.66%	<0.01%	22.84	2.16

The sampling and methodology employed by Rambler to obtain the samples and to define the variability of feedstock for the metallurgical process is described in Section 11.

LOWER FOOTWALL ZONE CRUSHING AND GRINDING INDICES

Sub-samples from the LFZ ROM sample were stage-crushed to the required sizes and submitted for crushing and grinding index testing at SGS Canada Inc. The results are summarized in Table 13.7. Compared to other deposits, the LFZ sample was found to be medium hard for crushing, soft for rod milling, and very soft for ball milling. The sample was mild in terms of abrasiveness.

Table 13.7 Lower Footwall Zone ROM Sample Crushing and Grinding Characteristics

Sample	Crusher Work Index CWI (kWh/tonne)	Rod Mill Work Index RWI (kWh/tonne)	Ball Mill Work Index BWI (kWh/tonne)	Bond Abrasion Index AI (g)
ROM Composite	10.3	10.9	8.6	0.117

LOWER FOOTWALL ZONE BATCH FLOTATION

Scoping rougher batch flotation tests were conducted on samples from the LFZ to assess the reagent scheme and operating conditions. The following flotation reagents were included in the assessment:

- Hydrated lime (pH control);
- Potassium Amyl Xanthate (PAX - strong bulk sulphide collector and precious metal collector);
- Aerofloat 208 (dithiophosphate sulphide mineral collector and strong gold collector);
- Aero 5100 (copper mineral collector);
- MX-5160 (xanthate replacement collector);
- Methyl Isobutyl Carbinol (MIBC – frother).

In addition to varying reagent type and dosage, the primary grind size was varied from a P_{80} of 76 micron to a P_{80} of 183 micron. The LFZ samples responded well to rougher flotation with a typical batch test result as illustrated in Table 13.8 (P_{80} = 111 micron, 10 min. total float time, 10 g/t PAX, 30 g/t MIBC, pH 10.5-11.0).

Table 13.8 Batch Rougher Kinetic Test on Lower Footwall Zone (2014)

Product	Mass	Assays					
	Dist. (%)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)
RO Conc 1 (0-1 min)	4.0	1.08	14.50	24.40	0.01	0.46	35.10
RO Conc 2 (1-3 min)	3.4	1.31	14.80	21.30	0.01	0.50	38.00
RO Conc 3 (3-6 min)	2.3	1.67	13.20	17.50	0.01	0.46	37.30
SC Conc (6-10 min)	0.7	1.02	9.30	9.74	0.01	0.30	34.40
Calc. RO+SC Conc	10.4	1.28	13.97	20.87	0.01	0.46	36.50
Tails	89.6	0.03	0.10	0.04	0.01	0.01	6.67
Calc. Head	100.0	0.16	1.55	2.21	0.01	0.06	9.78
Assayed Head		0.18	1.77	2.18	0.01	0.07	9.40
Product	**Mass**	**Distribution**					
	Dist. (%)	**Au (%)**	**Ag (%)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**Fe (%)**
RO Conc 1 (0-1 min)	4.0	27.4	37.2	43.8	4.0	31.9	14.3
RO Conc 2 (1-3 min)	3.4	28.8	32.9	33.1	3.4	30.1	13.4
RO Conc 3 (3-6 min)	2.3	25.0	19.9	18.5	2.3	18.8	8.9
SC Conc (6-10 min)	0.7	4.5	4.1	3.0	0.7	3.6	2.4
Calc. RO+SC Conc	10.4	85.7	94.2	98.4	10.4	84.3	38.9
Tails	89.6	14.3	5.8	1.6	89.6	15.7	61.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

LOWER FOOTWALL ZONE FLOTATION TAILINGS CHARACTERIZATION

A sub-sample of the tailings from open circuit Lower Footwall Zone (LFZ) rougher flotation testing was subjected to modified acid-base accounting (ABA) analysis by the Sobek method with the results shown in Table 13.9. With the low sulphide content, there was a positive net neutralizing potential, but with a value less than 20 kg/tonne $CaCO_3$, the material is considered to have 'uncertain' acid generating potential. Therefore, the flotation tailings are considered as potentially acid generating.

Table 13.9 Results of ABA Analysis of LFZ Rougher Flotation

Paste pH	Total Sulphur (wt%)	Acid Production Potential (kg $CaCO_3$/tonne)	Neutralizing Potential (kg $CaCO_3$/tonne)	Net Neutralizing Potential (kg CaCO3/tonne)	NP/AP
8.6	0.13	4.0	20.6	16.6	5.1

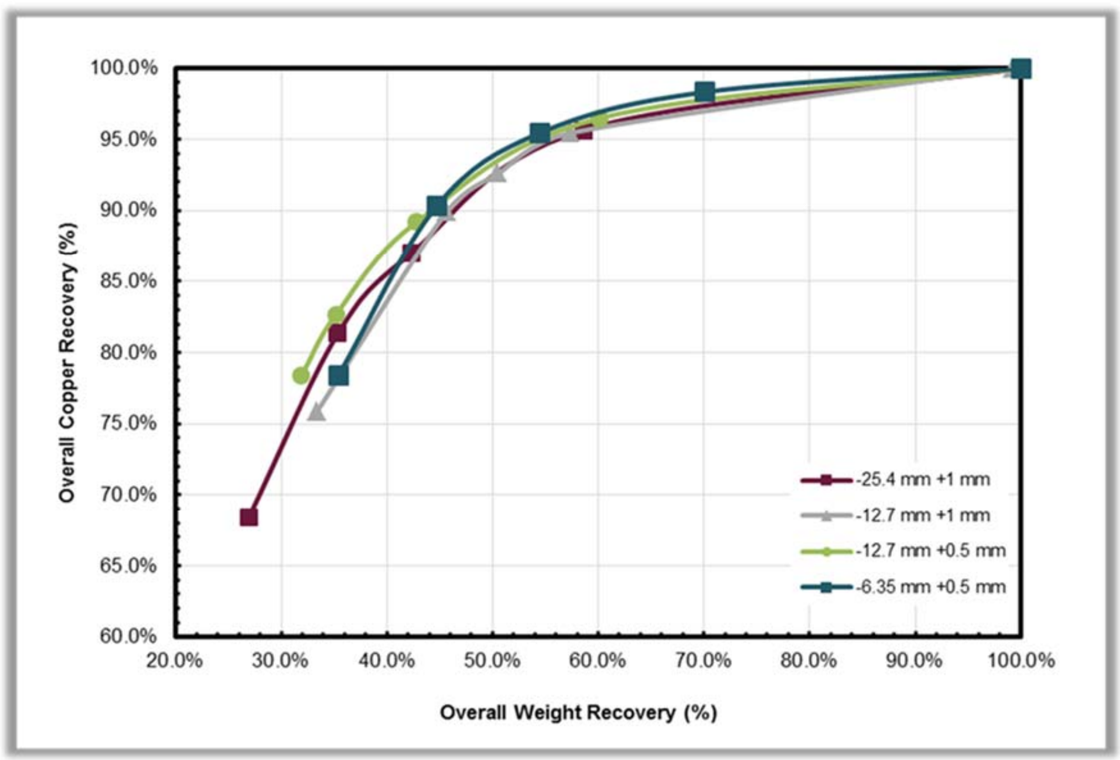
The LFZ rougher flotation tailings sample was also subjected to the standard toxicity characteristic leaching procedure (TCLP) test by US EPA Method 1311. The leachate analysis from the standard TCLP test resulted in very low leachability of all deleterious metals analyzed, including those metals regulated under Metal Mining Effluent Regulations (MMER).

LOWER FOOTWALL ZONE DENSE MEDIA SEPARATION

Dense media separation (DMS) tests were conducted to assess the amenability of the LFZ to pre-concentration for upgrading prior to flotation. Batch tests were first conducted using heavy liquid to assess the effect of separation specific gravity, crush size, and sample variability on the resulting grade-recovery relationship for pre-concentration. In preparing the samples prior to the heavy liquid tests, the fines fraction was removed at either 0.5 mm or 1.0 mm. The fines fraction was not subjected to heavy liquid separation and was recombined with the upgraded “sinks” portion of the heavy liquid test product to represent the overall pre-concentrate that would be delivered to the flotation plant. The batch test results for upgrading with different crush sizes and different head grade samples are illustrated on Figures 13.11 and 13.12, respectively. Figure 13.13 shows that over 95% of the copper was recovered while rejecting 40% of the original feed mass for all crush sizes tested. Similarly, all variability samples also achieved similar recoveries of greater than 95% copper recovery at 40% waste mass removal (Figure 13.12).

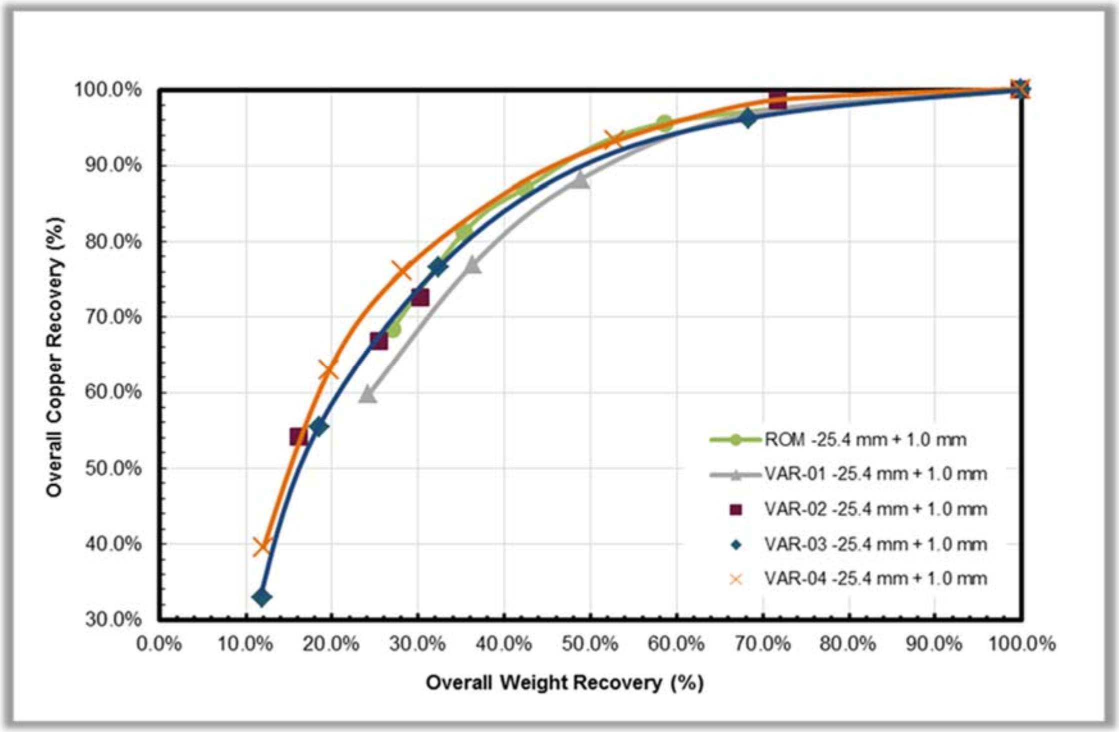
The batch heavy liquid separation tests conducted represent the ideal separation that is possible based on the liberation characteristics of the sample. When operating a commercial DMS plant with a cyclone type separator, there will be a loss in efficiency associated with the separator. In order to assess separation efficiency and evaluate the response of a larger sample, a pilot DMS test on 1,021 kg of ROM Composite sample was conducted. The pilot testing was performed by SGS Canada Inc. and involved the use of a continuously fed DMS plant operated over a four-hour duration. The crush top size was selected as the maximum that the pilot plant could handle at 9.5 mm with fines screening at 0.85 mm.

Figure 13.11 DMS Recovery of Copper for all Samples



***Note**: The axis shows the ‘Overall Copper Recoveries’ and ‘Overall Weight Recoveries’.*

Figure 13.12 DMS Recovery of Copper for 25mm ROM



***Note**: The axis shows the 'Overall Copper Recoveries' and 'Overall Weight Recoveries'*

The metallurgical balance for the pilot test run is summarized in Tables 13.10 and 13.11 and shows that the overall upgrading including fines plus the DMS sinks resulted in 95.6% copper recovery at 31% rejection of mass to waste. The copper grade was improved from 1.48% to 2.05%. Table 13.12 summarizes the overall recoveries for the DMS pilot test.

Table 13.10 Dense Media Separation Pilot Test Product Assays

Sample	Mass (kg)	Assays					
		Cu (%)	Pb (%)	Zn (%)	Fe (%)	Au (g/t)	Ag (g/t)
Dry Screen Oversize	800.0	1.25	0.003	0.040	6.66	N/A	1.00
Dry Screen Undersize	221.0	1.93	0.005	0.061	8.58	0.24	1.40
DMS Screen Undersize	78.3	1.18	0.01	0.05	7.64	0.12	0.60
Total Undersize (Calc.)	299.3	1.74	0.01	0.06	8.33	0.21	1.19
DMS Feed (Calc.)	721.7	1.37	0.01	0.05	7.25	0.19	0.94
DMS Floats	318.7	0.21	0.01	0.02	4.85	0.02	0.10
DMS Sinks	403.0	2.29	0.01	0.08	9.14	0.32	1.60
Combined DMS Sinks + Total Undersize (Calc.) [1]	702.3	2.05	0.01	0.07	8.80	0.27	1.43
Calculated Head - Whole Ore	1021.0	1.48	0.01	0.05	7.56	0.19	1.01
Assayed Head - Whole Ore		1.40	0.0036	0.044	7.08	N/A	1.00

***Table Note**:*

[1] This represents the combined overall pre-concentrate that would be fed to the flotation circuit.

Table 13.11 Dense Media Separation Pilot Test Distribution of Mass and Metals in Each Product

Sample	Distribution						
	Mass (%)	Cu (%)	Pb (%) [2]	Zn (%)	Fe (%)	Au (%)	Ag (%)
Dry Screen Oversize	78.4	66.3	-	56.5	69.0	0.0	77.4
Dry Screen Undersize	21.6	28.3	-	24.0	24.5	26.8	30.0
HMS Screen Undersize	7.7	6.1	-	7.0	7.7	4.8	4.5
Total Undersize (Calc.)	29.3	34.4	-	31.0	32.3	31.6	34.5
DMS Feed (Calc.)	70.7	65.6	-	69.0	67.7	68.4	65.5
DMS Floats	31.2	4.4	-	11.4	20.0	3.2	3.1
DMS Sinks	39.5	61.1	-	57.6	47.7	65.2	62.4
Combined DMS Sinks + Total Undersize (Calc.) [1]	68.8	95.6	-	88.6	80.0	96.8	96.9
Calculated Head - Whole Ore	100.0	100.0	-	100.0	100.0	100.0	100.0

Table Notes:

[1] This represents the combined overall pre-concentrate that would be fed to the flotation circuit.

[2] The lead distribution could not be accurately determined due to samples assaying at the same 0.01% reporting limit.

Table 13.12 Dense Media Separation Pilot Test Recoveries

Calculated Recovery	Mass (%)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	Au (%)	Ag (%)
Dense Media Step Only [1]	55.8	93.2	55.8	83.5	70.4	95.3	95.3
Overall - Sinks + Undersize [2]	68.8	95.6	65.3	88.6	80.0	96.8	96.9

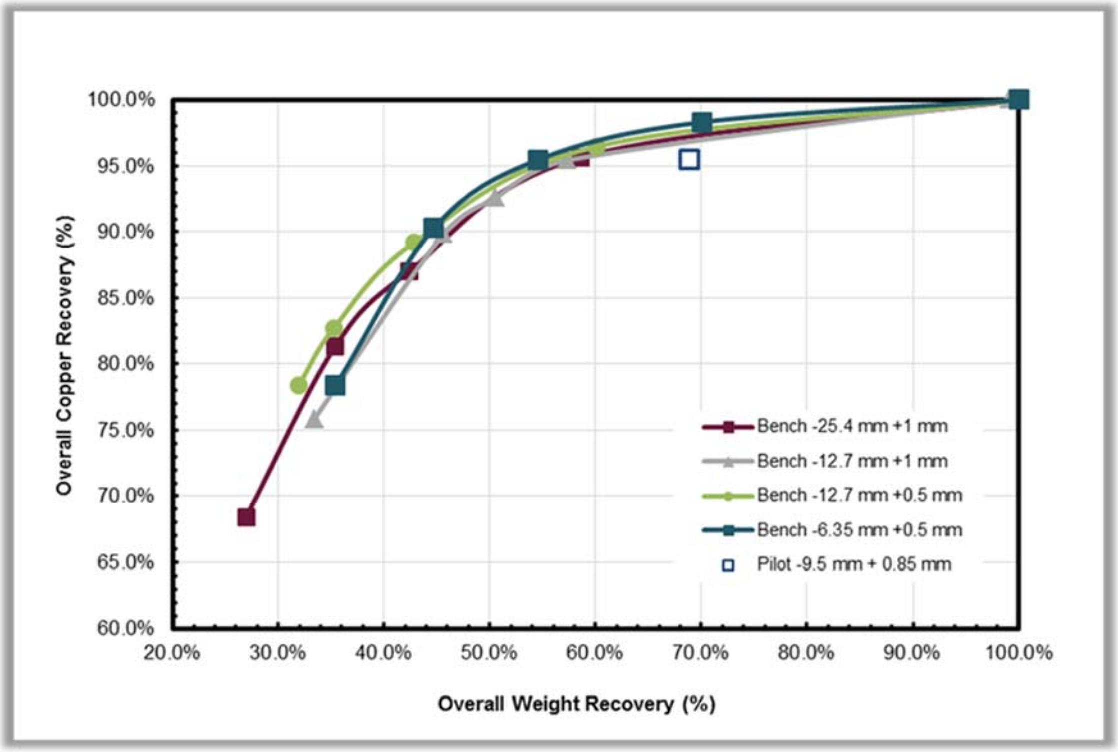
Table Notes:

[1] Recovery relative to feed of coarse (+0.85 mm) only to the heavy media process.

[2] Recovery of the overall pre-concentrate fed to flotation relative to run of mine feed sample.

Figure 13.13 compares the pilot DMS test result to the bench heavy liquid separations. With the operation of an actual DMS cyclone separator, there was about a 2% drop in copper recovery compared to the ideal separation that was achieved in the bench scale tests.

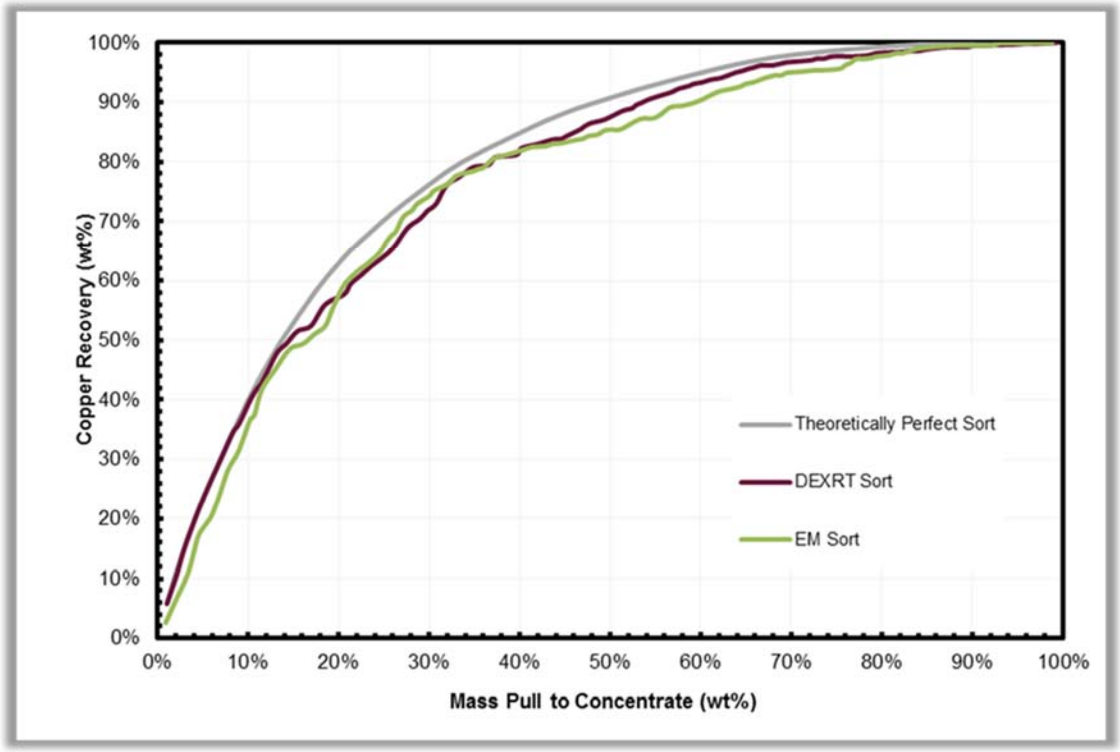
Figure 13.13 Bench and Pilot DMS Separation Relative to ROM Sample – Weight Recovery Basis



LOWER FOOTWALL ZONE ORE SORTING TESTS

As another pre-concentration option, the use of sensor-based ore sorting was tested for initial determination of the ability to sense higher grade as compared to low-grade (waste) material in the feed. The testing was based on bench scale testing of two of the sensor options (X-ray transmission – DEXRT and electromagnetic – EM) for their ability to classify the particles. No testing of a sorting machine was conducted, which is necessary in order to determine the possible grade-recovery performance for pre-concentration. Using 100 particles in the 20 to 30 mm size range, the two sensors were tested by Tomra Sorting, with the results as shown on Figure 13.14. The test showed that the DEXRT sensor performed better than the EM sensor at copper recoveries greater than 80%, and the DEXRT sensor was able to sort the particles from high copper grade to low copper grade very closely to the theoretical sort possible once the assay of each particle was determined. The testing determined that the LFZ sample was amenable to sorting using the DEXRT sensor; however, additional testing on a sorting machine would be required to quantify the expected pre-concentration performance.

Figure 13.14 Comparison of Theoretically Perfect Sort to Sorting Possible by DEXRT and EM Sensors



13.5.5 BATCH FLOTATION, DENSE MEDIA SEPARATION, AND ORE SORTING (THIBAULT 2015)

SAMPLE DESCRIPTION

Rambler selected and provided a sample from the LFZ in the form of blasted rock from the mine workings, with a target copper head grade near the run-of-mine (ROM) grades being considered for a production rate of 1,250 mtpd. The sampling and methodology employed by Rambler to obtain the samples and to define the variability of feedstock for the metallurgical process is described in Section 11. The composite test sample head assays are summarized in Table 13.13.

A bulk modal SEM analysis on the feed sample determined that copper was almost exclusively present as chalcopyrite with trace cubanite ($CuFe_2S_3$) and iron sulphides were mostly present as pyrite with minor pyrrhotite. The main gangue mineral was quartz with minor chlorite and other silicates.

Table 13.13 Lower Footwall Zone Locked Cycle Flotation Testing Head Sample Analysis

Element	Units	Lower Footwall Zone Run-Of-Mine Composite
Ag	mg/kg	1.5
Al	wt%	4.52
As	mg/kg	43
Ba	mg/kg	121
Be	mg/kg	0.2
Bi	mg/kg	15
Ca	wt%	0.344
Cd	mg/kg	<5
Ce	mg/kg	8
Co	mg/kg	66
Cr	mg/kg	87
Cu	wt%	2.21
Fe	wt%	10.80
Ga	mg/kg	<50
Ge	mg/kg	<50
In	mg/kg	<50
K	wt%	0.584
La	mg/kg	<5
Li	mg/kg	<10
Mg	wt%	2.04
Mn	mg/kg	433
Mo	mg/kg	8
Na	wt%	0.283
Nb	mg/kg	<50
Ni	mg/kg	42
P	mg/kg	<100
Pb	mg/kg	349
S	wt%	7.47
Sb	mg/kg	<25
Se	mg/kg	<50
Si	wt%	26.63
Sn	mg/kg	<50
Sr	mg/kg	17
Ta	mg/kg	<25
Te	mg/kg	<50
Ti	mg/kg	1293
V	mg/kg	102
W	mg/kg	<50
Zn	mg/kg	800
Zr	mg/kg	19

BATCH FLOTATION TESTS ON LOWER FOOTWALL ZONE

A series of batch flotation tests was conducted for rougher, scavenger and cleaner flotation of the LFZ sample. The reagent scheme was selected based on a similar approach used at the Nugget Pond facility for processing of MMS. Using a common reagent scheme for LFZ and MMS would facilitate compatibility for co-processing MMS and LFZ mill feed. The test program assessed flotation kinetics, grade-recovery profiles and the effect of varying reagent dosages, pH and primary grind size. Concentrate regrind was not assessed. The results of the batch open-circuit tests were used to select the conditions for the locked cycle flotation test.

LOCKED CYCLE FLOTATION TEST ON LOWER FOOTWALL ZONE

A locked cycle test on the LFZ with eight complete cycles following the flowsheet on Figure 13.15 was conducted at a primary grind particle size of P_{80} = 90 micron. The flotation times selected were based on the design batch flotation times available within the existing Nugget Pond concentrator.

The average reagent consumption for the entire flotation flowsheet for the locked cycle test was as follows:

- Lime: 817 g/tonne as $Ca(OH)_2$;
- Aerophine 3418A: 17.2 g/tonne as received;
- MIBC: 47.0 g/tonne as received.

The performance of the flowsheet on the LFZ test sample is presented in Table 13.14 as the average of the last four cycles of the test, with a copper recovery of 98.9% to a concentrate grading 28.9% copper. A detailed analysis of the final concentrate from the locked cycle test is shown in Table 13.15.

Figure 13.15 Flowsheet for Lower Footwall Zone Locked Cycle Test Program

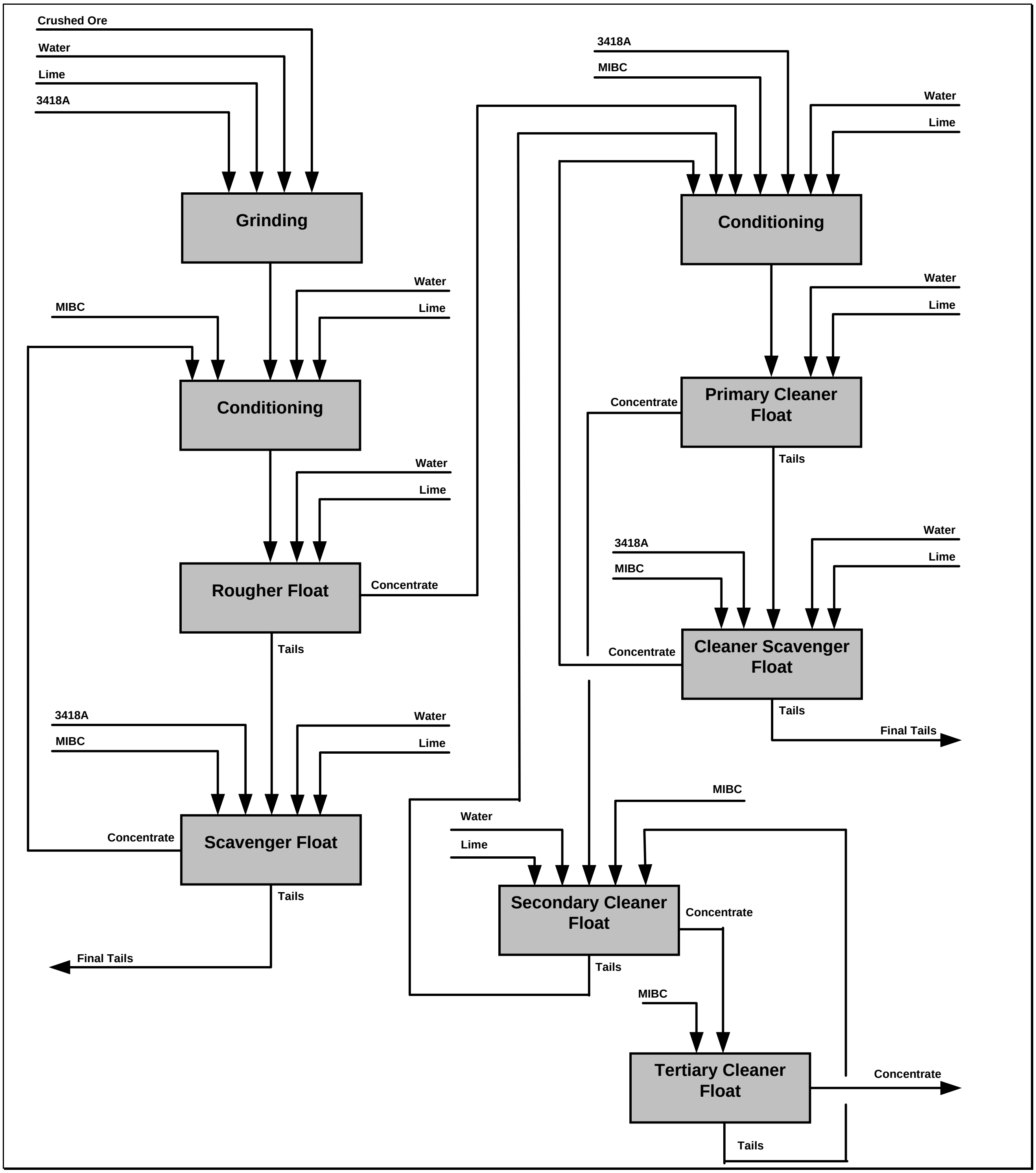


Table 13.14 Average Product Assays and Weight Distribution for Lower Footwall Zone Locked Cycles 5 to 8

Product	Mass Distribution (%)	Assays					
		Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)
Rougher Scavenger Tails	91.81	0.09	0.51	0.03	0.03	0.04	7.45
Cleaner Scavenger Tails	0.74	0.13	1.21	0.15	0.11	0.03	8.47
3rd Cleaner Concentrate	7.45	2.00	10.51	28.92	0.17	0.57	30.53
Calculated Head	100.00	0.23	1.26	2.18	0.04	0.08	9.18
Assayed Head	-	0.251	1.50	2.18	0.03	0.08	10.80
Product	**Mass Distribution (%)**	**Distribution**					
		Au (%)	**Ag (%)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**Fe (%)**
Rougher Scavenger Tails	91.81	36.0	37.3	1.1	64.5	44.0	74.5
Cleaner Scavenger Tails	0.74	0.4	0.7	0.1	2.2	0.3	0.7
3rd Cleaner Concentrate	7.45	63.6	62.0	98.9	33.3	55.7	24.8
Calculated Head	100.00	100	100	100	100	100	100
Assayed Head	-	-	-	-	-	-	-

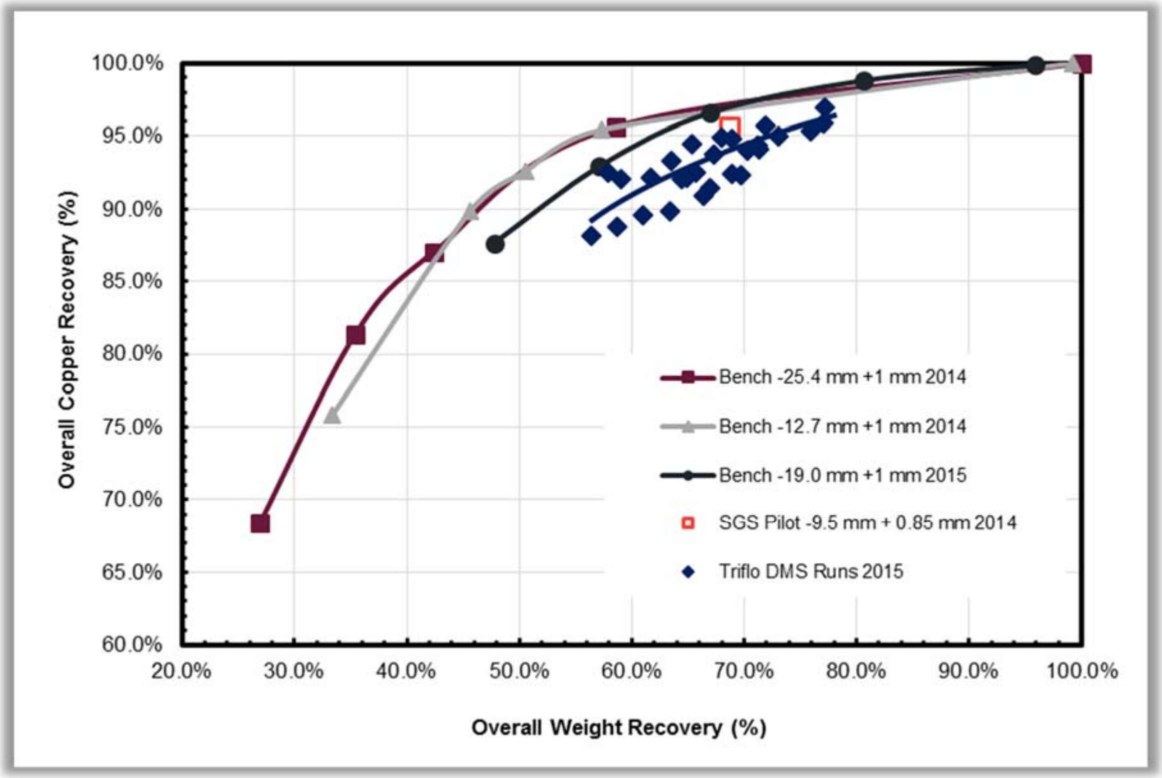
Table 13.15 Final Concentrate Analysis from Cycle 8 of Lower Footwall Zone Locked Cycle Test

Element	Units	Value	Element	Units	Value
Ag	g/tonne	12.95	Mg	mg/kg	256.5
Al	mg/kg	1098	Mn	mg/kg	14
As	mg/kg	84	Mo	mg/kg	13
Au	g/tonne	2.2	Na	mg/kg	120.4
Ba	mg/kg	2.4	Nb	mg/kg	<50
Be	mg/kg	<0.1	Ni	mg/kg	75
Bi	mg/kg	14	P	mg/kg	<100
Ca	mg/kg	494	Pb	%	0.175
Cd	mg/kg	36	S	%	36.3
Ce	mg/kg	<5	Sb	mg/kg	<25
Cl	mg/kg	29	Se	mg/kg	367
Co	mg/kg	75	Si	mg/kg	1820
Cr	mg/kg	140.2	Sn	mg/kg	40
Cu	%	29.16	Sr	mg/kg	1
F	mg/kg	120	Ta	mg/kg	<25
Fe	%	30.56	Te	mg/kg	<100
Ga	mg/kg	<50	Ti	mg/kg	72.1
Ge	mg/kg	<50	Tl	mg/kg	<50
Hg	mg/kg	9.4	V	mg/kg	81
In	mg/kg	<50	W	mg/kg	<50
K	mg/kg	27	Zn	%	0.57
La	mg/kg	<2	Zr	mg/kg	<100
Li	mg/kg	<10			

DENSE MEDIA SEPARATION DEMONSTRATION TESTS

A 15 mtph dense media separation (DMS) demonstration scale plant was installed at the Nugget Pond site in 2014 with testing occurring in 2015. The DMS equipment was supplied by Sepro Mineral Systems. The LFZ ore was crushed to either 19 mm or 12.7 mm top size, screened for fines removal at 1 mm or 2 mm, and the screen oversize was processed for upgrading in the DMS plant. Floats (waste product) were removed by the DMS plant. Sinks (DMS concentrate) were fed to the grinding/flotation plant for copper recovery. Fines from the 1 mm or 2 mm screen size were pumped to the grinding circuit for grinding and copper recovery. Many tests were conducted to determine the effect of operating variables on the upgrading performance. Figure 13.16 shows the resulting copper and weight recovery relationship established for the continuous-flow DMS demonstration plant tests as compared to the bench scale separation tests and the 2014 DMS pilot test.

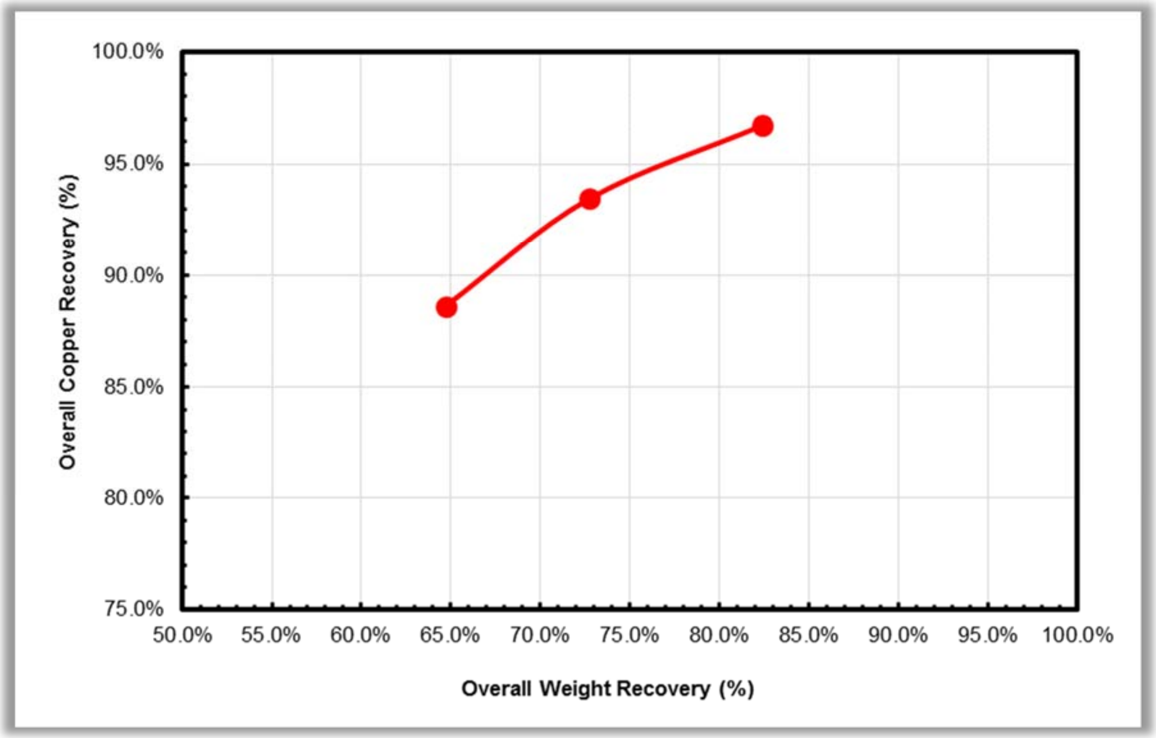
Figure 13.16 DMS Demonstration Upgrading Performance compared to Bench and Pilot Tests



ORE SORTING PILOT TESTS

Sensor-based ore sorting was conducted by Tomra Sorting Solutions (Tomra) in Germany, using a continuously-fed pilot sorter with x-ray transmission (XRT) sensors. A 1190 kg bulk sample of LFZ ore was prepared with an average head grade of 1.25% copper. The sample was crushed and screened to minus 75 mm. Fines less than 6.35 were then removed from the sample as they are too small for sorting. The rest of the sample was screened into various size fractions for separate testing on the ore sorting machine. By operating the sorter with a range of rejection criteria, a relationship between mass recovery and copper recovery to the upgraded material was established, as shown on Figure 13.17, after recombining the non-sortable minus 6.35 mm fines with the upgraded material. At a given weight recovery, the upgrading by ore sorting had slightly lower copper recoveries as compared to the average DMS demonstration plant performance.

Figure 13.17 Ore Sorting Test Results - Copper and Weight Recovery Relationship



13.6 METALLURGICAL TESTING OF MASSIVE SULPHIDE ZONE SAMPLES (2008-2011)

13.6.1 BACKGROUND

A bench scale metallurgical test program was developed and managed by Thibault & Associates Inc. to provide design data as required to define a process flowsheet and design criteria for processing the Massive Sulphide samples (Thibault & Associates Inc., 2011). The development of the process flowsheet was based on the recovery of copper as a copper concentrate using a selective flotation process. Gold recovery was based on flotation of a portion of the gold to the copper concentrate and optional recovery of additional gold by cyanide leaching of the flotation tailings. The test work was conducted by numerous service laboratories including:

— SGS Mineral Services (Lakefield, Ontario) - Crushing and Grinding Index Testing.
— Research and Productivity Council (Fredericton, New Brunswick) - Bench Scale Flotation Tests and Tailings Stability Tests.
— Pacific Press Co. (Fullerton, California) - Concentrate Filtration Tests.
— Thibault & Associates Inc. (Fredericton, New Brunswick) - Concentrate Thickening Tests and Gold Leaching Tests.
— Met-Solve Laboratories Inc. (Burnaby, British Columbia) - Gravity Recoverable Gold Testing - Centrifugal Separator.
— Minerals Engineering Centre (Halifax, Nova Scotia) - Gravity Recoverable Gold Testing.

— Buchanan Environmental Ltd. (Fredericton, New Brunswick) - Aquatic Life Toxicity Test.
— AMTEL (London, Ontario) - Flotation Tailings Gold Association and Deportment Mineralogical Studies.

13.6.2 MASSIVE SULPHIDE SAMPLE DESCRIPTION

Rambler selected and provided several MMS metallurgical samples for testing. Table 13.16 summarizes some of the key head assay data for the metallurgical samples used in the test program, while a trace element scan is shown in Table 13.17 for the Composite sample. The Composite sample was selected by Rambler to represent a typical ROM sample from the MMS. This sample was a blend of drill core from throughout the Massive Sulphide deposit, a portion of a bulk sample from the 1807 face, as well as waste rock.

Table 13.16 Head Assay Data for Massive Sulphide Test Program Metallurgical Samples

Sample	Description	Head Analysis						
		Fe (wt%)	Cu (wt%)	Pb (wt%)	Zn (wt%)	S (wt%)	Ag g/tonne)	Au (g/tonne)
Composite	Run of Mine	24.1	3.10	0.11	0.63	26.1	14	**1.84**
Variability A/B	High Copper	17.1	9.62	0.09	0.18	15.6	18	**1.56**
Variability C	High Gold	32.1	2.24	0.13	0.91	33.7	19	**3.58**
Variability G	Low Copper	26.7	1.25	0.13	0.52	31.3	14	1.85

Table 13.17 Trace Element Analysis for Massive Sulphide Composite Metallurgical Sample

Element	Units	Value	Element	Units	Value
Al	mg/kg	3.64	**Mg**	mg/kg	3600
As	mg/kg	586	**Mn**	mg/kg	272
Ba	mg/kg	46	**Mo**	mg/kg	21
Be	mg/kg	0.1	**Na**	mg/kg	3500
Bi	mg/kg	19	**Nb**	mg/kg	<10
Ca	mg/kg	7900	**Ni**	mg/kg	35
Cd	mg/kg	28	**P**	mg/kg	215
Ce	mg/kg	5	**Sb**	mg/kg	84
Co	mg/kg	132	**Se**	mg/kg	128
Cl	mg/kg	106	**Si**	%	12.93
Cr	mg/kg	103	**Sn**	mg/kg	<20
F	mg/kg	300	**Sr**	mg/kg	24
Ga	mg/kg	37	**Ta**	mg/kg	14
Ge	mg/kg	<10	**Te**	mg/kg	52
Hg	mg/kg	1.24	**Ti**	mg/kg	1560
In	mg/kg	<50	**V**	mg/kg	85
K	mg/kg	2800	**W**	mg/kg	<10
La	mg/kg	3	**Zr**	mg/kg	11
Li	mg/kg	3			

Rambler provided two additional Massive Sulphide samples for comminution tests. Sample A consisted of a blasted sample from the 1807 zone face, whereas Sample D consisted of drillcore which represented a typical composite sample over the entire Massive Sulphide deposit.

The sampling and methodology employed by Rambler to obtain a representative ROM sample and to define the variability of feedstock for the metallurgical process is described in Section 11.

13.6.3 MASSIVE SULPHIDE CRUSHING AND GRINDING INDICES

A set of parameters commonly used to size crushing and grinding equipment were determined by SGS Mineral Services on Massive Sulphide Sample A (coarse rock) with some tests repeated on Massive Sulphide Sample D (1/4 split drill core) - reference SGS Mineral Services, "*An Investigation into the Grindability Characteristics of Two Samples from the Rambler Project*", Project 12348-001 Revision 3, May 20, 2010. The samples were stage crushed and the appropriate size fractions were collected as required to complete the following tests:

— Crushing Parameters: Bond Low-energy Impact Test (CWI), Bond Abrasion Index (AI).

— SAG Mill Grinding Parameters: JK Drop Weight Test (DWT), Abbreviated DWT (SMC).

— Rod and Ball Mill Grinding Parameters: Bond Rod Mill Work Index (RWI), Bond Ball Mill Work Index (BWI).

The crushing and grinding parameters determined from these tests are presented in Table 13.18, and SGS Mineral Services classified the relative hardness or softness of the samples compared to other samples in their database. In terms of crushing parameters, Sample A was categorized as "medium hardness" with "medium abrasiveness". The coarse rock Sample A contained a larger proportion of waste rock and its SAG mill hardness was higher than the split core Sample D. In general, Sample A was described as "moderately soft" with respect to the SAG mill parameters, while Sample D was considered "very soft". The rod mill work index measured for Sample A was categorized as "soft" in comparison to other samples. Both samples had similar ball milling parameters which were considered "very soft" relative to other values in the SGS Mineral Services database.

Table 13.18 Crushing and Grinding Parameters for Massive Sulphide Metallurgical Samples

Sample	Specific Gravity	JK DWT Parameters			Work Indices (kWh/tonne)			AI
		Axb [1]	Axb [2]	t_a	CWI	RWI	BWI	(g)
A - Coarse Rock	3.30	63.5	59.6	0.66	10.7	10.2	9.7	0.252
D - Split Core	4.05	-	184	1.18	-	-	9.5	-

Table Notes:

[1] Axb from the JK Drop Weight Test

[2] Axb from the SMC Test

13.6.4 MASSIVE SULPHIDE FLOTATION TESTING

SCOPING ROUGHER AND CLEANER BENCH SCALE TESTS

Open circuit batch flotation kinetic tests were conducted on the MMS Composite metallurgical sample to evaluate the effect of the following parameters on rougher and cleaner flotation performance: reagent scheme and dosage, primary grind particle size, and the effect of regrind and regrind particle size. The proposed reagent scheme was selected for testing based on that used in a previous study by Thibault & Associates Inc. completed for Rambler on a metallurgical sample from a different area of the Property (1600 Level) (Thibault & Associates Inc., 2008). The reagent scheme tested included the following:

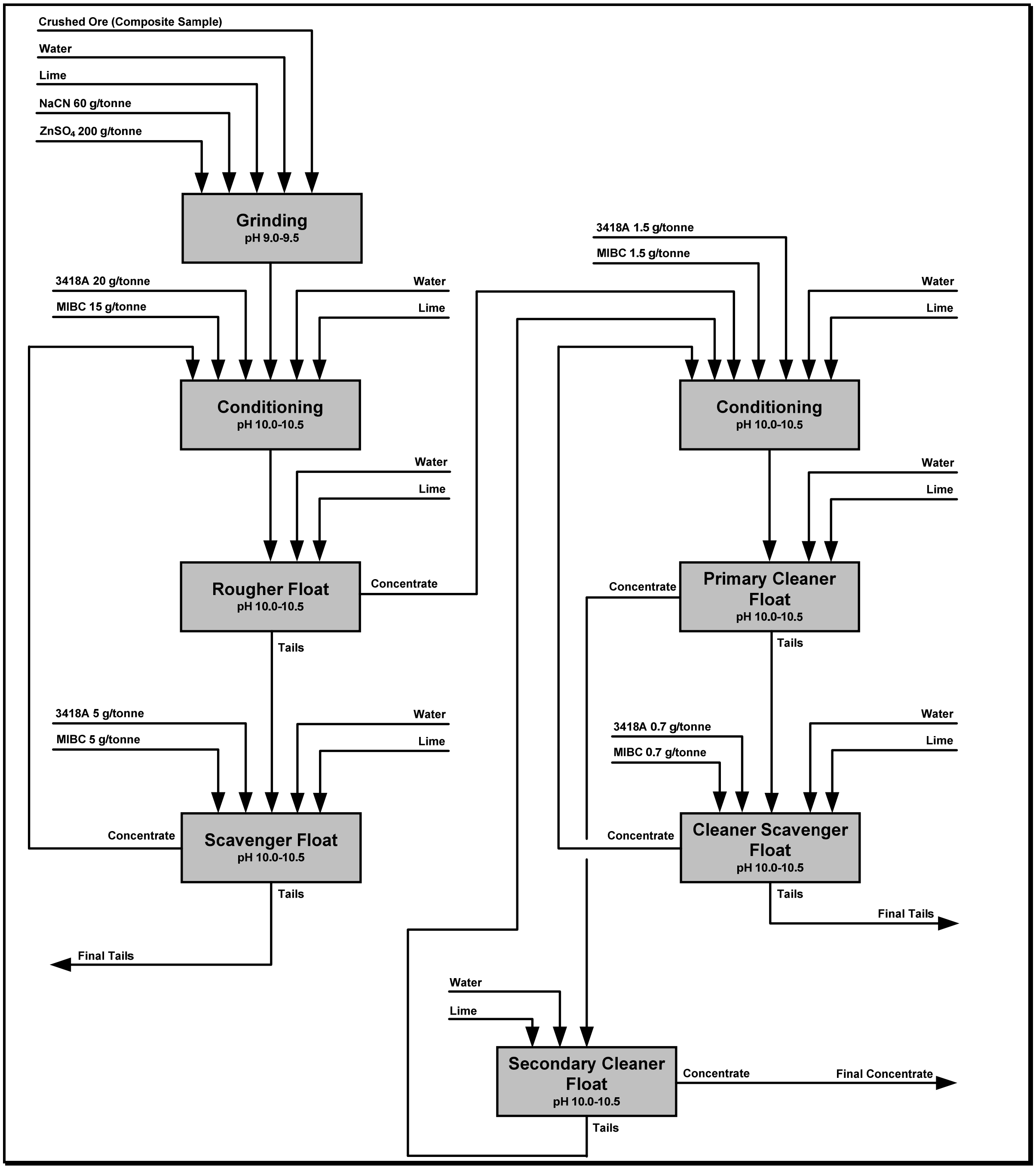
- Lime (pH control, iron suppression).
- Zinc Sulphate (iron and zinc suppression).
- Sodium Cyanide (iron and zinc suppression).
- Potassium Amyl Xanthate (PAX - copper and gold collector).
- Cytec Aerophine 3418A (copper and gold collector).
- Methyl Isobutyl Carbinol (MIBC - frother).

Based on the scoping tests, the reagent dosages, grind size, and flotation residence times, as well as a flotation flowsheet were selected for further evaluation in a locked cycle test.

LOCKED CYCLE TEST

A locked cycle test was completed using the MMS Composite metallurgical sample with a primary grind size of approximately 80% passing 70 micron with no regrind of the rougher or scavenger concentrates. The locked cycle flowsheet and reagent scheme are illustrated on Figure 13.18.

Figure 13.18 Massive Sulphide Locked Cycle Flotation Test Block Diagram



The locked cycle test was carried out for a total of six complete cycles. The total reagent consumption for the locked cycle test was as follows:

- Lime: 1.0 kg/tonne as $Ca(OH)_2$.
- Zinc Sulphate: 200 g/tonne as $ZnSO_4$.
- Sodium Cyanide: 60 g/tonne as NaCN.
- Aerophine 3418A: 27.2 g/tonne as received.
- MIBC: 22.2 g/tonne as received.

It should be noted that zinc sulphate and sodium cyanide were used in this test program to assist with rejection of pyrite and sphalerite. Based on the Nugget Pond flotation plant operation to date since the completion of this test program, and considering a blended mill feed consisting of LFZ and MMS resource material, it is not expected that zinc sulphate and sodium cyanide addition will be required.

The locked cycle test results and metal distributions averaged over the last four cycles are shown in Table 13.19. The final concentrate (from Cycle 6) of the locked cycle test was submitted for detailed assay, the results of which are summarized in Table 13.20.

Table 13.19 Average Product Assays and Weight Distribution for Massive Sulphide Locked Cycles 3 to 6

Product	Weight Distribution (wt%)	Assays					
		Fe (wt%)	Cu (wt%)	Pb (wt%)	Zn (wt%)	Ag (g/tonne)	Au (g/tonne)
2nd Cleaner Concentrate	9.8	30.98	29.06	0.57	0.96	83.01	14.66
Rougher Scavenger Tail	87.1	25.09	0.08	0.05	0.56	3.00	0.68
Cleaner Scavenger Tail	3.1	27.32	1.38	0.72	0.63	37.96	4.25
Combined Total Tails	90.2	25.16	0.12	0.07	0.57	4.19	0.80
Calculated Head	100.0	25.73	2.95	0.12	0.61	11.91	2.16
Product	**Weight Distribution (wt%)**	**Distribution**					
		Fe (wt%)	**Cu (wt%)**	**Pb (wt%)**	**Zn (wt%)**	**Ag (wt%)**	**Au (wt%)**
2nd Cleaner Concentrate	9.8	11.8	96.3	45.8	15.5	68.2	66.4
Rougher Scavenger Tail	87.1	84.9	2.2	35.8	81.3	21.9	27.5
Cleaner Scavenger Tail	3.1	3.3	1.4	18.4	3.2	9.8	6.1
Combined Total Tails	90.2	88.2	3.7	54.2	84.5	31.8	33.6

Table 13.20 Final Concentrate Analysis from Cycle 6 of Massive Sulphide Locked Cycle Test

Element	Units	Value	Element	Units	Value
Ag	g/tonne	91	**Mg**	mg/kg	232
Al	mg/kg	612	**Mn**	mg/kg	32
As	mg/kg	473	**Mo**	mg/kg	58
Au	g/tonne	16.56	**Na**	mg/kg	362
Ba	mg/kg	10	**Nb**	mg/kg	<2
Be	mg/kg	<0.1	**Ni**	mg/kg	12
Bi	mg/kg	25	**P**	mg/kg	<100
Ca	mg/kg	1147	**Pb**	%	0.62
Cd	mg/kg	47	**S**	%	35.20
Ce	mg/kg	<2	**Sb**	mg/kg	172
Co	mg/kg	58	**Se**	mg/kg	441
Cl	mg/kg	35	**Si**	%	0.20
Cr	mg/kg	3	**Sn**	mg/kg	75
Cu	%	28.15	**Sr**	mg/kg	2
F	mg/kg	110	**Ta**	mg/kg	17
Fe	%	30.55	**Te**	mg/kg	93
Ga	mg/kg	40	**Ti**	mg/kg	29
Ge	mg/kg	<10	**Tl**	mg/kg	< 5
Hg	mg/kg	8.5	**V**	mg/kg	7
In	mg/kg	<50	**W**	mg/kg	<10
K	mg/kg	80	**Zn**	%	0.90
La	mg/kg	<2	**Zr**	mg/kg	1
Li	mg/kg	<2			

VARIABILITY TESTS

Using the same primary grind size, flotation reagent scheme and dosages defined for the Composite metallurgical sample, the three variability samples plus the Composite sample were tested using open-circuit batch rougher, scavenger and cleaner kinetic tests. The flotation kinetics were similar for all four samples and all samples responded well to the selected reagent scheme and reagent dosages, indicating that the proposed reagent scheme is technically viable.

13.6.5 GRAVITY GOLD RECOVERY FROM MASSIVE SULPHIDE SAMPLES

Gravity concentration was investigated to determine if additional gold could be recovered from the MMS flotation tailings using gravity equipment. Rougher flotation tailings from batch scoping tests on the Composite sample were tested for gravity recovery of gold using a Wilfley gravity table (Minerals Engineering Centre, Halifax, Nova Scotia) and a Falcon centrifugal concentrator (Met-Solve Laboratories, 2010). In the Wilfley table test, a flotation tailings head sample assaying at 0.51 g/tonne gold yielded a concentrate grading at 1.57 g/tonne gold, corresponding to 5.7 wt% gold recovery. The Falcon test was conducted with five separate passes on flotation tailings assaying at 0.57 g/tonne gold, with no appreciable upgrading of the gold achieved. The gravity tests indicate that following flotation, there is no significant gravity recoverable gold remaining in the flotation tailings. Based on the testing completed, gravity recovery of gold from the MMS flotation tailings was concluded as being not technically viable.

A standard gravity recoverable gold (GRG) test was conducted on the Composite metallurgical sample as received (before flotation) using a three stage grinding protocol and a Falcon centrifugal concentrator. The total GRG test concentrate yielded 26.7 wt% recovery of gold into 7.40 wt% of the original feed mass at a grade of 8.00 g/tonne gold. The weight yield was high at each stage which suggests that most of the gold recovered was associated with sulphide minerals and that there was not a significant amount of gravity recoverable free gold in the sample. Based on the results of the GRG test on this sample, gravity gold recovery in the grinding circuit prior to flotation would have little benefit for improving the overall gold recovery in the copper concentrator.

13.6.6 MASSIVE SULPHIDE FLOTATION TAILINGS MINERALOGY

Tailings from the MMS locked cycle flotation test were analysed in a mineralogical study (reference AMTEL Ltd., 2010) to determine the forms and carriers of gold in the flotation tailings. Gold was found to be present as the gold minerals electrum and aurostibite ($AuSb_2$) and also submicroscopic gold in pyrite (colloidal-sized gold micro-inclusions and solid solution gold). The majority of the gold in the tailings (69%) is associated with free pyrite, with a little over half of this as submicroscopic gold and the remainder as mineral inclusions/attachments. Another 17% of the gold in the tailings is carried in free/liberated gold mineral grains; the majority of which are less than 5 microns in size and therefore below the ideal size for optimum recovery by flotation or gravity separation. A further 9% of the gold in the tailings is carried in rock-sulphide composite particles, primarily in gold inclusions. The remaining 5% of the gold is carried in magnetic particles (magnetite/pyrrhotite) and clean rock particles (little or no associated pyrite).

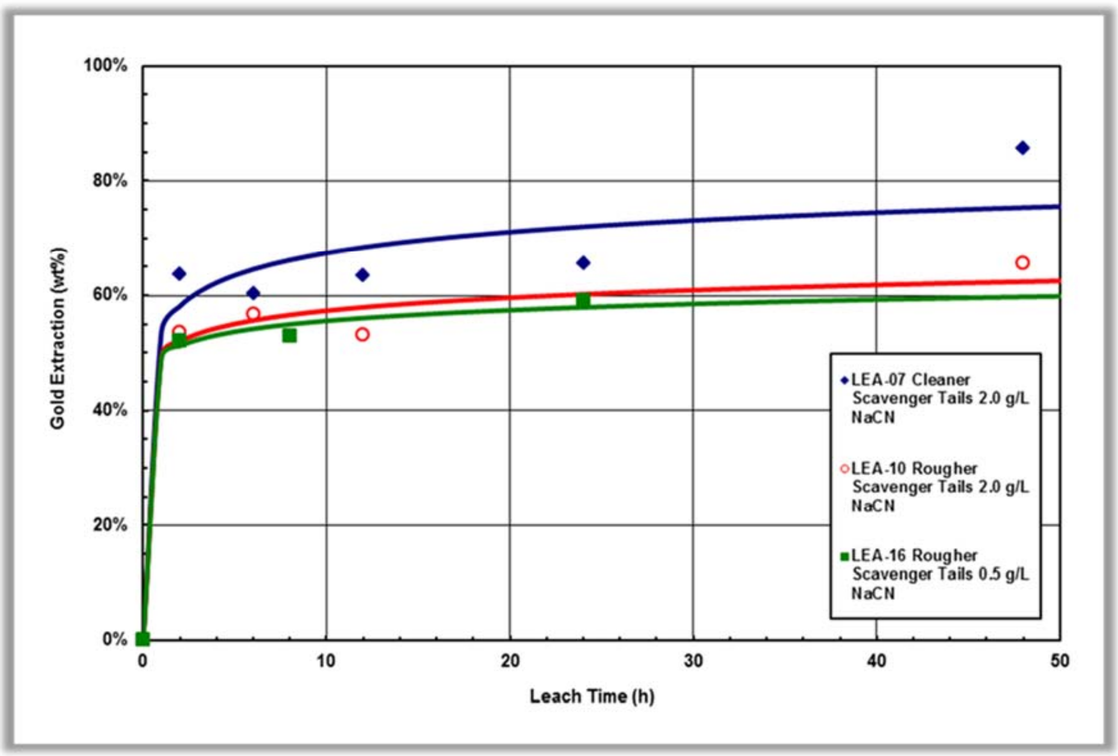
It was concluded from the flotation tailings mineralogy study that the MMS locked cycle flotation was fairly well optimized for gold recovery. Free gold grains remaining in the tailings are too small for recovery by flotation, while the principal carrier of gold in the tailings, pyrite, must be rejected to make an acceptable grade copper concentrate. As a result, a substantial increase in gold recovery by flotation is not expected with further optimization of the flotation process.

13.6.7 MASSIVE SULPHIDE FLOTATION TAILINGS GOLD CYANIDE LEACHING

Since the remaining gold in the MMS flotation tailings could not be concentrated by gravity separation, and additional recovery of gold to the copper concentrate was not viable, the flotation tailings were tested for gold recovery by direct cyanide leaching. Several leach tests were conducted in stirred beakers with air injection and varying cyanide concentrations from 0.5 to 2.0 g/L NaCN. Leaching was also conducted on the fine (minus 38 micron) and coarse (plus 38 micron) fractions of the tailings, which produced similar results to the whole flotation tailings sample. All tests were conducted at pH 10 to 11. The results of the cyanide leach kinetic tests at 0.5 and 2.0 g/L NaCN are shown on Figure 13.19 for both the rougher scavenger tailings and the cleaner scavenger tailings samples from the MMS locked cycle flotation test.

The kinetics for the initial portion of the leach extraction curve (up to 2 hours leach time) was very fast while the leach reaction became much slower after 2 hours leach time. This result is in agreement with the flotation tailings mineralogy study which indicated that some of the gold may be refractory due to the submicroscopic inclusions and solid solution in pyrite. Therefore, only a portion of the gold in the flotation tailings is leachable by conventional cyanide leaching. Based on the bench scale leach results, a sodium cyanide concentration of 0.5 g/L NaCN was selected for leaching of flotation tailings. The recovery of gold in the cyanide leach was similar with either 0.5 g/L or 2.0 g/L NaCN; however, the consumption of sodium cyanide was much less when leaching at 0.5 g/L NaCN.

Figure 13.19 Cyanide Leach Kinetics for Leaching MMS Locked Cycle Test Flotation Tailings



13.6.8 DEWATERING TESTS – MASSIVE SULPHIDE SAMPLES

Static concentrate thickening tests were performed using concentrate samples from the MMS flotation test program to confirm flocculant selection and dosage and to define thickener sizing parameters. Magnafloc 10 was added at a dosage of 20 g/tonne to produce a thickener underflow dry solids concentration of up to 65 wt%.

Concentrate filtering tests were conducted using a bench scale pressure filter to define sizing parameters for a filter press. Without cake air blow, the final moisture content was 9.9% which was subsequently reduced to 6.5% moisture with air blow through the cake. Therefore, a filter press using air blow is expected to meet the target concentrate dryness defined as 8% moisture content.

13.6.9 MASSIVE SULPHIDE COPPER FLOTATION WASTEWATER ANALYSIS

As an integral part of the MMS locked cycle test program, a 200 mL sample of 100% tailings water collected from filtering the concentrate and tailings products at the end of each cycle were retained for thiosalt analysis. Fresh water was added to the remaining tailings water at the end of each cycle to 50% v/v and this 50% tailings water was used as process water for completion of the next locked cycle to simulate reclaim of process water from the existing polishing pond. Since for the initial operation on MMS feed, tailings water is intended to be discharged to the existing tailings pond where it will be mixed with other process water streams, precipitation and site run-off before being reclaimed from the polishing pond is expected, the 50% tailings water is considered to approximate the final effluent discharge to the environment from the polishing pond (not accounting for tailings and wastewater generated from operation of the existing gold hydromet circuit, not presently in operation). Samples of 50% tailings water from each cycle were retained for analysis.

The 50% tailings water sample collected at the end of locked cycle 6 was analyzed to provide full characterization of inorganic chemistry and trace metals parameters, radiological parameters, total phosphorus, total dissolved solids, fluoride, biological oxygen demand (BOD) and total cyanide concentrations. The results of this analysis are summarized in Tables 13.21 to 13.24.

Table 13.21 Results of Inorganic Chemistry Analysis for MMS Locked Cycle Flotation Tailings Water

Parameter	Units	Measured Value in 50% Tailings Water [1]	Estimated Value in 100% Tailings Water [2]	MMER Effluent Discharge Limit [3]
Sodium	mg/L	20.7	41.4	--
Potassium	mg/L	8.52	17.04	--
Calcium	mg/L	55.9	111.8	--
Magnesium	mg/L	1.89	3.78	--
Iron	mg/L	0.04	0.08	--
Manganese	mg/L	0.005	0.010	--
Copper	mg/L	0.013	0.026	0.3
Zinc	mg/L	0.008	0.016	0.5
Ammonia (as N)	mg/L	<0.05	n/a	--
pH	pH units	8.0	n/a	6.0 - 9.5
Alkalinity (as $CaCO_3$)	mg/L	49	98	--
Chloride	mg/L	51.7	103.4	--

(table continues on next page)

Parameter	Units	Measured Value in 50% Tailings Water [1]	Estimated Value in 100% Tailings Water [2]	MMER Effluent Discharge Limit [3]
Fluoride	mg/L	0.23	0.46	--
Sulphate	mg/L	93	186	--
Nitrate + Nitrite (as N)	mg/L	<0.05	n/a	--
o-Phosphate (as P)	mg/L	<0.01	n/a	--
r-Silica (as SiO_2)	mg/L	4.7	9.4	--
Carbon - Total Organic	mg/L	6.2	12.4	--
Turbidity	NTU	1.9	n/a	--
Conductivity	µS/cm	434	n/a	--
Sulphide	mg/L	<0.05	n/a	--
Cyanide - Total	mg/L	0.011	0.022	1.0
Phosphorus - Total	mg/L	0.035	0.07	--
BOD_5	mg/l	<6	n/a	--
Phenols	mg/l	0.001	0.002	--
Solids – Total Dissolved	mg/L	180	360	--
Bicarbonate (as $CaCO_3$)	mg/L	48.5	97	--
Carbonate (as $CaCO_3$)	mg/L	0.456	0.912	--
Hydroxide (as $CaCO_3$)	mg/L	0.050	0.100	--
Cation Sum	meq/L	4.07	n/a	--
Anion Sum	meq/L	4.37	n/a	--
Percent Difference	%	-3.65	n/a	--
Theoretical Conductivity	µS/cm	460	n/a	--
Hardness (as $CaCo_3$)	mg/L	147	n/a	--
Ion Sum	mg/L	262	n/a	--
Saturation pH (5º)	pH units	8.2	n/a	--
Langelier Index (5º)	pH units	-0.21	n/a	--

Notes for Table:

[1] 50% tailings water is 100% tailings water collected at end of locked cycle 6 blended with 50% v/v fresh water to approximate final effluent discharge from polishing pond.

[2] Parameters for 100% tailings water are estimated as 2 times parameters measured in 50% tailings water sample.

[3] Stated MMER effluent discharge limits represent maximum authorized monthly mean limits as defined by the Government of Canada Metal Mining Effluent Regulations.

Table 13.22 Results of Trace Metals Analysis for Massive Sulphide Locked Cycle Flotation Tailings Water

Parameter	Units	Measured Value in 50% Tailings Water [1]	Estimated Value in 100% Tailings Water [2]	MMER Effluent Discharge Limit [3]
Aluminum	µg/L	286	572	--
Antimony	µg/L	10.4	20.8	--
Arsenic	µg/L	11	22	500
Barium	µg/L	13	26	--
Beryllium	µg/L	<0.1	n/a	--
Bismuth	µg/L	<1	n/a	--
Boron	µg/L	13	26	--
Cadmium	µg/L	0.07	0.14	--
Calcium	µg/L	55900	111800	--
Chromium	µg/L	<1	n/a	--
Cobalt	µg/L	0.4	0.8	--
Copper	µg/L	13	26	300
Iron	µg/L	40	80	--
Lead	µg/L	4.1	8.2	200
Lithium	µg/L	1.0	2	--
Magnesium	µg/L	1890	3780	--
Manganese	µg/L	5	10	--
Mercury	µg/L	<0.025	n/a	--
Molybdenum	µg/L	16.5	33.0	--
Nickel	µg/L	23	46	500
Potassium	µg/L	8520	17040	--
Rubidium	µg/L	4.0	8.0	--
Selenium	µg/L	271	542	--
Silver	µg/L	<0.1	n/a	--
Sodium	µg/L	20700	41400	--
Strontium	µg/L	182	364	--
Tellurium	µg/L	1.7	3.4	--
Thallium	µg/L	<0.1	n/a	--
Tin	µg/L	<0.1	n/a	--
Uranium	µg/L	0.1	0.2	--
Vanadium	µg/L	<1	n/a	--
Zinc	µg/L	8	16	500

***Notes for Table**:*

[1] 50% tailings water is 100% tailings water collected at end of locked cycle 6 blended with 50% v/v fresh water to approximate final effluent discharge from polishing pond.

[2] Parameters for 100% tailings water are estimated as 2 times parameters measured in 50% tailings water sample.

[3] Stated MMER effluent discharge limits represent maximum authorized monthly mean limits as defined by the Government of Canada Metal Mining Effluent Regulations.

Table 13.23 Results of Radiological Analysis for Massive Sulphide Locked Cycle Flotation Tailings Water

Parameter	Units	Measured Value in 50% Tailings Water [1]	MMER Effluent Discharge Limit [2]
Radium 226	Bq/L	< 0.01	0.37
Strontium 90	Bq/L	< 0.1	--
Gross Beta Count	Bq/L	< 0.1	--
Gross Alpha Count	Bq/L	< 0.1	--

Notes for Table:

[1] 50% tailings water is 100% tailings water collected at end of locked cycle 6 blended with 50% v/v fresh water to approximate final effluent discharge from polishing pond.

[2] Stated MMER effluent discharge limits represent maximum authorized monthly mean limits as defined by the Government of Canada Metal Mining Effluent Regulations.

Table 13.24 Results of Thibault Analysis for 100% Tailings Water from MMS Locked Cycle Flotation Test

Sample Description	Sample Temperature (°C)	Thiosalt Concentration (mg/L as S_2O_3)
100% Tailings Water Locked Cycle #1	17.0	16
100% Tailings Water Locked Cycle #2	17.0	36
100% Tailings Water Locked Cycle #3	17.0	39
100% Tailings Water Locked Cycle #4	17.0	32
100% Tailings Water Locked Cycle #5	17.0	36
100% Tailings Water Locked Cycle #6	17.0	35

With respect to the general inorganic chemistry and trace metals analysis, both the measured parameters in the 50% tailings water sample and the parameters estimated for the 100% tailings water met all of the MMER effluent discharge criteria. As a result, the flotation tailings water will not require additional treatment for removal of heavy metals or cyanide, if in use, prior to discharge into the existing tailings pond. Furthermore, radiological analysis of the 50% tailings water collected at the end of locked cycle 6 demonstrated compliance with MMER criteria for radium 226 in liquid effluent and results for radium 226, strontium 90 and gross alpha / beta counts were all below the analytical method detection limits.

In addition to defining specific concentration limits for metals, cyanide, radium 226, total suspended solids and pH in the final effluent from mining operations, MMER also requires that the effluent be non-acutely lethal to aquatic life. The 50% flotation tailings water samples retained from locked cycles 1, 2, 3, 4, 5 and 6 were combined to provide a 40-litre bulk sample of simulated polishing pond effluent for acute lethality testing. A single concentration 96-hour bioassay test was performed in accordance with Environment Canada protocol EPS 1/RM/13 (2007), and demonstrated that the sample was non-acutely lethal to rainbow trout with zero mortalities observed during the test period.

13.6.10 MASSIVE SULPHIDE FLOTATION TAILINGS CHARACTERIZATION

Preliminary characterization of the MMS flotation tailings solids collected at the end of locked cycle 6 was completed and included: modified acid base accounting as determined by the Sobek method for assessment of acid generating potential, standard toxicity characteristic leaching procedure (TCLP) in accordance with US EPA Method 1311, and a custom leaching procedure at pH 8.5. The results of this characterization are summarized in Tables 13.25 and 13.26.

Table 13.25 Results of Modified Acid Base Accounting for MMS Locked Cycle Flotation Tailings

Parameter	Units	Value for Flotation Tailings Sample
Paste pH	pH units	6.1
Total Sulphur	wt%	18.5
Acid Production Potential (AP)	kg $CaCO_3$/tonne	578
Neutralization Potential (NP) at pH 8.3	kg $CaCO_3$/tonne	21.3
Net Neutralization Potential at pH 8.3	kg $CaCO_3$/tonne	-557
NP/AP	no units	0.04

Table 13.26 Results of Leachate Trace Metals on Massive Sulphide Locked Cycle Flotation Tailings

Parameter	Units	Leachate from Standard TCLP	Leachate from Custom Leach at pH 8.5
Aluminum	µg/L	180	< 20
Antimony	µg/L	2	2
Arsenic	µg/L	< 20	< 20
Barium	µg/L	440	< 20
Beryllium	µg/L	< 2	< 2
Bismuth	µg/L	< 2	< 2
Boron	µg/L	< 20	< 20
Cadmium	µg/L	16.5	< 0.2
Calcium	µg/L	372000	37900
Chromium	µg/L	< 20	< 20
Cobalt	µg/L	35	< 2
Copper	µg/L	< 20	< 20
Iron	µg/L	< 400	< 400
Lead	µg/L	2840	< 2
Lithium	µg/L	9	2
Magnesium	µg/L	4600	1200
Manganese	µg/L	4960	< 20
Mercury	µg/L	< 0.025	< 0.025
Molybdenum	µg/L	< 2	2
Nickel	µg/L	40	< 20
Potassium	µg/L	35600	3900
Rubidium	µg/L	110	7
Selenium	µg/L	20	60
Silver	µg/L	< 2	< 2
Strontium	µg/L	140	30
Tellurium	µg/L	< 2	< 2
Thallium	µg/L	13	< 2
Tin	µg/L	< 2	< 2
Uranium	µg/L	10	< 2
Vanadium	µg/L	< 20	< 20
Zinc	µg/L	4440	< 20

In Table 13.25, the negative value shown for the net neutralization potential at pH 8.3 indicates that the flotation tailings are a net acid producer, which is typical of tailings from processing of sulphide ores. The acid production potential determined by the Sobek method represents the worst-case scenario in which 100% of the total sulphur content of the tailings is converted to sulphuric acid; however, deposition of flotation tailings under water cover in the existing tailings pond should significantly decrease the rate and extent of tailings oxidation. After completion of this test program, deposition of flotation tailings under water cover has been practiced following the start-up of the Nugget Pond flotation concentrator.

Based on the flotation process design and operating parameters developed through the bench scale flotation test program, the pH of the tailings streams from the copper concentrator will be in the range of 10.0 to 10.5 and additional lime slurry will be mixed with the tailings in the Flotation Tailings Treatment Tank to neutralize acid generating potential.

The results of the standard TCLP and custom leaching procedures provide an indication of the metals that may leach from the tailings, and to what extent, in the short term following sub-aqueous disposal. The leachate produced by the standard TCLP test procedure (18 hrs. leach time at pH 4.93) contained concentrations of both lead (2.84 mg/L) and zinc (4.44 mg/L) that exceed MMER effluent discharge guidelines; however, at the custom leach procedure pH of 8.5, concentrations of all trace metals in the leachate were very low (most below detection limits). The custom leach procedure is performed to simulate the short-term release of metals from flotation tailings at a pH of 8.5.

14 MINERAL RESOURCE ESTIMATES

The Ming Mine resource statement as of December 31, 2017 is summarized in Table 14.1.

Table 14.1 Ming Mine Resource Summary

Classification	Quantity ('000) t	Grades			Contained Metal		
		Copper (%)	Gold (g/t)	Silver (g/t)	Copper (M lbs)	Gold (K oz)	Silver (K oz)
Measured Total	19,328	1.60	0.25	2.31	682.8	156.3	1438.5
Indicated Total	4,120	1.83	0.62	3.50	166.4	82.2	463.8
M&I Total	23,448	1.64	0.32	2.52	849.3	238.6	1902.3
Inferred Total	2,873	1.78	0.42	2.78	113.1	38.8	256.4

14.1 MING MASSIVE SULPHIDE ZONE

WSP reviewed the procedures used by Rambler to calculate the resources in the various Ming Massive Sulphide (MMS) zones. The procedures remain unchanged from the 2012 PEA (*Darling et. al., 2012*).

Table 14.2 shows the dates the MMS resources were last updated.

Table 14.2 MMS Update Summary

VMS Zone	Last Update
1807	September 1, 2017
1806	June 1, 2015
MSZ	September 1, 2017
MNZ	August 1, 2017
Unmined Levels	July 1, 2010
Remnant Pillars	May 1, 2015

Table 14.3 summarizes the MMS resource.

Table 14.3 Summary of MMS Resource

Zone	Cutoff	Quantity	Grades			Contained Metal		
		('000) t	Cu (%)	Au (g/t)	Ag (g/t)	Cu (M lbs)	Au (K oz)	Ag (K oz)
Measured								
1807 Zone	1.00% Cu	488	2.29	2.54	19.45	24.6	39.8	305.4
1806 Zone	1.25 g/t Au	185	0.40	3.00	14.74	1.6	17.8	87.7
Ming South Down Plunge	1.00 % Cu	323	2.09	2.62	15.99	14.9	27.2	166.3
Ming North Down Plunge	1.00% Cu	192	1.96	1.88	13.83	8.3	11.6	85.3
Ming South Up Plunge	1.00% Cu	30	3.46	1.16	7.36	2.3	1.1	7.0
Unmined Levels	--							
Remnant Pillars	--							
Subtotal MMS - Measured		**1,218**	**1.93**	**2.49**	**16.64**	**51.7**	**97.6**	**651.7**
Indicated								
1807 Zone	1.00% Cu	83	1.72	2.51	18.86	3.1	6.7	50.2
1806 Zone	1.25 g/t Au	65	0.71	2.87	16.01	1.0	6.0	33.7
Ming South Down Plunge	1.00 % Cu	293	2.14	2.57	15.09	13.8	24.2	142.1
Ming North Down Plunge	1.00% Cu	140	1.88	1.99	14.45	5.8	9.0	65.2
Ming South Up Plunge	1.00% Cu	41	2.69	1.04	8.30	2.4	1.4	10.9
Unmined Levels	--							
Remnant Pillars	--							
Subtotal MMS - Indicated		**622**	**1.92**	**2.36**	**15.10**	**26.3**	**47.2**	**302.0**
Measured and Indicated Combined								
1807 Zone	1.00% Cu	571	2.21	2.53	19.37	27.8	46.5	355.7
1806 Zone	1.25 g/t Au	250	0.48	2.96	15.07	2.6	23.9	121.3
Ming South Down Plunge	1.00 % Cu	616	2.12	2.59	15.56	28.8	51.4	308.3
Ming North Down Plunge	1.00% Cu	332	1.93	1.92	14.09	14.1	20.5	150.6
Ming South Up Plunge	1.00% Cu	70	3.02	1.09	7.91	4.7	2.5	17.9
Unmined Levels	--	125	2.43	1.99		6.7	8.0	
Remnant Pillars	--	259	3.96	2.00		22.6	16.7	
Subtotal MMS –M&I		**2,224**	**2.19**	**2.37**	**13.34**	**107.3**	**169.4**	**953.7**
Inferred								
1807 Zone	1.00% Cu	122	1.72	1.19	7.68	4.6	4.7	30.3
1806 Zone	1.25 g/t Au	149	0.66	2.63	10.67	2.2	12.6	51.1
Ming South Down Plunge	1.00 % Cu	260	2.26	0.78	3.16	13.0	6.5	26.4
Ming North Down Plunge	1.00% Cu	290	1.84	0.71	3.71	11.8	6.6	34.6
Ming South Up Plunge	1.00% Cu	3	1.35	1.44	9.08	0.1	0.2	1.0
Unmined Levels	--							
Remnant Pillars	--							
Subtotal MMS - Inferred		**825**	**1.74**	**1.15**	**5.40**	**31.7**	**30.6**	**143.4**

14.2 LOWER FOOTWALL ZONE

WSP reviewed the procedures used by Rambler to calculate the resources of the Lower Footwall Zone (LFZ) of the Ming Mine. The same procedures remain unchanged from the 2015 PFS (*McCracken et al., 2015*). The effective date of the LFZ resource is December 31, 2017.

14.3 DATABASE

Rambler maintains all borehole data in DATAMINE Studio®. Header, survey, assays, and lithology information are saved as individual tables in the database. The database information was provided to WSP originally in October 2017.

The LFZ database contains 256 diamond boreholes assembled by Rambler. There were three types of drilling campaigns; the drillhole names prefixed by "RM" were drilled from surface, while the drillhole names prefixed by "RMUG" and "R" were drilled from underground. There were 16,848 assay records in the database, with 16,844 records containing analysis for copper. Table 14.4 summarizes the boreholes used in the LFZ estimation.

Table 14.4 Database Summary

	Number of Boreholes	Length (m)	Number of Records					
			Lithology	Survey	Cu	Au	Ag	Zn
LFZ Boreholes	256	83,026	10,001	20,072	16,844	11,580	11,523	11,958
Surface Boreholes	47	54,659	4,680	12,143	3,271	3,271	3,271	3,271
Underground Boreholes	209	28,367	5,321	7,929	13,573	8,309	8,252	8,687

14.4 TOPOGRAPHIC DATA

The LFZ is an underground resource and is not impacted by topography. A Digital Terrain Model (DTM) was created using the borehole collars in an area sufficient to cover the current resource model to check the collar elevations.

Figures 14.1 and 14.2 illustrate the position and spacing of the drillholes used in the LFZ estimation.

Figure 14.1 LFZ Drillhole Plan View (with and without surface DTM)

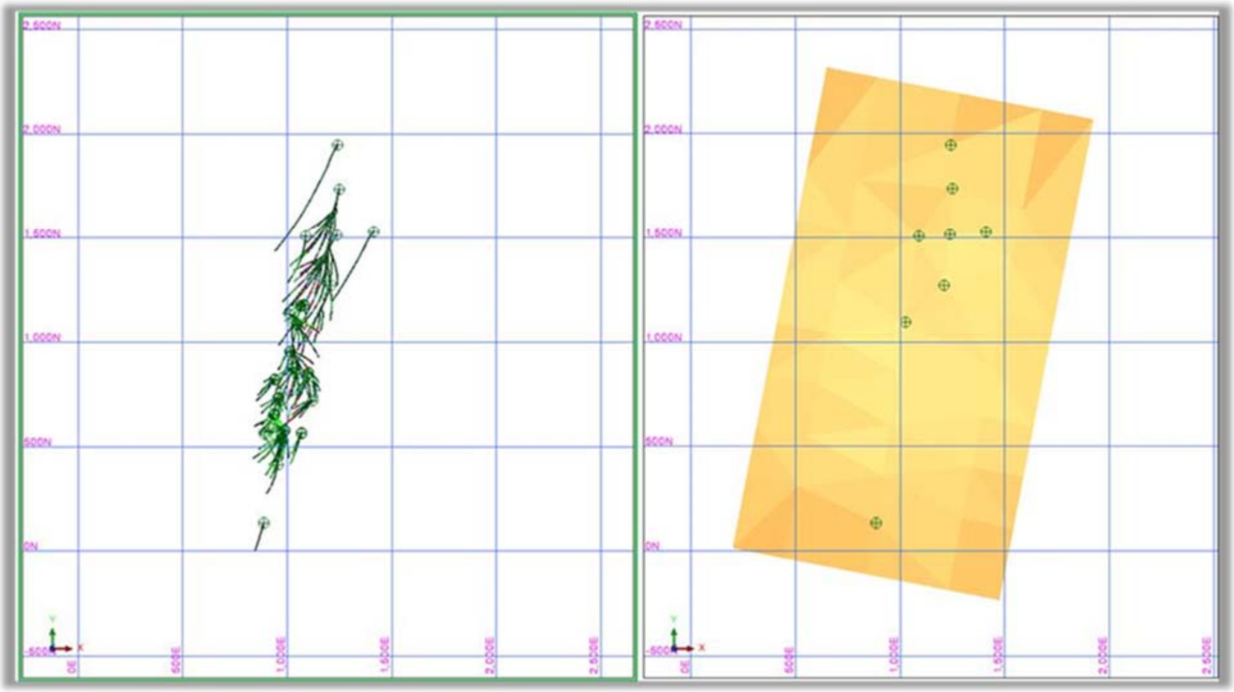
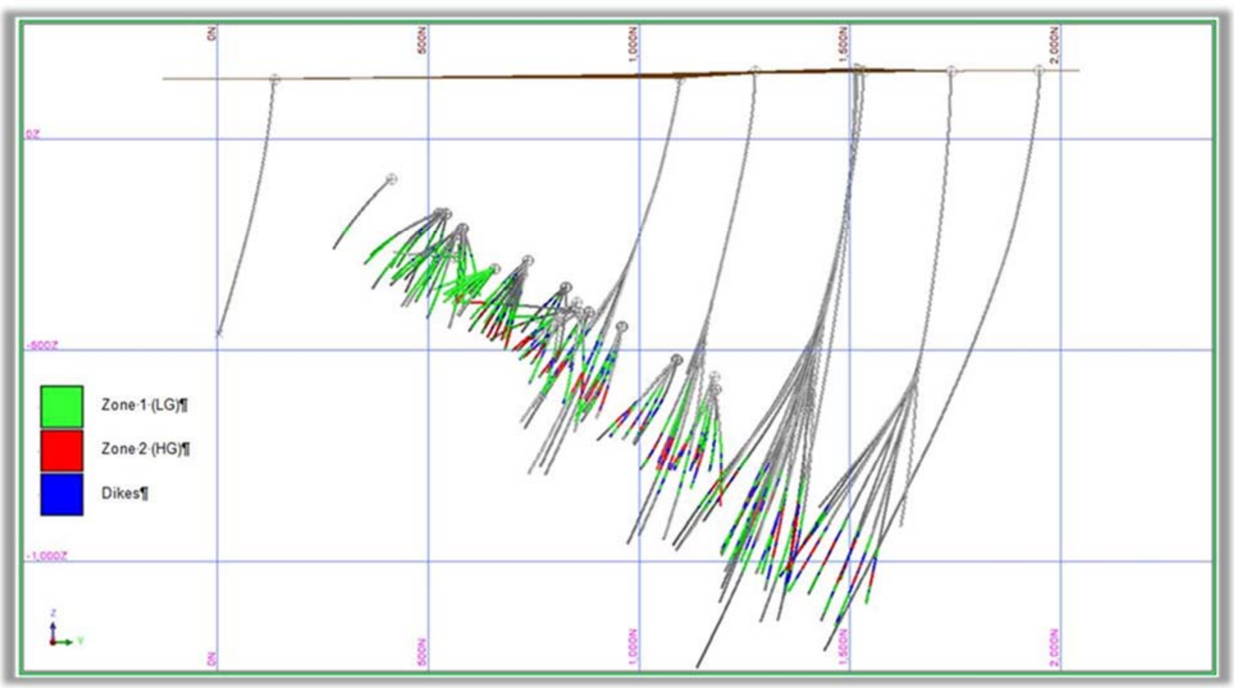


Figure 14.2 LFZ Drillhole Longitudinal Projection



14.5 GEOLOGICAL INTERPRETATION

Three-dimensional wireframe models of mineralization were developed in DATAMINE Studio® environment by Rambler technical staff. The wireframes were based on the geological interpretation of the zones as distinct domains, associated with grade intervals to define the borders between them. The geological interpretation followed industry standards, through sectional interpretation of the boreholes, linked by tag strings, and triangulated to build three-dimensional solids.

The wireframes were based on the geological interpretation of Zones 1 and 2, where the mineralized horizons were split in two different domains called high grade (HG) and low grade (LG). The HG domain encompassed material generally above 2% Cu, while the LG domain incorporated material above 1% Cu. The mineralization has a pronounced strike, with azimuth N12E/35SW, and the HG domain is completely encapsulated within the LG domain. There are no distinct visual markers that differentiate the LG from the HG. The boundary between the two domains should be considered as a soft boundary not a hard contact.

Figure 14.3 illustrates the HG and LG solids used in the resource estimate.

The LH and HG domains are cross cut by a number of mafic dykes. A total of 22 dykes with thickness greater than 1 metre were generated as a solid for each dyke (Figure 14.4).

Figure 14.5 provides a generalized view of the LFZ HG and LG domains with the drillhole dataset to demonstrate the coverage by drilling within the block model.

Table 14.5 tabulates the dimensions and associated volumes for each of the solids in the LFZ.

Figure 14.3 LFZ LG and HG Mineral Domain Solids (not to scale)

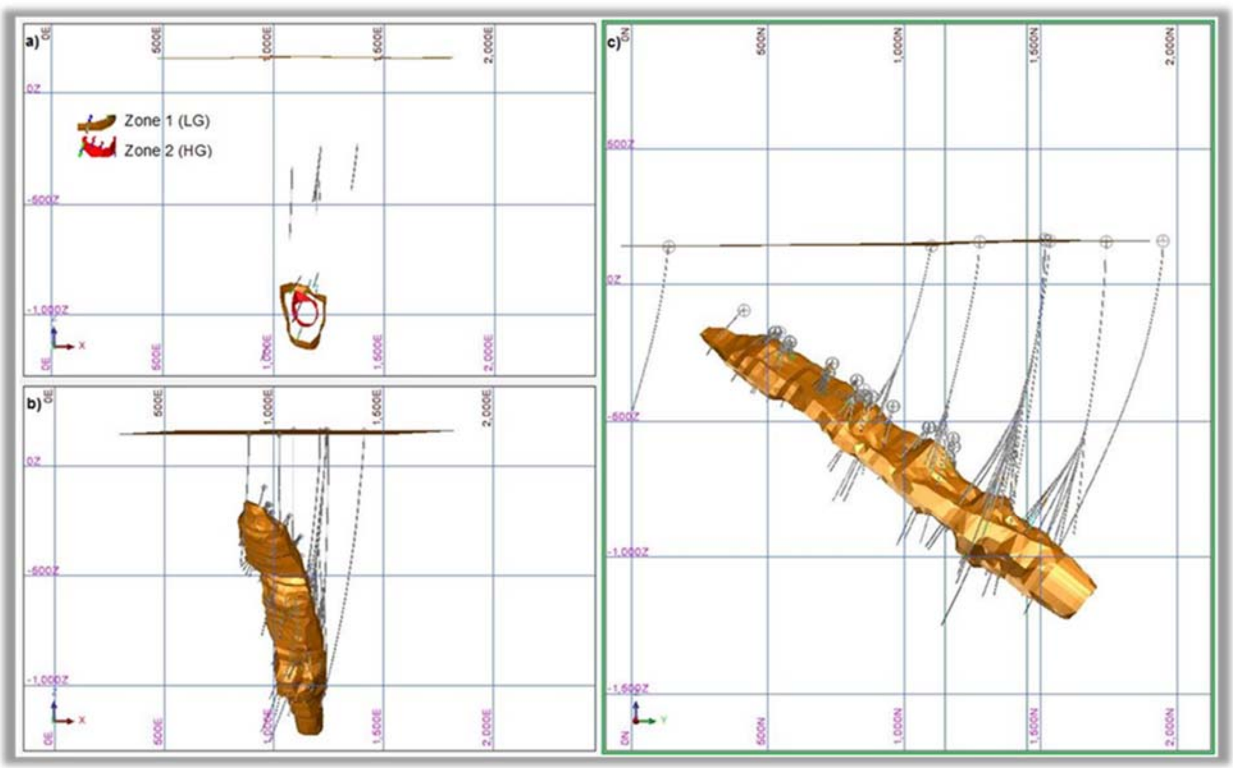


Figure 14.4 LFZ Dyke Solids (not to scale)

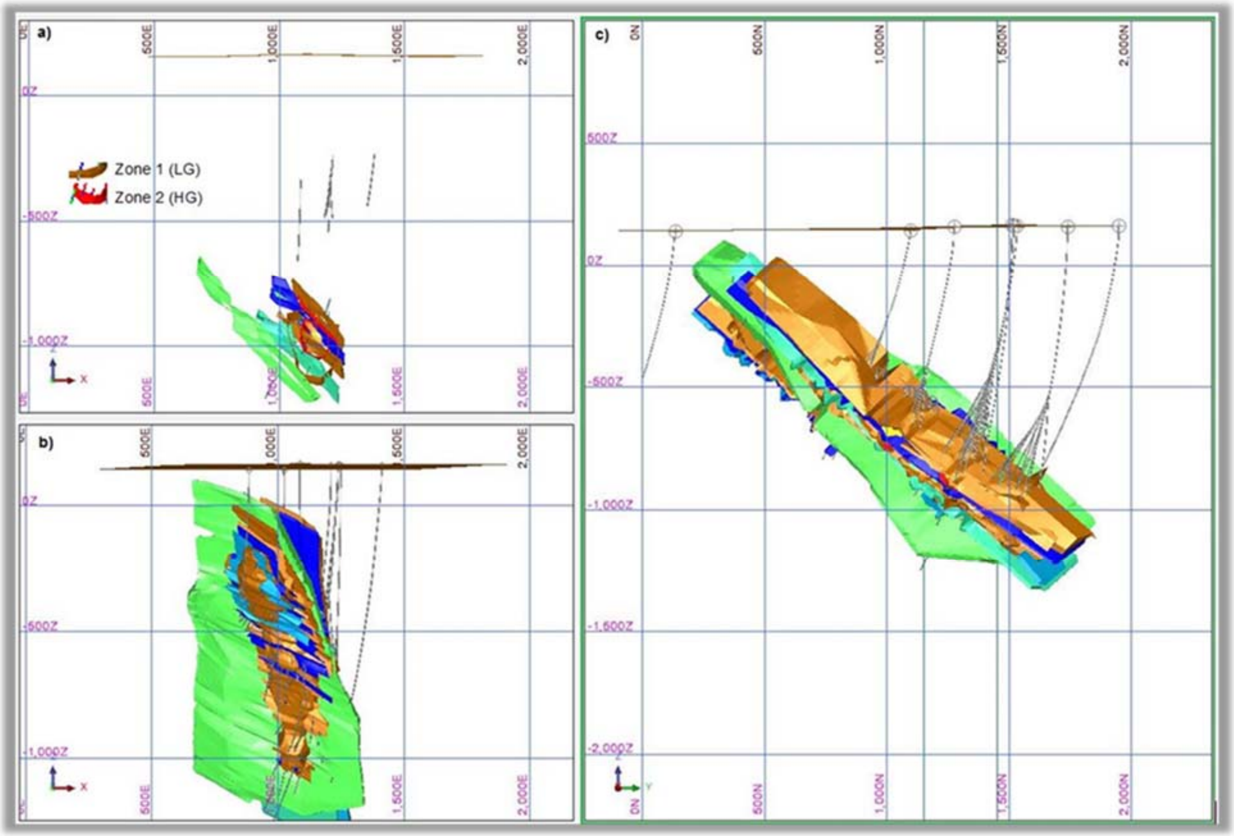


Figure 14.5 Generalized LFZ View with Drillholes

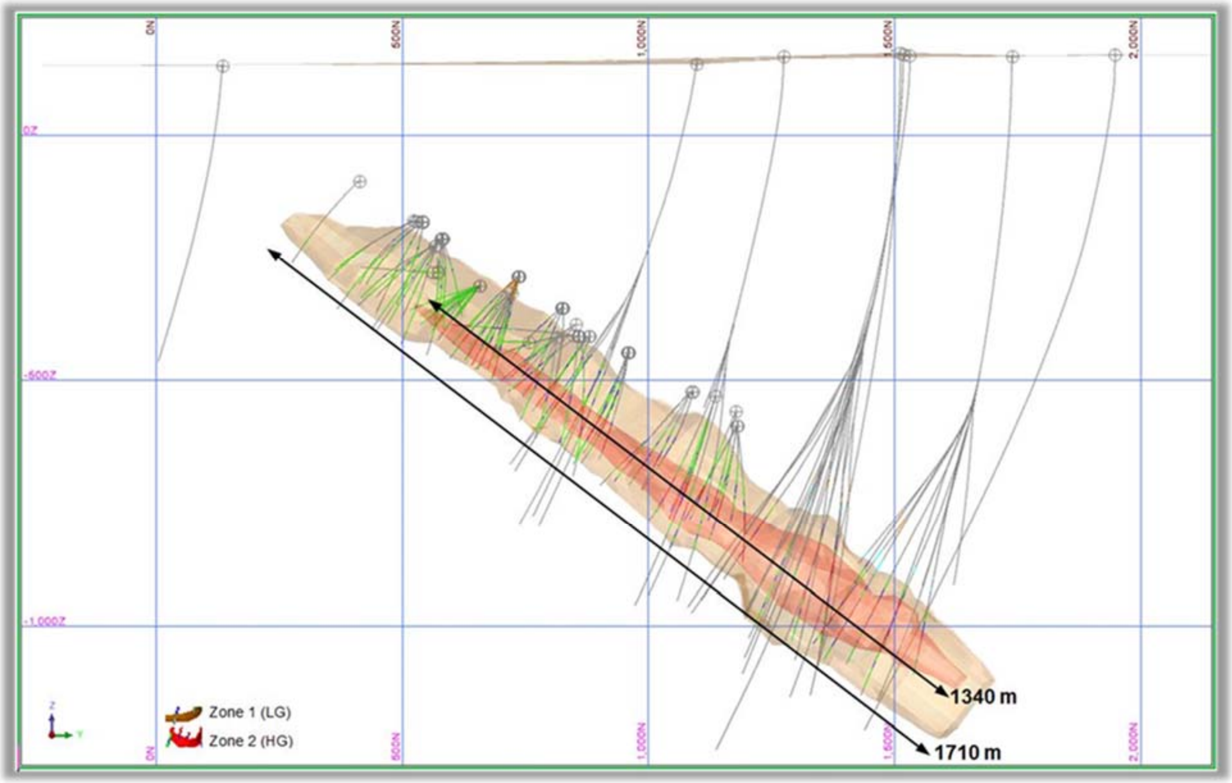


Table 14.5 Mineral Solid Summary

Zone	Minimum X	Maximum X	Minimum Y	Maximum Y	Minimum Z	Maximum Z	Surface Area (m^2)	Volume (m^2)
Zone 1 (HG)	834.21	1,243.73	250.47	1,706.83	-1,227.80	-156.8	1,164,172.14	46,132,933.15
Zone 2 (LG)	982.85	1,205.26	522.01	1,648.72	-1,128.50	-341.61	422,514.27	9,066,780.93
Dyke 01	906.06	1,292.94	417.05	1,855.80	-1,184.19	35.49	1,119,530.11	7,410,591.67
Dyke 02	886.59	1,293.72	342.29	1,815.41	-1,227.59	-21.37	1,316,065.06	8,363,523.61
Dyke 03	1,057.43	1,300.00	1,534.15	1,731.63	-1,312.43	-1,114.99	88,657.74	438,133.84
Dyke 04	836.42	1,249.94	351.7	1,782.55	-1,334.75	56.8	1,459,720.65	7,175,234.79
Dyke 05	640.03	1,346.09	199.29	1,853.06	-1,227.80	104.27	2,669,411.62	24,326,900.74
Dyke 06	882.94	1,274.21	874.19	1,574.27	-1,151.04	-464.74	572,752.84	1,988,358.56
Dyke 07	1,096.04	1,256.05	1,299.36	1,451.21	-1,032.93	-882.84	46,104.05	168,695.26
Dyke 08	1,048.62	1,276.64	1,214.58	1,510.24	-1,005.76	-722.24	133,952.24	207,321.06
Dyke 09	1,016.98	1,093.15	1,571.59	1,617.10	-943.81	-904.96	3,912.88	8,094.27
Dyke 10	976.95	1,208.39	1,231.97	1,502.06	-1,133.75	-954.39	41,099.83	60,908.67
Dyke 11	994.54	1,080.31	1,267.50	1,334.11	-1,056.12	-998.03	6,532.46	6,281.98
Dyke 12	949.26	1,264.36	1,009.60	1,377.53	-1,038.58	-675.32	139,470.44	189,654.14
Dyke 13	968.23	1,265.54	1,164.16	1,457.12	-1,050.05	-786.66	135,323.18	163,511.36
Dyke 14	979.21	1,271.05	1,054.95	1,444.77	-945.91	-607.62	152,737.83	188,121.95
Dyke 15	948.51	1,277.95	977.95	1,421.92	-916.92	-528.81	130,736.59	190,573.92
Dyke 16	787.54	1,202.32	224.48	1,227.61	-918.3	-58.97	785,885.80	1,285,122.99
Dyke 17	981.05	1,234.00	980.52	1,232.07	-809.86	-581.58	78,628.23	98,177.85
Dyke 18	1,017.81	1,213.70	930.35	1,180.77	-703.08	-576.17	24,960.15	15,794.38
Dyke 19	998.26	1,091.64	1,090.19	1,170.88	-690.36	-611.35	9,737.27	4,482.84
Dyke 20a	784.21	1,161.42	253.28	800.87	-501.24	8.54	363,856.77	778,491.69
Dyke 20b	842.71	1,220.18	587.88	1,051.27	-673.15	-544.63	336,915.15	444,171.99
Dyke 21	791.18	1,214.67	209.1	954.47	-366.11	-75.65	529,208.94	705,608.73
Dyke 22	779.93	1,127.13	199.55	741.71	-418.14	-307.36	335,994.66	371,837.86

14.6 EXPLORATORY DATA ANALYSIS

14.6.1 ASSAYS

The two mineral domains included in the mineral resource were sampled by a total of 15,064 assay records in the database. The assay intervals within each mineral domain were captured using a Datamine® routine to flag the intercept into a new table in the database. These intervals were reviewed to ensure all the proper assay intervals were properly captured. Table 14.6 summarizes the basis statistics for each domain.

Table 14.6 Drillhole Statistics by LFZ Domain

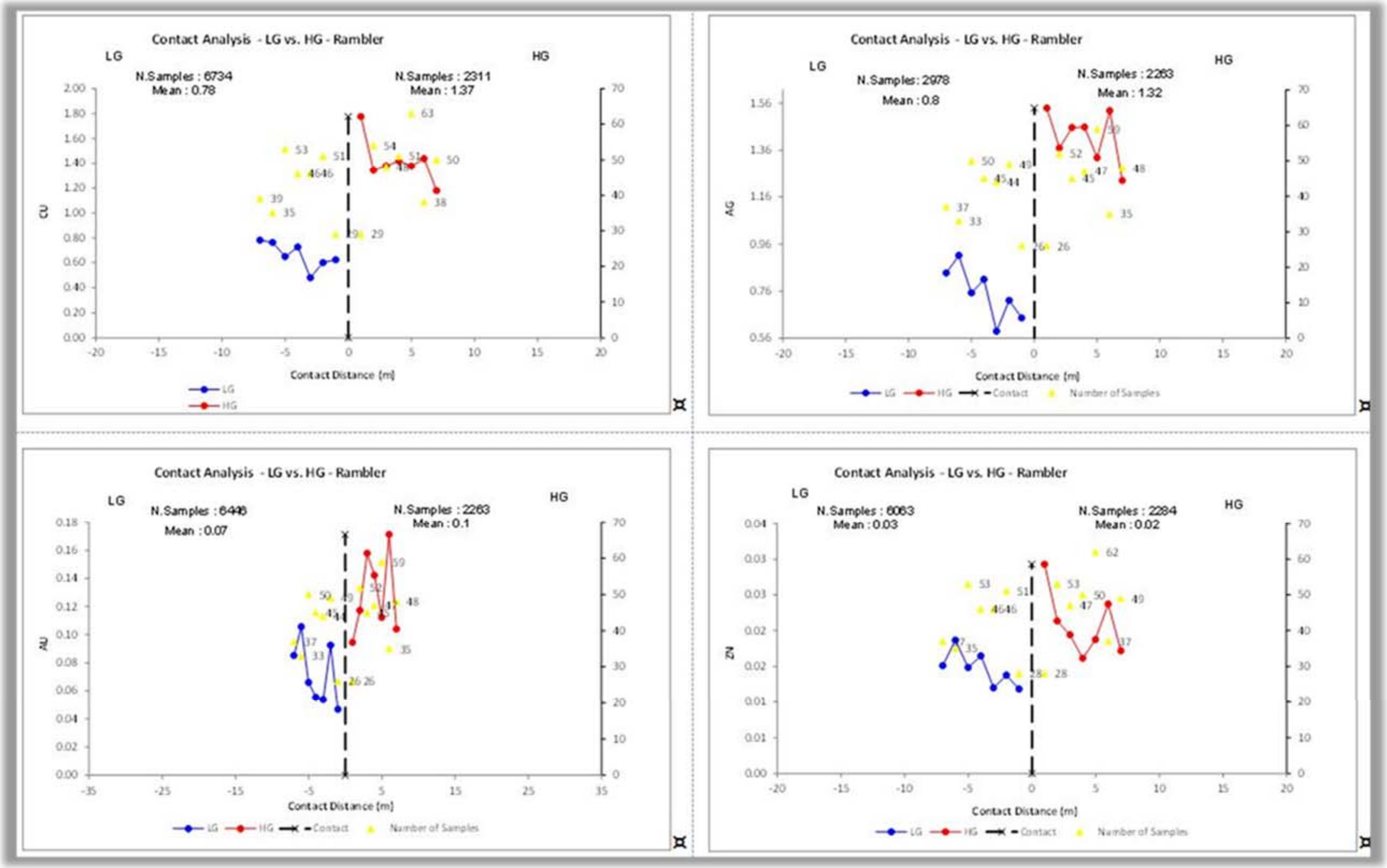
Zone	Field	No of Records	Minimum	Maximum	Mean	Standard Deviation
Zone 1 (LG)	Length (m)	10,119	0.01	39.60	1.32	1.14
	Cu (%)	8,944	0.00	10.10	0.53	0.59
	Ag (g/t)	5,893	0.00	18.70	0.64	0.74
	Au (g/t)	5,905	0.00	4.19	0.07	0.12
	Zn (%)	6,364	0.00	1.30	0.03	0.05
Zone 2 (HG)	Length (m)	6,239	0.01	4.40	1.16	0.48
	Cu (%)	6,120	0.00	22.60	1.47	1.38
	Ag (g/t)	3,612	0.00	20.20	1.47	1.41
	Au (g/t)	3,653	0.00	3.82	0.12	0.19
	Zn (%)	4,128	0.00	1.99	0.04	0.10

14.6.2 CONTACT ANALYSIS

The grade behaviour of copper, silver, gold, and zinc in the two main domains (LG and HG), was analyzed applying a distance increment from the geological contact, with the purpose to verify if the domains were homogeneous or not.

Figure 14.6 demonstrates that the HG and LG domains are very well characterized in the assay samples with a distinct difference in grades on either side of the domain boundary.

Figure 14.6 Contact Analysis by Element



14.6.3 LFZ GRADE CAPPING

Raw assay data for each domain was examined individually to assess the amount of metal that is biased from high grade assays. A combination of viewing the cumulative frequency plots and decile distribution was used to assist in the determination of the grade capping that was required for each element in each domain.

A variable top cut by element by domain was applied. Table 14.7 summarizes the results of the capping procedure. Copper was capped at 6.0%, gold at 0.4 g/t, silver at 5.5 g/t and zinc at 0.20%.

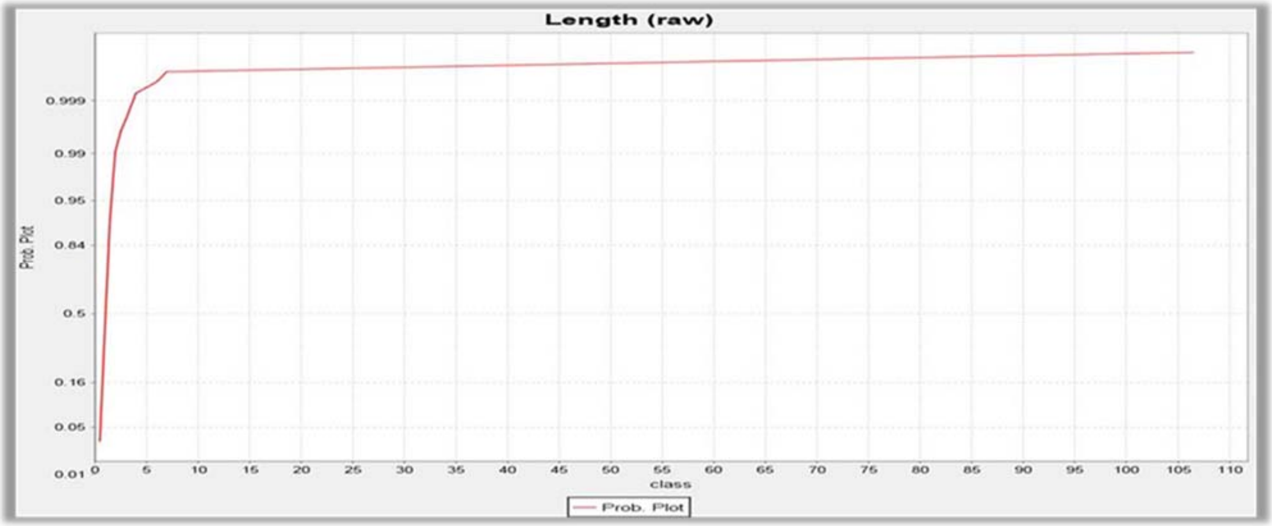
Table 14.7 Capped Drillhole Statistics by LFZ Domain

Zone	Field	Minimum	Maximum	Mean	Standard Deviation	No. of Records Capped
Zone 1 (LG)	Cu (%) - Uncapped	0.00	10.10	0.53	0.59	-
	Cu (%) - Capped	0.00	6.00	0.53	0.58	11
	Ag (g/t) - Uncapped	0.00	18.70	0.64	0.74	-
	Ag (g/t) - Capped	0.00	5.50	0.63	0.66	16
	Au (g/t) - Uncapped	0.00	4.19	0.07	0.12	-
	Au (g/t) - Capped	0.00	0.40	0.07	0.07	77
	Zn (%) - Uncapped	0.00	1.30	0.03	0.05	-
	Zn (%) - Capped	0.00	0.20	0.02	0.03	96
Zone 2 (HG)	Cu (%) - Uncapped	0.00	22.60	1.47	1.38	-
	Cu (%) - Capped	0.00	6.00	1.43	1.14	73
	Ag (g/t) - Uncapped	0.00	20.20	1.47	1.41	-
	Ag (g/t) - Capped	0.00	5.50	1.43	1.13	56
	Au (g/t) - Uncapped	0.00	3.82	0.12	0.19	-
	Au (g/t) - Capped	0.00	0.40	0.10	0.09	123
	Zn (%) - Uncapped	0.00	1.99	0.04	0.10	-
	Zn (%) - Capped	0.00	0.20	0.03	0.04	115

14.6.4 COMPOSITING

Compositing of all the assay data within the various domains was completed on downhole intervals honoring the interpretation of geological solids. Statistics indicate that a majority of samples were collected at 1 m intervals. Figure 14.7 confirms that a majority of the samples were collected at 1 m intervals.

Figure 14.7   Samples Length Cumulative Frequency Plot



Composite were completed on 2-metre averaged lengths for both domains. The Best Fit process was used in the compositing routine to ensure the majority of the captured sample material was included, and the Best Fit routine adjusts the composite lengths for each individual borehole in order to compensate for the last sample interval. Table 14.8 summarizes the statistics for the boreholes after compositing.

Table 14.8   Composite Drillhole Statistics by Domain

Zone	Field	No of Records	Minimum	Maximum	Mean	Standard Deviation
Zone 1 (LG)	Cu (%)	5,357	0.00	5.52	0.53	0.47
	Ag (g/t)	3,150	0.01	5.50	0.65	0.54
	Au (g/t)	3,156	0.00	0.40	0.07	0.06
	Zn (%)	3,398	0.00	0.20	0.02	0.03
Zone 2 (HG)	Cu (%)	3,668	0.00	6.00	1.45	0.89
	Ag (g/t)	1,927	0.00	5.50	1.48	0.93
	Au (g/t)	1,946	0.00	0.40	0.10	0.08
	Zn (%)	2,193	0.00	0.20	0.03	0.04

14.7 SPATIAL ANALYSIS

Rambler variography was determined using Surpac™ version 6.6 software. Each domain was modeled for copper, silver, gold, and zinc using a downhole variogram to determine nugget effect and then a pair-wise variogram was used to determine spatial continuity in the HG-LG domains. The variogram results were converted from Surpac format to Datamine format in order for Rambler to run the estimations.

Even though the samples were flagged for each of the mineralized domains, the variograms for the two domains were so similar that the same variogram could be used for the two domains. It was deemed appropriate to use an anisotropic variogram for the updated resource estimation. Table 14.9 summarizes the results of the variogram model for each element. The variogram rotation and maximum range governed the search ellipse rotation and size.

Table 14.9 Variogram Summary

Variographic Attributes	Cu LG/HG	Au LG/HG	Ag LG/HG
Bearing	39.65	185.00	200.00
Plunge	-31.32	35.00	35.00
Dip	85.00	-10.00	5.00
Major axis	95.70	115.42	100.23
Semi-major axis	64.45	73.37	52.67
Minor axis	45.66	49.03	22.48
Major/semi-major anisotropy ratio	1.49	1.57	1.90
Major/minor anisotropy ratio	2.10	2.35	4.46
Nugget	0.20542	0.00208	0.38276
Sill 1st S	0.28284	0.00322	0.11029
Sill 2nd S	0.20362	0.00397	0.30160
Range 1st S	44.77	67.44	100.23
Range 2nd S	95.70	115.42	161.28

Figures 14.8 to 14.10 are the directional variograms for the copper domains.

Figure 14.8 Copper Variogram – Major Axis

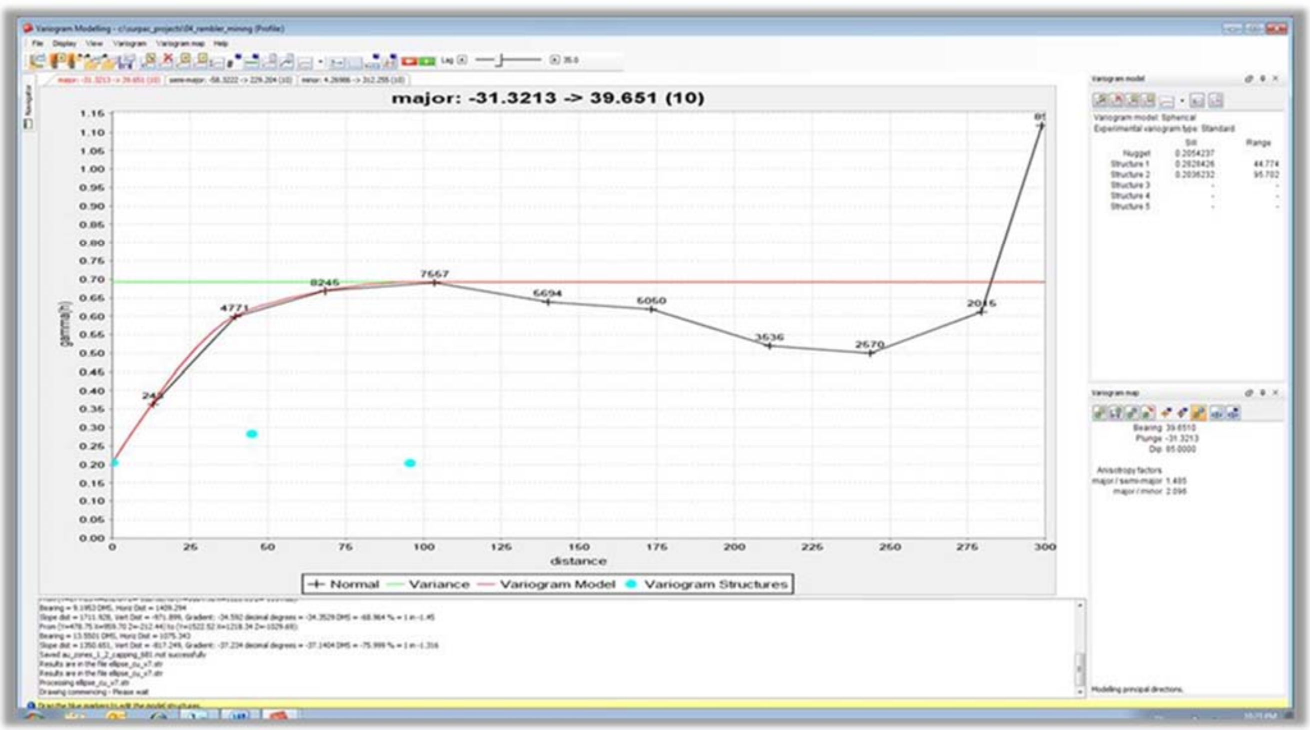


Figure 14.9 Copper Variogram – Semi-Major Axis

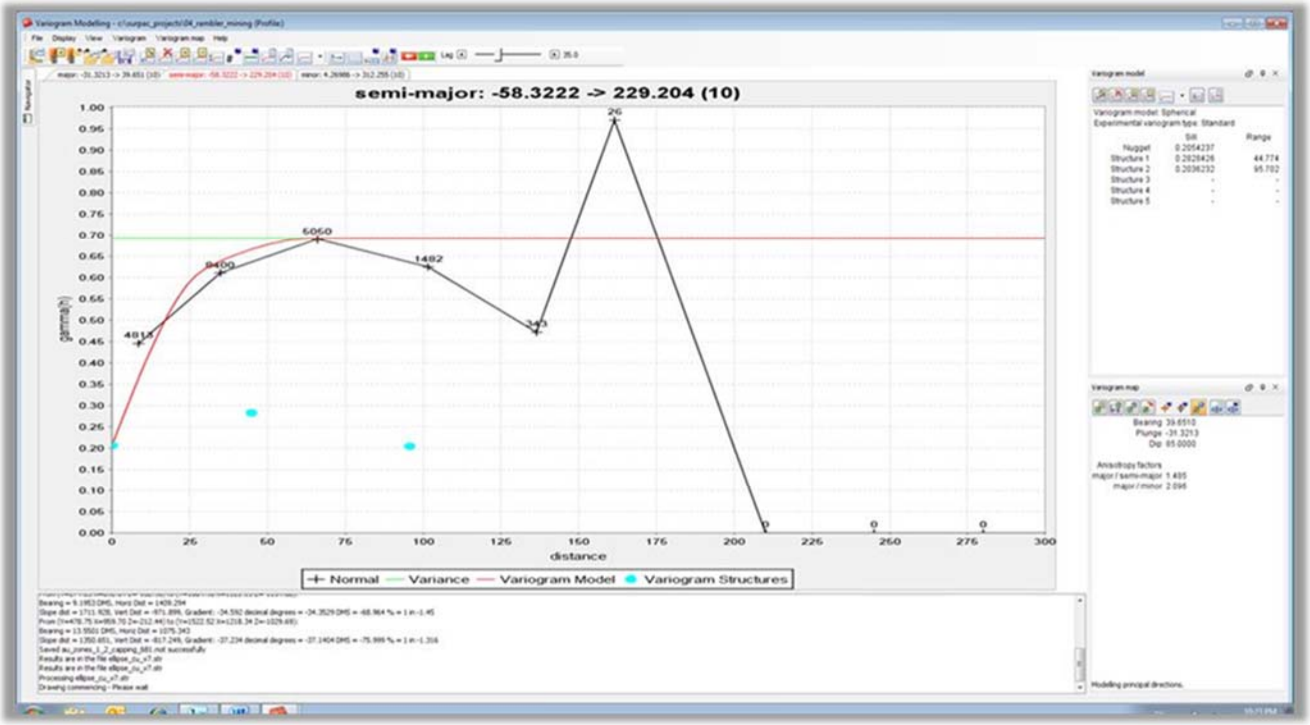
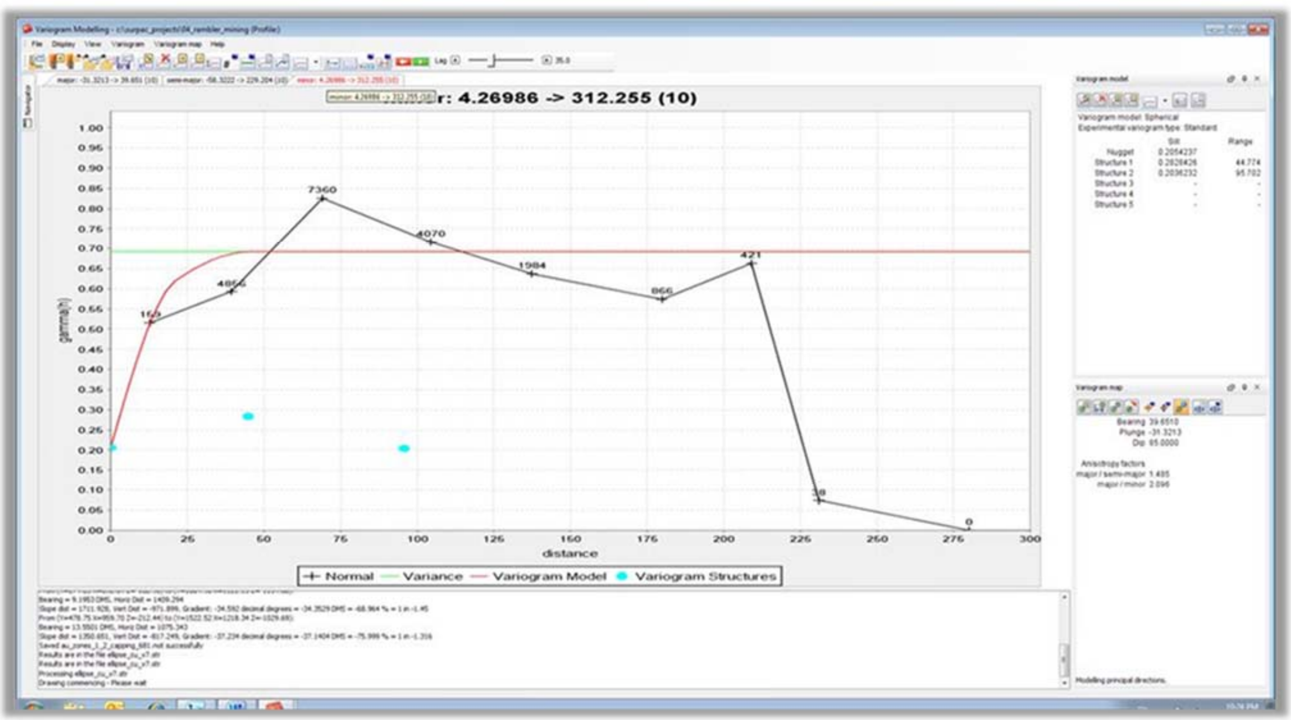


Figure 14.10 Copper Variogram – Minor Axis



14.8 SPECIFIC GRAVITY

Rambler has collected a total of 6,902 samples from the LFZ for specific gravity (SG) measurements.

Rambler used the following procedure to determine the SG for each sample:

- Sample selected for SG measurement.
- The Borehole ID, From, To, and Rock Type were entered into a spreadsheet.
- The sample was weighted dry on the scale.
- The sample was then weighted submerged saturated in tap water at a relatively constant temperature (Figure 14.11).

Figure 14.11 Specific Gravity Scale in Core Logging Facility

The specific gravity is determined using the following equation:

$$SG = \frac{Wd}{Wd - Ws}$$

Wd = Dry Weight, Ws = Submerged Weight

Upon validation of the SG results, a total of 6,214 samples were used to determine the SG of the mineralized material within the LFZ. The samples were plotted on a scattered plot comparing the copper (Cu) grade of the sample to the measured SG of the sample. A 3rd order polynomial regression curve was fitted to the data to generate an equation that relates SG to Cu grades.

The SG of each mineralized block in the model was assigned a value based on the rock codes of the block and the copper grade of that block using the regression formula.

$$SG=-0.0001〖Cu〗^3+0.0042〖Cu〗^2+0.0241Cu+2.795$$

The use of the regression formula to determine block SG provides an improved local estimate of the SG, while maintaining a consistent global value (i.e. low-grade blocks, lower SG; high-grade blocks, higher SG).

An additional 618 samples of dyke material was used to determine the global SG for the dykes, which was assigned a SG value of 2.91. Table 14.10 summarizes the SG results.

Table 14.10 Summary of Specific Gravity Measurements

	Full Dataset	HG and LG	Dyke
Total records	6,902	6214	618
Minimum SG	1.05	1.05	2.67
Maximum SG	12.58	5.32	3.85
Weighted average SG	2.87	2.83	2.92
Minimum Cu %	-	0.0001	0.0002
Maximum Cu %	-	18.6	3.83
Weighted Cu grade %	-	0.744	0.076

14.9 RESOURCE BLOCK MODEL

The Block Model was established in Datamine for each of the mineral domains using one parent model as the origin; the model was not rotated. The drillhole fan spacing is variable with the majority of the surface drilling being spaced at 200 to 250 m sections, with an extreme peak of 900 m of spacing. The underground fan drilling provides more detail with spacing at 40 to 80 metres, with an extreme spacing peak of 140 m. A block size of 5 m x 5 m x 5 m as selected in order to accommodate the underground design potential.

Sub-celling of the block model on a 1.25 m x 1.25 m x 1.25 m pattern allows the parent block to split in each direction to more accurately fill the volume of the narrow portions of the diabase dykes and their contacts with the ore domains wireframes, resulting in a more precise estimate of the tonnes in the resource.

Table 14.11 summarizes details of the parent block model.

Table 14.11 Parent Model Parameters

Type	Y	X	Z
Minimum coordinates	210	820	-1,150.00
Maximum coordinates	1,730.00	1,310.00	-160
User block size	5	5	5
Number blocks	304	98	198
Minimum block size	1.25	1.25	1.25
Rotation	0	0	0
Total blocks	5,898,816	-	-

14.9.1 ESTIMATION PARAMETERS

The interpolations of the LFZ was completed using the following estimation methods:

— Ordinary kriging (OK);

— Inverse distance squared (ID^2);

— Nearest neighbour (NN).

The LFZ resource statement is based on the ordinary kriging estimation method. The LFZ estimation was accomplished using a hard boundary technique.

The LG solid was used as the final constraining boundary. The estimation was completed as if the dykes were not present. Upon completion of the estimation runs, the block located within the dyke solids had the properties reset to zero and the specific gravity set to 2.91. Table 14.12 summarizes the estimation criteria used in the estimation process.

Table 14.12 Estimation Strategy Summary

Pass No.	Search Ellipse Factor	Minimum No. of Composites	Maximum No. of Composites	Composite/ boreholes	LG Shell Dataset	HG Core Dataset
1	50% of maximum range	4	15	2	LG Shell only Samples	HG Core only Samples
2	75% of maximum range	3	15	2	LG Shell only Samples	HG Core only Samples
3	100% of maximum range	2	15	2	LG Shell only Samples	HG Core only Samples
4	150% of maximum range	2	15	2	LG Shell only Samples	HG Core only Samples

14.10 RESOURCE CLASSIFICATION

Several factors are considered in the definition of a resource classification:

- NI 43-101 requirements;
- Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Estimation of Mineral Resource and Mineral Reserve Best Practice Guidelines;
- Author's experience with massive sulphide hosted deposits;
- Spatial continuity based of the assays within the drillholes;
- Understanding of the geology of the deposit;
- Drillhole spacing and the estimation runs required to estimate the grades in a block.

The following parameters were used to determine the resource classification:

- A block was classified as Measured when:
  - the copper kriged grade was greater than 0;
  - more than five composites were used in the estimate;
  - and, only in the first two estimation passes.
- A block was classified as Indicated when:
  - the block is not already classified as measured;
  - the copper kriged grade was greater than 0;
  - more than four composites were used in the estimate;
  - and, in any of the four estimation passes.
- A block was classified as Inferred when :
  - the block is not already classified;
  - the copper kriged grade was greater than 0;
  - four or less composites were used in the estimate;
  - and, only in the blocks is estimated in the fourth pass.

No environmental, permitting, legal, title, taxation, socio-economic, marketing, or other relevant issues are known to WSP that may affect the estimate of mineral resources. Mineral reserves can only be estimated on the basis of an economic evaluation that is used in a preliminary feasibility study or a feasibility study of a mineral project; thus, no reserves have been estimated. As per NI 43-101, mineral resources, which are not mineral reserves, do not have to demonstrate economic viability.

14.11 RESOURCE TABULATION

The LFZ resource estimate is effective as of December 2, 2014 and has been tabulated in terms of a copper cutoff grade. The resources are tabulated at various cutoff grades to demonstrate that the resource has potential at different metal prices or production costs (Tables 14.13 to 14.15).

Table 14.13 LFZ Grade Tonnage – Measured Category

Sensitivity Table for Measured Resources				
Interval Above Cu %	Tonnes (000's)	Grades		
		Cu (%)	Ag (g/t)	Au (g/t)
0.25	47,834	0.96	0.95	0.08
0.50	36,250	1.15	1.06	0.08
0.75	25,211	1.38	1.21	0.09
1.00	18,110	1.58	1.35	0.10
1.25	13,187	1.75	1.45	0.11
1.50	8,683	1.95	1.55	0.11
1.75	5,269	2.16	1.69	0.12
2.00	3,001	2.38	1.84	0.12
2.25	1,604	2.62	1.98	0.13
2.50	791	2.89	2.14	0.14
2.75	395	3.16	2.29	0.15
3.00	203	3.45	2.44	0.16

Table 14.14 LFZ Grade Tonnage – Indicated Category

Sensitivity Table for Indicated Resources				
Interval Above Cu %	Tonnes (000's)	Grades		
		Cu (%)	Ag (g/t)	Au (g/t)
0.25	8,062	0.98	1.08	0.08
0.50	6,206	1.17	1.21	0.08
0.75	4,351	1.40	1.41	0.09
1.00	3,114	1.62	1.62	0.10
1.25	2,473	1.74	1.70	0.11
1.50	1,684	1.91	1.80	0.11
1.75	1,035	2.10	1.98	0.12
2.00	547	2.30	2.13	0.12
2.25	274	2.49	2.20	0.12
2.50	106	2.69	2.28	0.13
2.75	27	2.95	2.34	0.12
3.00	7	3.23	2.47	0.12

Table 14.15 LFZ Grade Tonnage – Inferred Category

Sensitivity Table for Inferred Resources				
Interval Above Cu %	Tonnes (000's)	Grades		
		Cu (%)	Ag (g/t)	Au (g/t)
0.25	4,008	1.21	1.33	0.10
0.50	3,312	1.38	1.44	0.11
0.75	2,408	1.66	1.63	0.12
1.00	2,048	1.80	1.72	0.12
1.25	1,827	1.88	1.76	0.13
1.50	1,234	2.12	1.91	0.14
1.75	891	2.32	1.95	0.15
2.00	722	2.43	2.02	0.15
2.25	476	2.58	2.19	0.16
2.50	266	2.81	2.69	0.19

Based on Ming Mine's forecasted cost and copper pricing, a cutoff of 1.0% Cu was selected for final resource tabulation (Table 14.16).

Table 14.16 LFZ Resource Summary

Resource Classification	Tonnes (000's)	Grades			Contained Metal		
		Cu (%)	Ag (g/t)	Au (g/t)	Cu lbs	Ag K oz	Au K oz
Measured	18,110	1.58	1.35	0.10	631.1	786.8	58.8
Indicated	3,114	1.62	1.62	0.10	110.9	161.7	10.4
Measured and Indicated	21,224	1.59	1.39	0.10	742.0	948.50	69.2
Inferred	2,048	1.80	1.72	0.12	81.3	113.0	8.2

***Note**: Totals may not add due to rounding*

The Rambler project block model was validated by two methods:

1. Visual comparison of colour-coded block model grades with composite grades on section and plan.
2. Comparison of the global mean block grades for OK, ID^2, NN, and composites.

14.11.1 VISUAL VALIDATION

The visual comparisons of block model grades with composite grades for the LFZ show a reasonable correlation between the values. No significant discrepancies were apparent from the sections reviewed, yet grade smoothing is apparent in some of the lower elevations due to the distance between drill samples being broader in these regions.

14.11.2 COMPARISON OF THE GLOBAL MEAN BLOCK GRADES FOR OK, ID^2, NN, AND COMPOSITES

The global block model statistics for the OK, ID^2, and NN were compared to the global NN model values as well as the composite capped drillhole data (Table 14.17). The results show a good correlation between the drillhole composites and the block grades for each of the estimation methods.

Table 14.17 Global Grade Comparison

Zone	Attribute	DDH Grade	OK Grade	ID^2 Grade	NN Grade
Zone 1 (LG)	Cu (%)	0.465	0.483	0.478	0.453
	Ag (g/t)	0.561	0.619	0.608	
	Au (g/t)	0.059	0.055	0.055	
	Zn (%)	0.022	0.014	0.014	
Zone 2 (HG)	Cu (%)	1.431	1.592	1.604	1.575
	Ag (g/t)	1.382	1.460	1.468	
	Au (g/t)	0.110	0.105	0.105	
	Zn (%)	0.035	0.018	0.018	

***Note**: NN grade estimation not completed for Ag, Au, or Zn.*

14.12 PREVIOUS ESTIMATION

The previous LFZ resource estimation was completed by WSP in 2014 (*McCracken et. al, 2015*). That estimate was based on the premise that the resource could potentially be extracted using traditional underground methods.

Table 14.18 compares the basic parameters used in the previous 2014 estimate with the current 2017 NI 43-101 compliant resource, which would explain some of the differences in the results. Table 14.19 illustrates the differences in the 2014 resource estimate with the current NI 43-101 compliant resource from 2017.

The primary differences between the 2015 resource model and the 2017 resource model are the increase in the number of boreholes used in the estimate, improve dyke models and the use of a hard boundary between the LG and HG domains.

Table 14.18 Resource Parameter Comparison for LFZ

Description	2014 WSP Model	RMM 2017
Number of boreholes	142	256
Grade capping	Cu: 6.54% (8 LG records) / 6.81%(8 HG records)	Cu: 6.0% (11 LG records) / 6.0% (73 HG records)
	Au: 1.32 g/t (4 LG records) / 1.32 g/t (7 HG records)	Au: 0.4 g/t (76 LG records) / 0.4 g/t (122 HG records)
	Ag: 7.54 g/t (10 LG records) / 6.98 g/t (8 HG records)	Ag: 5.5 g/t (16 LG records) / 5.5 g/t (55 HG records)
	Zn: 1.19% (6 LG records) / 0.19% (4 HG records)	Zn: 0.2% (96 LG records) / 0.2% (100 HG records)
Composite length	2.0 metres	2.0 metres
Cap - composite order	Cap - Composite	Cap - Composite
Cut-off grade	1.0% Cu	1.0% Cu
Number of mineralized zones	2 - soft boundary contact	2 - hard boundary contact
Block size	10 x 10 x 10 (sub block 2.5 x 2.5 x 2.5)	5 x 5 x 5 (sub block 1.25 x 1.25 x 1.25)
Estimation method	OK, ID^2, NN	OK, ID^2, NN
Copper search ellipse dimensions	96/64/45	96/64/45

Table 14.19 2014 Resource vs. 2017 Resource

Resource Classification	WSP 2014 Resource Summary				RMM 2017 Resource Summary			
	Tonnes	Grades			Tonnes	Grades		
	(000's)	Cu (%)	Ag (g/t)	Au (g/t)	(000's)	Cu (%)	Ag (g/t)	Au (g/t)
Measured	18,112	1.48	1.31	0.11	19,328	1.60	2.31	0.25
Indicated	7,846	1.43	1.23	0.10	4,120	1.83	3.50	0.62
Measured and Indicated	25,958	1.46	1.29	0.11	23,448	1.64	2.52	0.32
Inferred	3,090	1.37	1.23	0.11	2,873	1.78	2.78	0.42

15 MINERAL RESERVE ESTIMATES

15.1 RESERVE ESTIMATION METHODOLOGY

Rambler technical staff provided WSP with current Ming Mine development and production summaries and schedules to be used as a basis for the technical report update production and development schedules contained in this study. WSP personnel subsequently visited the Ming Mine site in February 2018 to synchronize the initially proposed technical report LOM schedules with the current Ming Mine operations plans.

The Ming Mine reserve statement as of January 1, 2018 is summarized in Table 15.1.

Table 15.1 Ming Mine Reserve Summary

Classification	Quantity	Grades				Contained Metal			
	(tonnes)	Cu (%)	Au (g/t)	Ag (g/t)	Zn (%)	Cu (M lbs)	Au (K oz)	Ag (K oz)	Zn (M lbs)
MMS - Total Proven Reserve	503,600	2.00	2.52	13.49	0.38	22	41	218	4.3
LFZ - Total Proven Reserve	2,949,000	1.85	0.08	1.26	0.01	120	8	120	0.7
(undiluted, unrecovered)									
TOTAL	**3,452,600**	**1.87**	**0.44**	**3.05**	**0.07**	**143**	**49**	**338**	**4.9**
MMS - Total Probable Reserve	724,700	2.00	2.52	13.49	0.38	32	59	314	6.1
LFZ - Total Probable Reserve	4,243,800	1.78	0.09	1.36	0.01	166	12	185	1.1
(undiluted, unrecovered)									
TOTAL	**4,968,500**	**1.81**	**0.44**	**3.13**	**0.07**	**198**	**71**	**500**	**7.2**
MMS - Dilution (all sources)	184,200	0	0	0	0	-	-	-	-
LFZ - Dilution (all sources)	1,078,900	0.75	0.07	0.86	0.01	19	2	30	0.2
TOTAL	**1,263,100**	**0.61**	**0.06**	**0.7**	**0.01**	**17**	**2**	**28**	**0.3**
Total MMS Reserve (diluted and recovered)	1,271,300	1.74	2.19	11.73	0.33	49	89	480	9.3
Total LFZ Reserve (diluted and recovered)	7,444,500	1.71	0.10	1.48	0.01	280	25	355	2.3
Combined Total Reserve (diluted and recovered)	**8,715,800**	**1.71**	**0.41**	**2.98**	**0.06**	**329**	**114**	**835**	**11.6**

15.1.1 MING MASSIVE SULPHIDES

WSP utilized current Ming Mine production and development plans to schedule the MMS development and production activities which were subsequently used to determine the MMS reserves. Any planning carrying beyond the current Ming Mine schedules utilized the original PFS study designs and layouts to fully outline the reserves out to depletion in the MMS.

15.1.2 LOWER FOOTWALL ZONE

Two mining zones were identified in the Lower Footwall Zone (LFZ) to proceed to mine design and scheduling. These areas were determined based on the ore grade and accessibility. The zones include the lower portion of the LFZ to be mined by longhole mining methods (Blocks 2 to 6) and the upper portion of the LFZ (Block 1) to be mined post-pillar mining method.

Block 1 post pillar mining reserves were supplied to WSP by Rambler Ming Mine engineering.

Block 2 to 6 reserves were determined by querying the LFZ block model at $63, $72, and $79 per tonne NSR values and applying the mining factors (internal dilution and recoverability) factors determined in the 2015 PFS using the following methodology.

— Development shapes were created in Surpac™ software and run against the block model to identify any resource material that would be mined by the development.

— Stope designs for longhole stoping were created in Surpac™ for the entirety of Block 4 of the LFZ, which consisted of five complete mining levels, as well as one level in Block 2 (-487el) and one level in Block 6, (-937el). When designing the stope shapes, the block model was filtered to an NSR of $110 and higher to ensure that overall grade of the stope would be economical once internal and external dilutions were considered and mine recoveries were applied. Stope designs for the post-pillar zone were completed for the entire zone.

— The stope designs were interrogated against the block model to determine the raw tonnes and grades of the shapes. Using the raw tonnes and grades for the longhole stoping, design factors were determined and conservatively applied throughout the remainder of the longhole mining areas. These factors included internal dilution and recovery percentages that were inherent to the longhole stope design only. An external dilution factor was determined based on these designs.

— Once the resources mined by longhole stoping were determined, mining dilution and recovery factors were applied to them to establish mill feed from mine production activities. The final mine reserves were determined by subsequently adding in mill feed from development and post pillar and/or cut and fill mining.

— Internal dilution factors were established by interrogating the designed stope shapes against the appropriate block model. Internal stope dilution was split into low-grade mineralization and dyke material categories and were both applied to the undiluted stope tonnages. A mining recovery factor was then applied against these tonnages to produce the final longhole mining reserves. Internal dilution for post-pillar mining was quantified by applying estimated dilution factors directly to the raw block model tonnages and grades, after which a recovery factor was applied to determine the tonnes and grades of the mill feed.

— External dilution factors were established based on the mining method, the abutments of the stopes in primary and secondary panels, and the stope floors. Rock mechanics calculations were performed to determine blast damage and sloughing quantities for host rock and backfill.

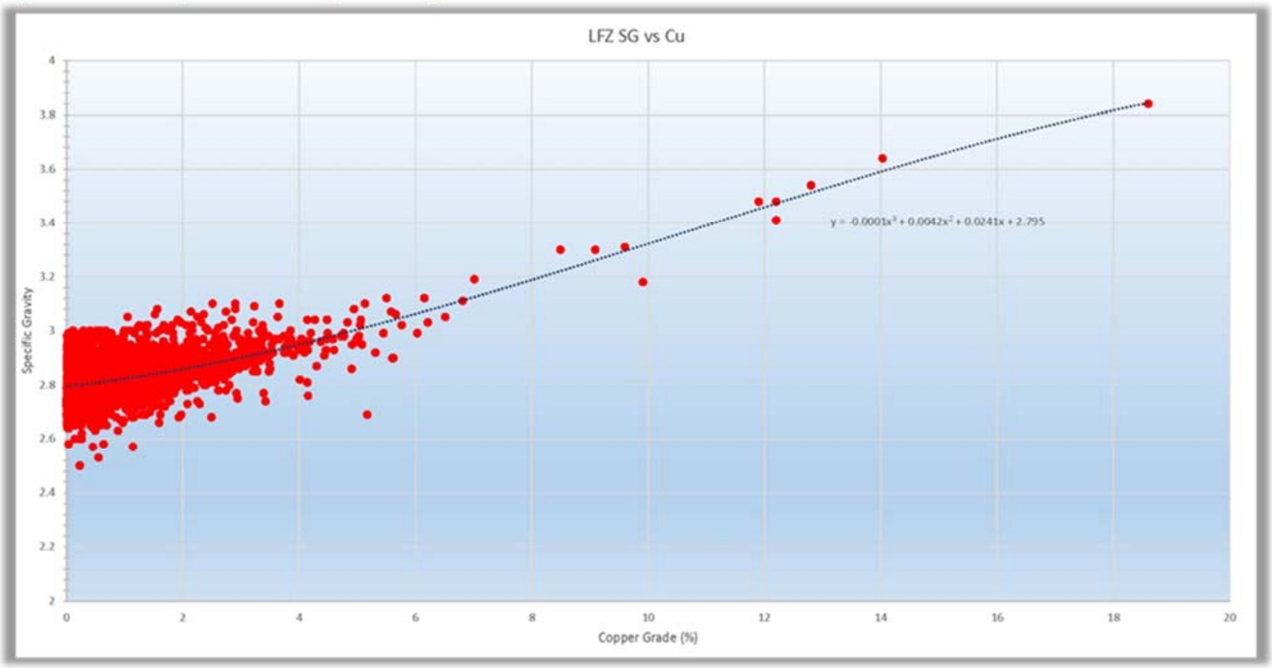
— Upon validation of the specific gravity (SG) results, a total of 4,944 samples were used to determine the SG of the mineralized material within the LFZ. The samples were plotted on a scattered plot comparing the copper (Cu) grade of the sample to the measured SG of the sample. A 3rd order polynomial regression curve was fitted to the data to generate an equation that relates SG to Cu grades. Figure 15.1 presents the SG vs. Cu plot with the regression equation.

The SG of each mineralized block in the model was assigned a value based on the rock codes of the block and the copper grade of that block using the regression formula.

$$SG = -0.0001Cu^3 + 0.0042Cu^2 + 0.0241Cu + 2.795$$

The use of the regression formula to determine block SG provides an improved local estimate of the SG, while maintaining a consistent global value (i.e. low-grade blocks, lower SG; high-grade blocks, higher SG).

Figure 15.1 Specific Gravity vs. Copper Grade



15.2 MINING COSTS

The methodology used to outline reserve material in the 2015 PFS was re-used for this update where the geological block models were queried at $80 and $100 NSR to split mill feed into high- and low-grade streams.

However, due to the small ratio of low to high grade material as well as reported difficulties in physically separating them in actual practice, the two streams will be blended into one which will be sent to the mill as it is brought to surface.

The following cash costs per dry metric tonne were used to determine the financial breakeven point in the 2017 technical report : mining $31.51, ore haulage to mill $7.31, general and administration cost $12.65, milling $12.81, port operations $0.44, and royalties $1.58 for a total cash cost of $66.31.

15.3 METAL PRICES

Forecast long-term prices of US$2.99 per pound copper, US$1,300 per ounce gold, and US$17.00 per ounce silver were used in conjunction with a long-term US$/CAN$ FX rate 1:0.80.

First year prices used in the cash flow were US$3.06 per pound copper, US$1,305 per ounce gold, and US$17.65 per ounce silver in conjunction with an exchange rate of US$/CAN$ FX rate 1:0.79.

15.4 MILL RECOVERY

The reserve material for the Ming Massive Sulphide (MMS) zones based on milling recovery at the concentrator for copper, gold, and silver was 96.1%, 67.8%, and 76.1% respectively based on locked cycle test work for MMS.

The reserve material for the LFZ based on milling recovery at the concentrator for copper, gold, and silver was 98.9%, 63.6%, and 62.0% respectively based on locked cycle test for the LFZ.

15.5 MINE CUTOFF

Net Smelter Return (NSR) was calculated utilizing mining dilution and recoveries, milling recoveries, transportation charges, smelter charges, and assumed metal pricing as set by Rambler. Table 15.2 indicates the parameters considered in the calculations.

Table 15.2 Parameters for NSR Calculations

Parameter	Value
Mining dilution (stopes, drifts)	15%, 0%
Mining recovery (stopes, drifts)	90%, 100%
Mill recovery (Cu, Au, Ag)	96.1% and 98.9%, 67.8% and 63.6%, 76.1% and 62.0 %
Concentrate grade (Cu)	28.50%
Concentrate moisture content	8.50%
Concentrate pay factors (Cu, Au, Ag)	96.65%, 97.00%, 90.00%
Copper price	US$3.06/lb (2018 Average)
Gold price	US$1,305/ounce (2018 Average)
Silver price	US$17.65/ounce (2018 Average)
Copper treatment charges	US$64.75 / dry tonne (2018), US$65.00/ dry tonne (2019), US$68.00/ dry tonne (long term)
Copper refining charges	US$0.082 /lb (2018), US$0.083 /lb (2019), US$0.086 /lb (long term)
Gold charges	US$5.00/ounce
Silver charges	US$0.50/ounce
Concentrate truck to port	$16.00 / dry tonne
Concentrate ship to smelter	US$42.50 / dry tonne
US$:CAN$ exchange rate	1.27

16 MINING METHODS

16.1 INTRODUCTION

The technical report update is based on an optimization of the current massive sulphide (Phase 1) operation by gradually increasing the proportion of Lower Footwall Zone (LFZ) ore with Massive Sulphide (MMS) to achieve a total mine production rate of 1,250 mtpd.

Current planned production at the operation is 1,250 mtpd of MMS and LFZ Block 1 post pillar material.

LFZ production presently comes entirely from post pillar cut and fill mining in Block 1, whereas all subsequent Blocks (2 to 6) will be mined using a longhole method.

Primary backfilling will utilize paste backfill augmented with waste rock produced during underground development and stope preparation activities.

Access to the LFZ blocks will be through new development and extension of the existing ramps and raises.

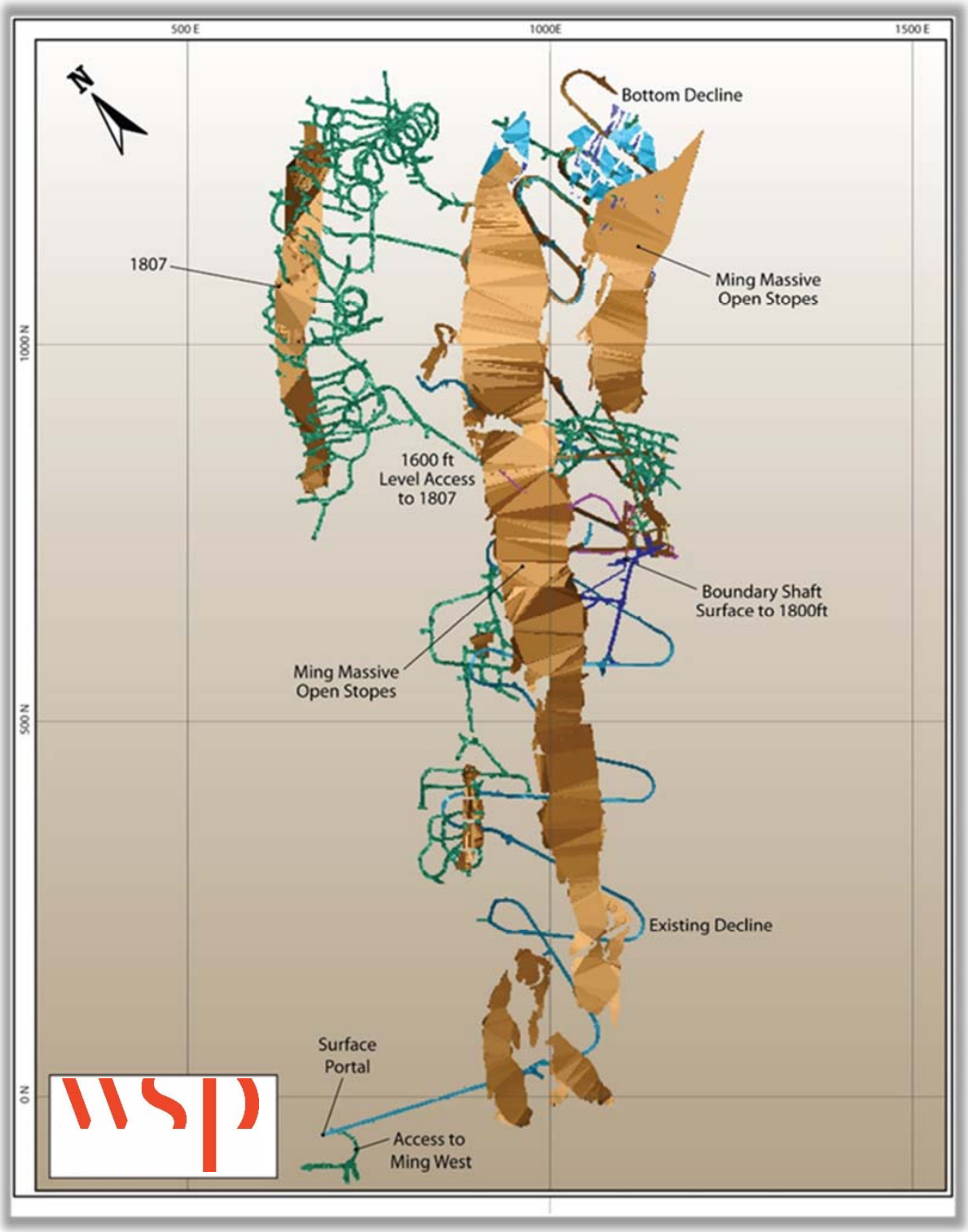
The mine ventilation system is presently being reconfigured to supply additional air to the underground workings as well as to allow development and production blasting to occur during work shifts, which will allow longer work shifts.

16.2 EXISTING EXCAVATIONS – MING MASSIVE SULPHIDES

Figure 16.1 is a plan view of the existing mine workings that consist of the following components:

- The portal and the main ramp: The ramp was driven 5.0 m wide and 2.5 m high (but later slashed to accommodate 42-tonne trucks) descending at 16% to 18% gradient from the portal elevation of 160 m to - 633 m, a length of 4,665 m.
- Levels were nominally spaced at 30 m (100 feet) vertically.
- Mined out stopes (which were not backfilled).
- The Boundary Shaft, which has three timbered compartments (two skip compartments and one service/manway compartment) extending from surface to - 461 m. The outside timber dimensions are 5.7 m by 2.2 m. The shaft was flooded from 1982 until 2008 and is now dewatered to the 1800 level. The shaft is used for second egress and ventilation.

Figure 16.1 Plan View of Existing Openings

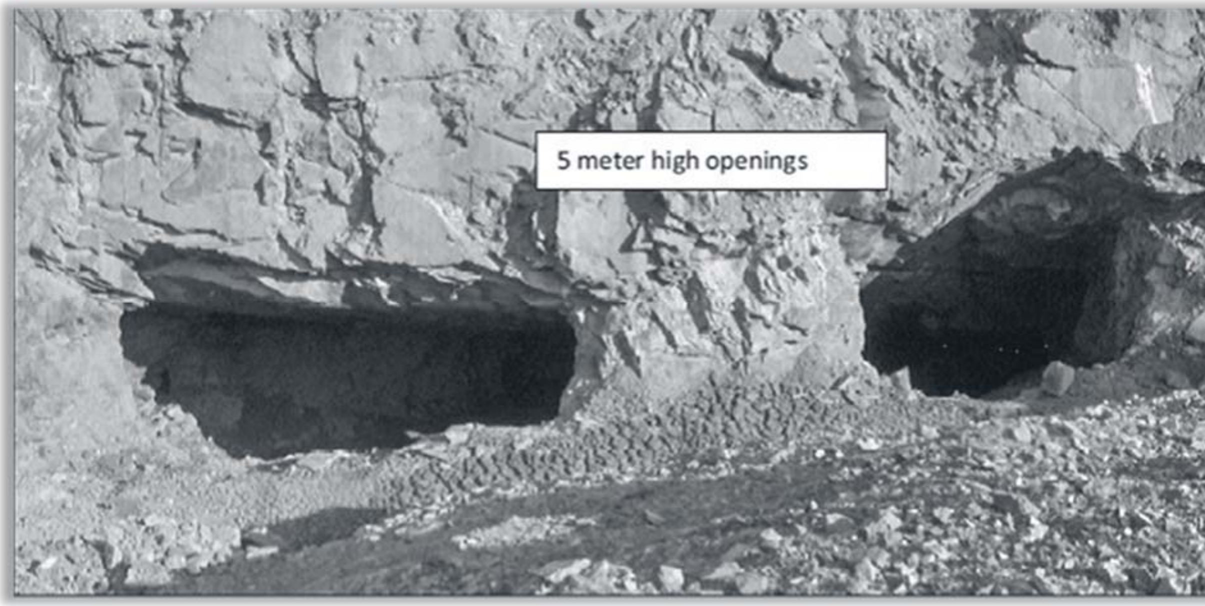


Historic mining was completed in the part of the deposit now known as the MMS zone where the planar deposit exhibited an average dip of 30 degrees with thicknesses of 5 to 10 m. Panels were mined up-dip predominately using jackleg drills and ore was slushed to a scram drift on the level. Post pillars were left behind for additional ground support. Backfill was not used, and access to the workings was along the footwall side of the orebody through the open stope. Production levels were spaced at 30 vertical metres apart. Ore was mucked from the stopes using load / haul / dump (LHD), loaded into 20-tonne trucks and trammed to the shaft.

16.3 GEOTECHNICAL CONSIDERATIONS

Prior to the mine reopening, SRK reviewed the historic underground stoping in the Ming Mine and also in the Ming West Mine where stopes broke through into the Mine West Pit. Reference was made, in both locations, to the competency of the exposed hanging walls and ore pillars. Minimal deterioration has been observed after having been exposed for time periods ranging from 11 to 25 years. Refer to Figures 16.2 and 16.3.

Figure 16.2 Ming West Mine Stope Viewed From Open Pit



***Source**: Darling et. al, 2012*

Figure 16.3 Ming West Mine Stope Hanging Walls

***Source**: Darling et. al, 2012*

Consultants also reviewed the as-built stoping plans at the 'old Ming Mine' in an attempt to determine the maximum spans between the pillars. Two of the largest panels were determined to be 11 x 26 m and 13 x 31 m respectively. These were all man-entry stopes and thus back and pillar stability was of paramount importance.

Based on these limited observations, mining consultants have assumed that future stoping in the MMS could be planned on the basis of solid, competent ground conditions.

Recent underground geotechnical visits by Rambler personnel accompanied by Dr. Rimas Pakalnis (Rambler's rock mechanics consultant) confirmed the observations made by previous consultants.

16.3.1 MINE DESIGN PARAMETERS FOR THE LOWER FOOTWALL ZONE

The geotechnical assessment of the LFZ was prepared by Pakalnis (2015). The scope of work was to provide, for the 2015 PFS, geotechnical guidance for purposes of defining stope dimensions, support requirements, mining sequence concerns, stress/structure/rock mass characterization for purposes of establishing a safe, cost-effective and workable mine plan, working in conjunction with the WSP design team.

This study concentrated primarily on the LFZ as the bulk increase of the tonnage to the 1,250 mtpd (Phase 2A) from the existing 650 mtpd will be mined from this zone. The existing mining has largely been confined to the MMS.

The following is a summary of recommendations from two reports prepared by Dr. Pakalnis (2015).

WALL STABILITY ASSESSMENT

- The transverse stopes should be 20 m wide x 20 m long x 25 m high in order to yield 0.5 m-1 m of wall slough (ore). Stopes should be characterized and a Cavity Monitor Survey (CMS) conducted upon completion to verify assumptions made.
- The dyke material will yield ~1 m of wall slough (zero grade) largely due to the inclination of HW(50°+). Minimizing expected dilution requires cabling on a ~3 m x 3 m pattern to yield blast damage only of 0.5 m.

POST PILLAR STABILITY ASSESSMENT

- An area in Block One, between -412 el and -312 el, was laid out for Post Pillar Cut & Fill with delayed unconsolidated rockfill with the mining direction from the bottom-up.
- The pillar width design of 5 m x 5 m at 8 m spacing were deemed stable as they will not carry much of the load after the first/second lift.
- The first lift is where the stress transfer will occur. For this reason, the lift height should try to keep to 4 m initially and then increase to 5 m thereafter. The first lift, according to WSP, is narrow. Therefore, pillar loading should not be an issue as the loading of the pillars will transfer to the abutments. Span of 8 m is not a concern. The ground support should use standard mechanical rockbolts on 1.2 m x 1.2 m pattern and rebar with adverse structure.
- The zones that have large plan area of pillars should consider Wp of 2:1 then go to 5 m wide. This does indicate that Wp (pillar width in m) would reach 8 m wide for a 4 m height. Leaving pillars in dyke will greatly alleviate the pillar size requirements.

DEVELOPMENT SUPPORT ASSESSMENT

- The temporary ore drives (4 m wide x 4.5 m high) should be supported with a minimum of 1.8 m long mechanical bolts on a 1.2 m x 1.2 m pattern. The permanent new ramps and wider level accesses (5 m wide x 5 m high) should be supported with 2.4 m long mechanicals on a 1.2 m x 1.2 m pattern – galvanized; this is for back and wall. The 5 m wide drifts must have the corner bolts strapped to the wall/back in the presence of adverse structure. The recommended quality control/assurance program for mechanical bolts, as outlined in the 2015 Geotechnical Assessment of the Lower Footwall Zone – Ming Mine by Rimas Pakalnis, is to be incorporated.
- The 20 m back span of the transverse stopes should be cabled to confine 'dead weight'. Ultimately this will be reduced as one assesses the overall stability/time dependency upon exposure.

BACKFILL DESIGN ASSESSMENT

- The paste aggregate fill, as recommended by Kovit (2015) should be employed as the minimum placed strength and has to exceed 0.6 MPa to ensure that the vertical exposure of the backfill remains standing. This should be confirmed upon testing of field-placed samples and observation of behaviour. It is critical not to expose a primary and secondary back at the same adjacent elevation, as the exposed span will exceed 20 m. This requires the primaries to be at least one lift above the adjacent secondary.

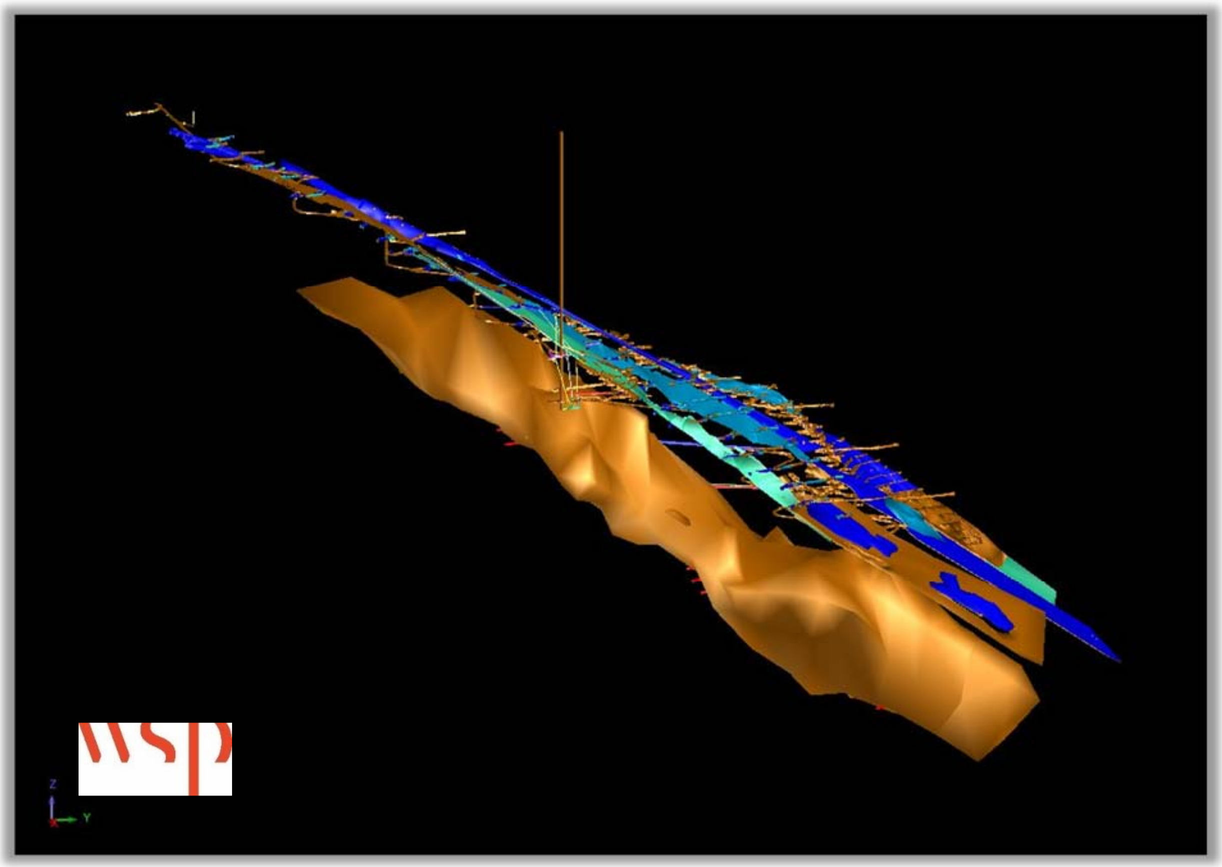
INDUCED STRESS ASSESSMENT

— No major stress concerns have been identified, incorporating a MAP 3D™ model to the end of Year 2034, with respect to the mining plan outlined in this study. The model will be confirmed along with input parameters upon exposure of mining as it shows that largely the depth of support tendon may require to be increased for the footwall accesses in the proximity of the stopes at depth (930 m elev.).

16.4 DEPOSITS

The main zones to be mined occur parallel to the historic Main Mine orebody which was mined by a previous owner. These zones are 1807, 1806, Ming South Zone, Lower Footwall Zone (LFZ), and Ming North Zone, (Figure 16.4).

Figure 16.4 Orthogonal View of the Ming Mine (image not to scale)



16.4.1 1807 ZONE

The 1807 Zone is located approximately 170 m west of the main ramp and is defined using diamond drillhole intersections between the proposed mining levels located between -304 m to -810 m elevations. Above and below these horizons the zone has not been well defined. Ore thickness is an average of 3 m wide. To date, the 1807 Zone resource model totals 500 m down plunge direction and the width (measured along strike) varies from 35 m to 88 m.

The 1807 Zone has a mainly tabular shape and plunges consistently to the north-east. In the upper section of the mine between -338 m to -346 m elevations, the ore has a dip of approximately 43 degrees. In the middle section of the zone, the ore flattens to a dip of approximately 22 degrees. On the proposed lower levels, the ore zone dips at an average of 34 degrees.

16.4.2 1806 ZONE

The 1806 Zone is defined as a set of high-grade gold-copper mineralized lenses which are bound to the east by a 20 to 30 m thick un-mineralized gabbroic dyke. The ore zone dips north-east at an average of 30 degrees and is located on the same stratigraphic horizon as the historically mined Ming massive sulphides. The zone is easily accessible due to its proximity to the existing decline as the ore zone is located 20 to 50 m higher in the hanging wall of the decline. The 1806 orebody dimensions are as follows:

— Thickness varies from 4 m up to 25 m.

— The length is approximately 685 m.

— The width varies from 30 m to 135 m.

The 1806 Zone location is shown on Figure 16.4. The upper portion has been previously mined.

16.4.3 MING MINE SOUTH (MSDP & MSUP)

The Ming South Down Plunge (MSDP) and the Ming South Up Plunge (MSUP) is mainly tabular. The ore zone is plunging north-east at an average dip of 30 degrees and runs parallel to the old workings in the upper mine. The zone starts at the bottom of the existing decline, and its thickness varies from 4 m up to 25 m. The middle section of the zone separating the MSUP and the MSDP has been previously mined. The ore zone has a total length of 450 m and width ranging from 30 m to 200 m. The Ming South ore zone location in shown on Figure 16.4.

The most recent drilling has shown that the MSDP extends to higher elevations in the mine than previously modeled. The newly discovered mineralization has been named the MSUP. A portion of the newly discovered mineralization crosses through the Boundary Shaft infrastructure on the 1800 Level.

The MSUP plunges to the north-east at a dip of 34 degrees and will be accessible from the 1600 and 1700 Levels in the ‘old workings’. A 50m permanent shaft pillar will be left in place to ensure the integrity of the shaft and other infrastructure as per Rimas Pakalnis.

16.4.4 LOWER FOOTWALL ZONE (LFZ)

The Lower Footwall Zone (LFZ) is a mineralized envelope that lies approximately 100 m below the historical Ming Massive Sulphide (MMS) horizon. The LFZ has a strike length of approximately 240 m and its thickness ranges from 200 m to 290 m. The LFZ zone plunges at 35 degrees and has been defined for over 1,300 m in the down dip direction. The transverse width of the orebody is large enough in most sections to accommodate bulk mining.

16.4.5 MING NORTH PLUNGE (MNZ)

The Ming North Plunge (MNZ) is a continuation of the historically mined MMS horizon. This zone has a limited amount of diamond drilling and has not been well defined. The MNZ is tabular in shape and dips to the north-east at an average angle of 35 degrees. It ranges from 40 m to 120 m in strike length and has been defined for 525 m in the down plunge direction. Average ore thickness ranges from 4 m to 15 m.

16.5 MINING METHODS

16.5.1 LONGHOLE (TRANSVERSE) WITH A DIP OVER 50 DEGREES

The LFZ has been divided into six blocks for design purposes. Blocks 2 to 6 will utilize longhole transverse mining methods, whereas Block 1 will be mined entirely with a post pillar method.

Mining sublevels will be spaced 25 vertical metres apart. Transverse stope accesses / crosscuts will be driven 4 m wide by 4.5 m high every 20 m along strike to the hanging wall contact. Drop raises, driven 2.4 m x 2.4 m, will be used as slots to facilitate stope using 76.2 mm (3-inch) production. Stopes will be mucked until the brow is opened up, upon which time they will be mucked remotely. Mine waste rock will be placed in the mucking horizon brows to act as fill barricades. Primary stopes will be filled with straight pastefill, whereas secondary stopes will be filled with straight waste rock (refer to Figures 16.5 to 16.7); waste rock may also be used to displace some of the pastefill requirements in primary stopes, albeit under strict engineering control to ensure that the final cured backfill strength is sufficient.

Mine designs have been standardized to maintain drift sizes to a minimum while optimizing production rates. Remote mucking of stopes will be employed where necessary.

Figure 16.5 Longitudinal Section - Longhole with a Dip over 50 Degrees

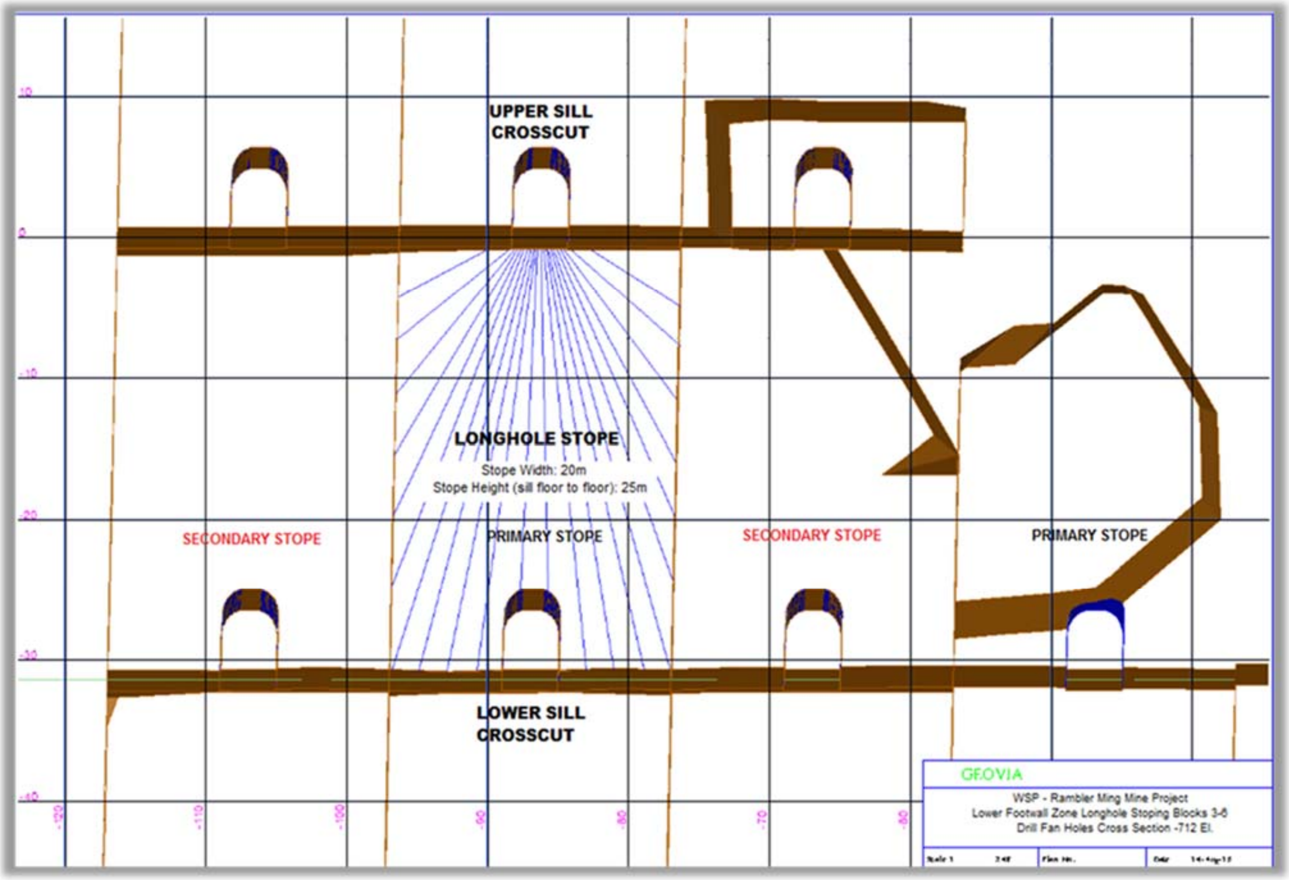


Figure 16.6 Idealized Cross-Section –Longhole with a Dip over 50 Degrees

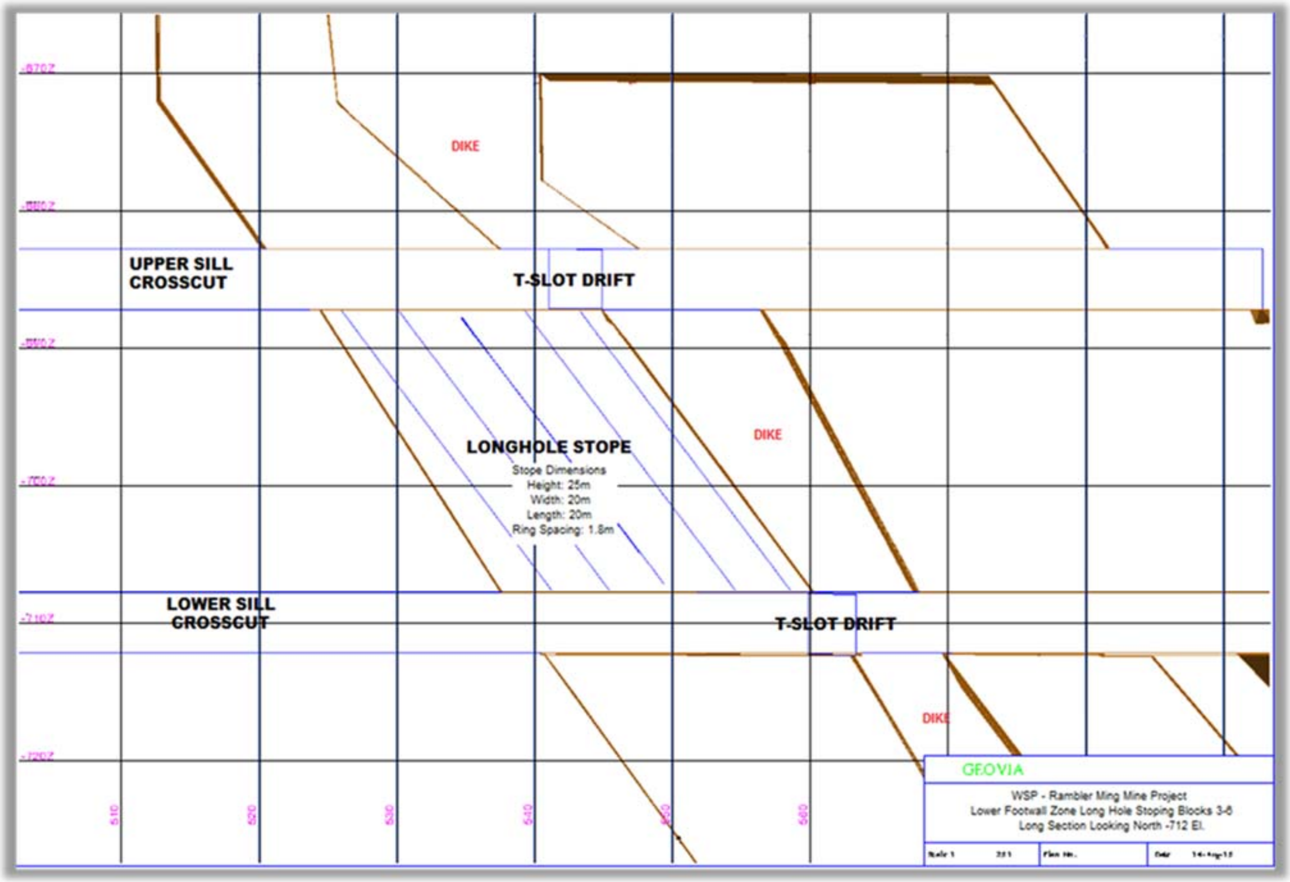
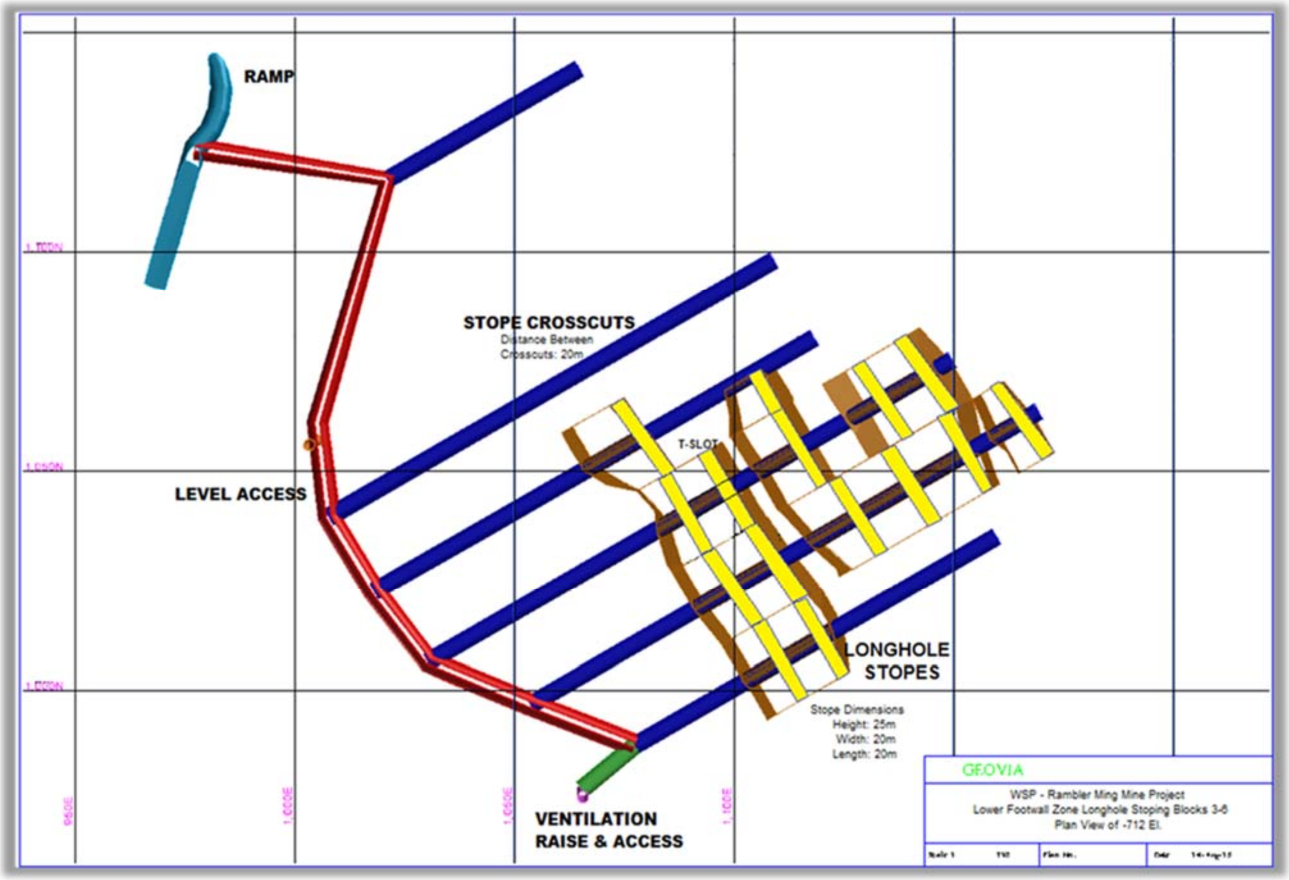


Figure 16.7 Plan View - Longhole with a Dip over 50 Degrees



16.5.2 LONGHOLE ADAPTED WITH A DIP UNDER 50 DEGREES

In the MMS, an undercut or bottom sill will be driven to a maximum of 8 m wide. Wider ore intersections will require pillars which will be recovered during primary blasting activities. A drift will be developed parallel to the orebody in the footwall waste which will be used to create an artificial footwall to achieve a minimum ore draw angle of 50 degrees. Waste will be blasted using upholes from this drift. A top sill will be developed to a maximum width of 8 m, followed by a 2.4 m x 2.4 m drop raise, excavated using with 64 mm (2.5-inch) diameter production holes. Production blasting will utilize a slot slash technique where blastholes will be broken into the previously created slot opening. Stopes will be mucked using LHDs. When the brow becomes open, the remainder of the broken stope material will be mucked remotely (refer to Figures 16.8 and 16.9).

Figure 16.8 Plan View - Longhole adapted with a Dip under 50 Degrees

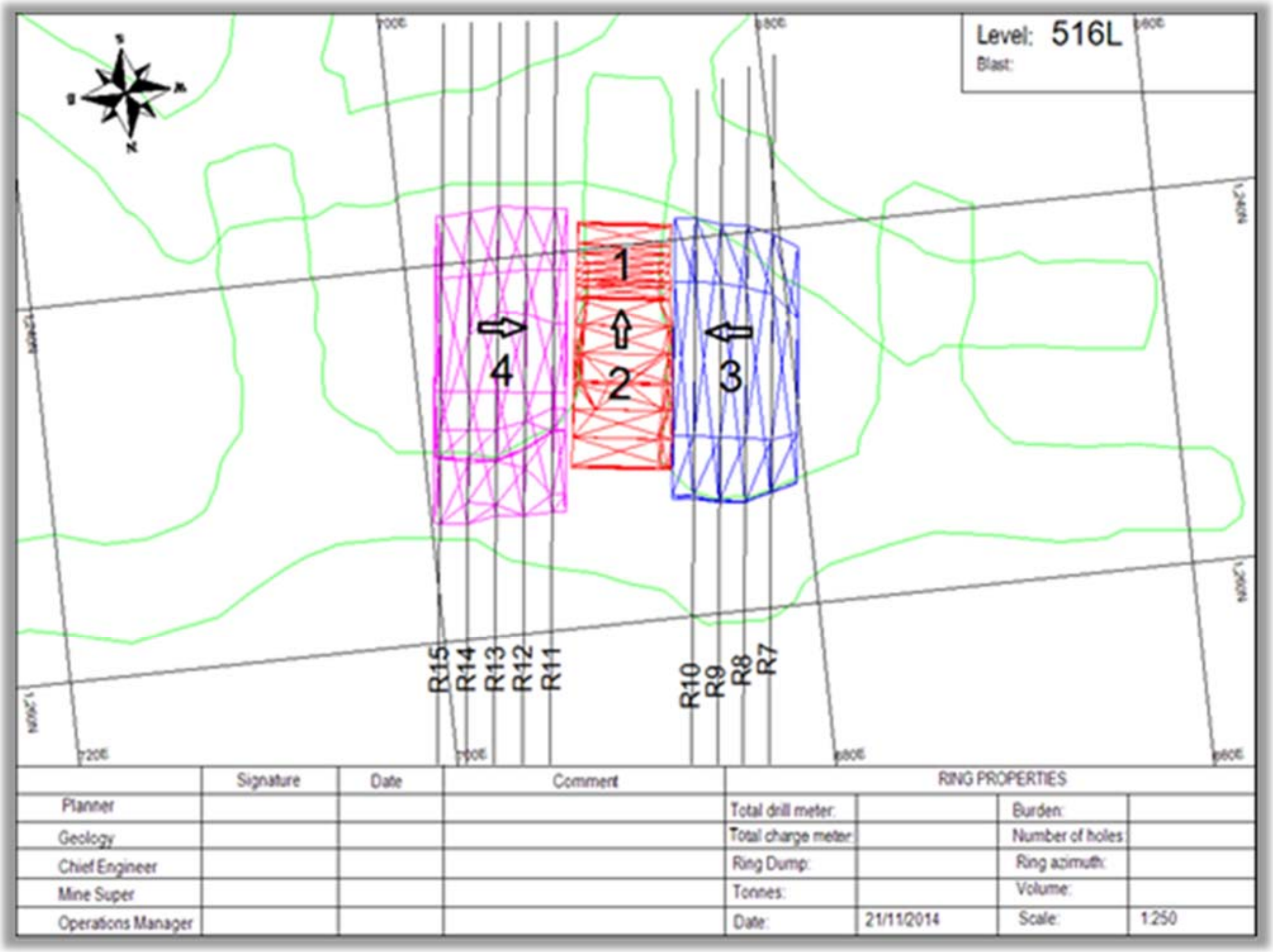
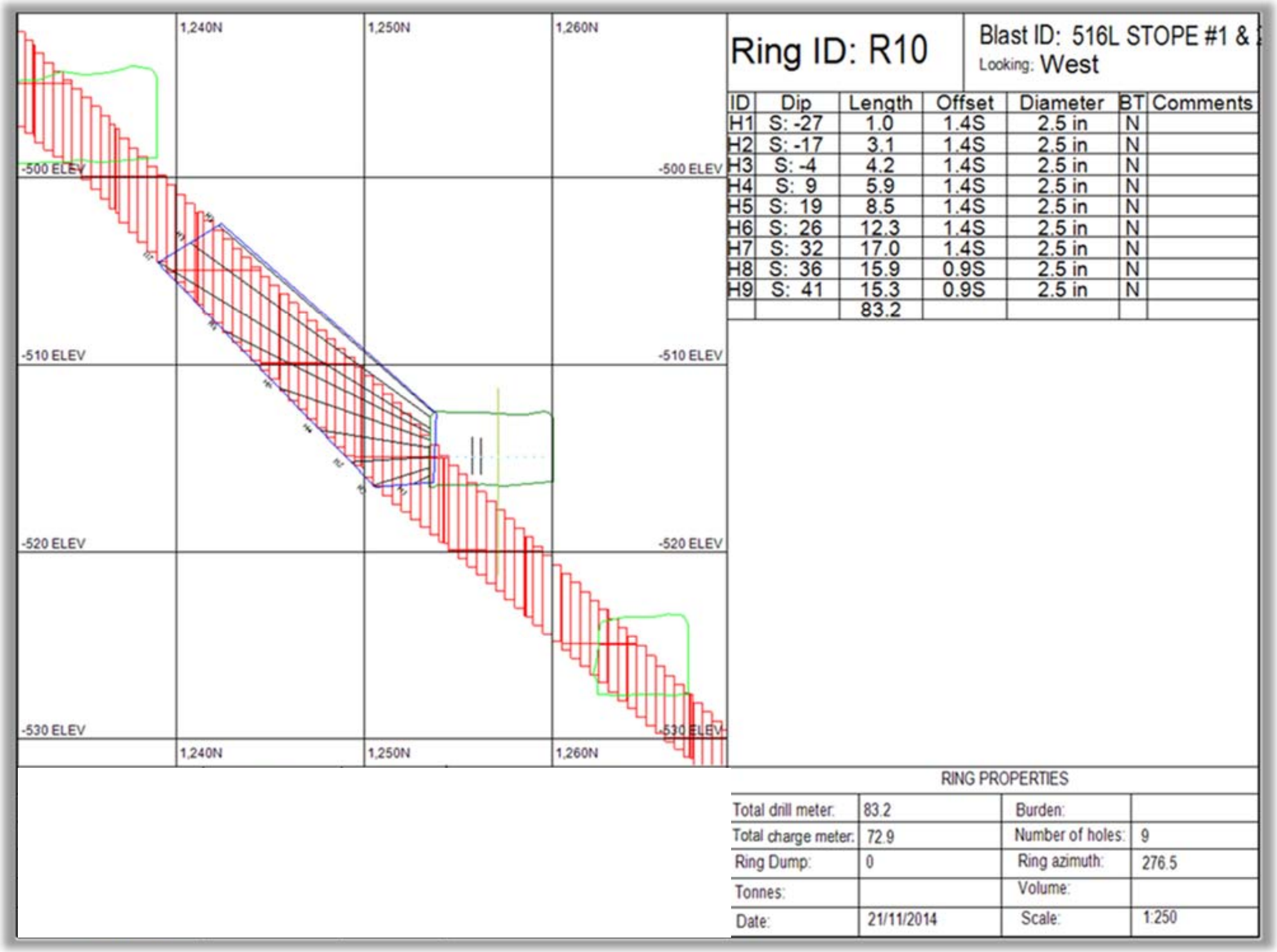


Figure 16.9 Cross-Section - Longhole adapted with a Dip under 50 Degrees



16.5.3 POST PILLAR CUT AND FILL MINING

The LFZ Block 1 zone utilizes a post pillar cut and fill mining method. An access ramp driven at -18% grade off the main ramp is driven down to the mining first lift in the ore zone where a 5 m high by up to 8 m wide sill cut is driven the full width of the ore zone. Post pillars (5 m by 5 m) are left where the ore zone exceeds 8 m in width. Mine waste rock is used to backfill completed sill cuts to the height required to downbreak the next higher lift. Subsequent sill cuts will be accessed by slashing down the ramp access back to achieve a 5 m face height at the footwall ore contact which will be used to drive the next higher sill drifts to the end of the ore zone, after which it will be backfilled and the general process repeated. New access ramps will be driven when required to access higher mining panels at acceptable incline grades which typically are +/- 18% (refer to Figures 16.10 and 16.11).

Figure 16.10 Plan View - Post Pillar Cut and Fill

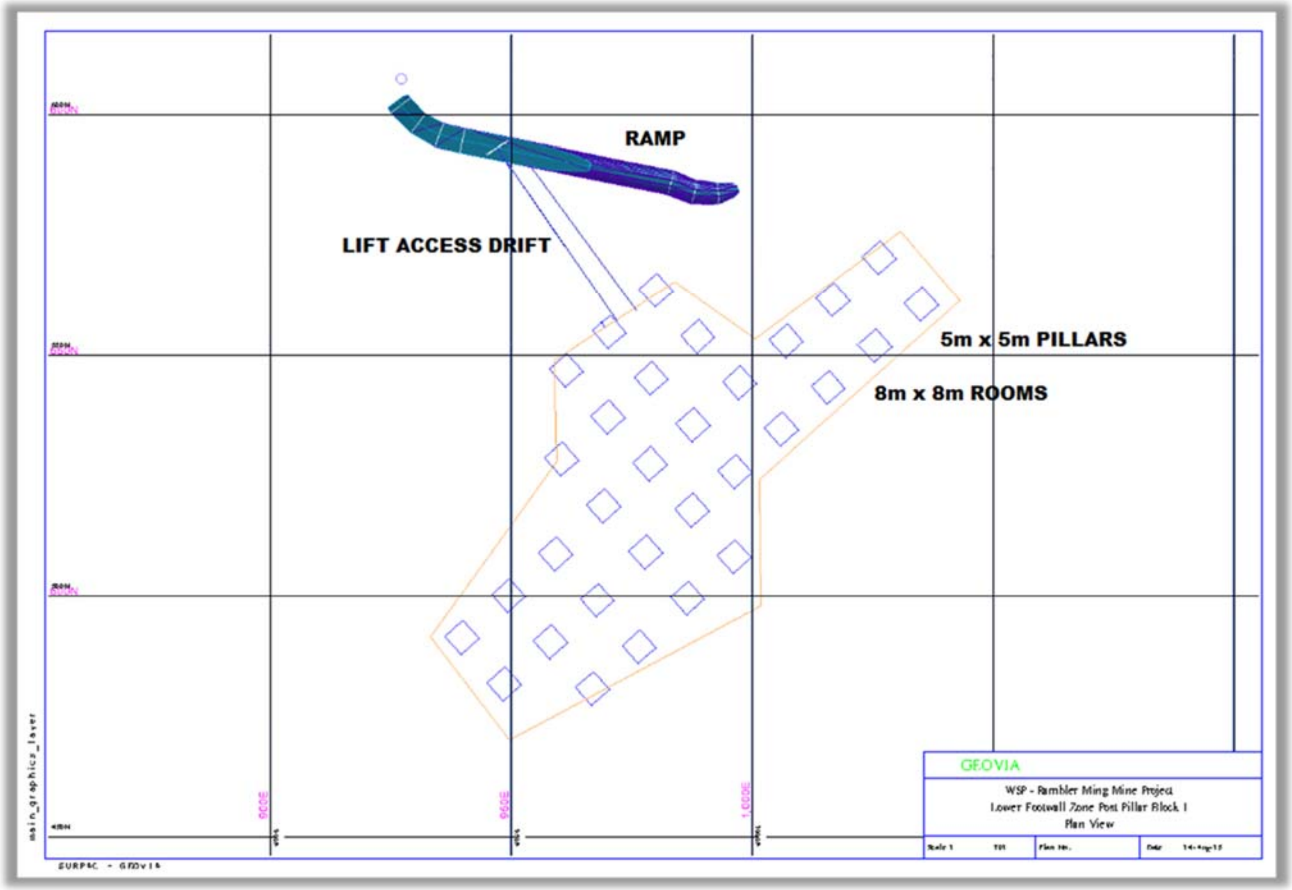
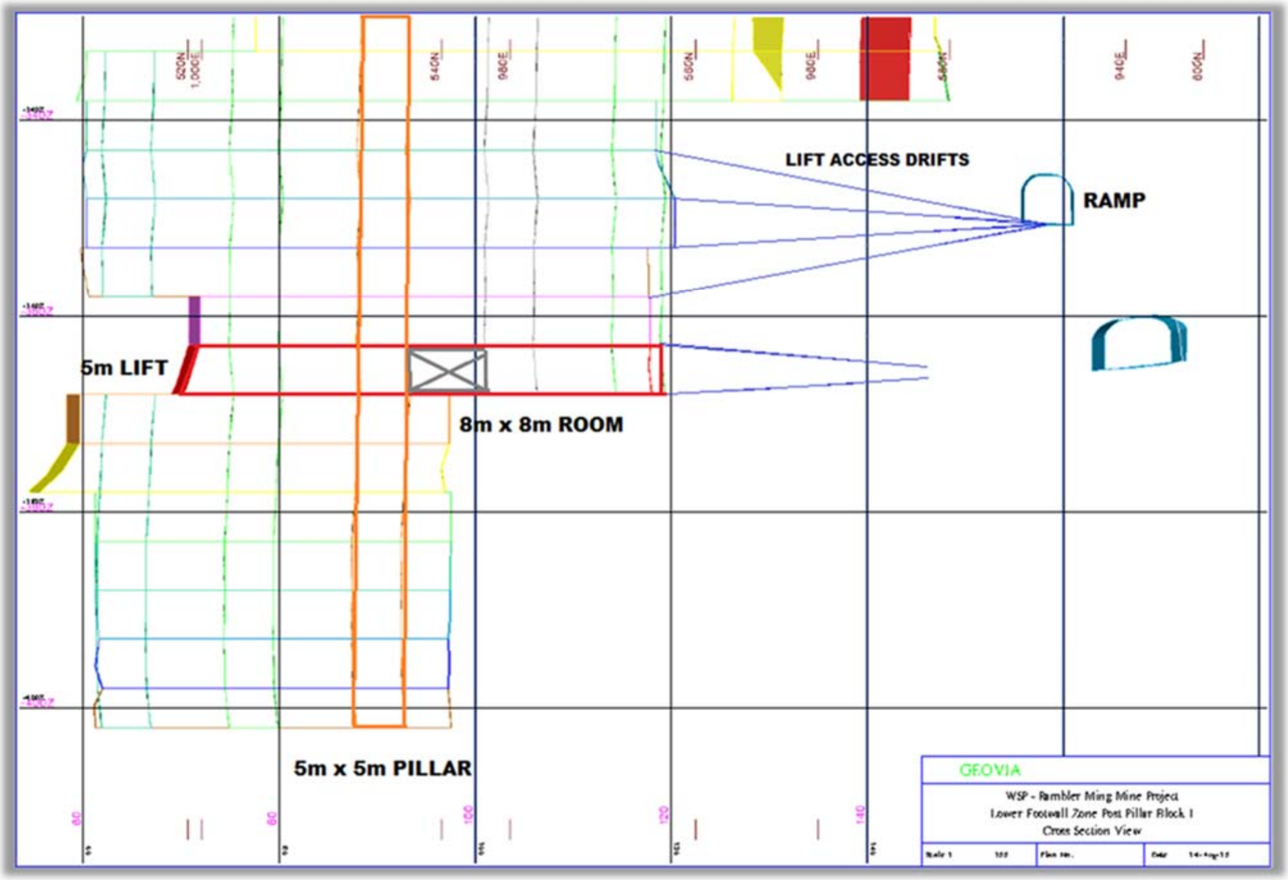


Figure 16.11 Cross Section - Post Pillar Cut and Fill

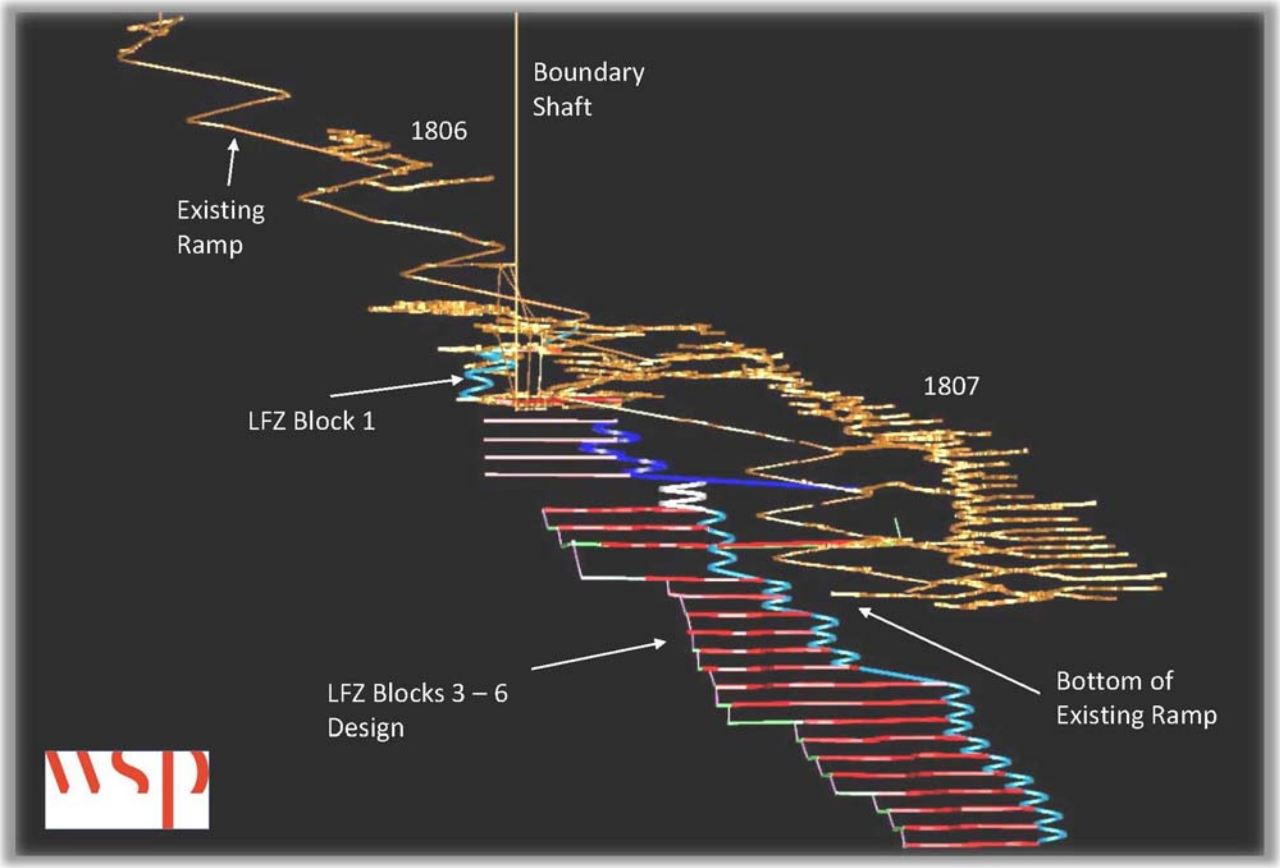


16.6 MINE DESIGN

16.6.1 MODEL DESCRIPTION

A 3D wire frame model of the underground was prepared in Surpac™ to facilitate mine design. Figure 16.12 presents a view of the model, looking southwest.

Figure 16.12 Life of Mine Development Plan (isometric view looking south-west)



16.6.2 UNDERGROUND MINE ACCESS

Primary underground access will be through the existing mine portal (top of Figure 16.11) using the existing MMS ramp. The current ramp has been geotechnically inspected and ground support has been installed for the portion of the ramp necessary for access to current and future production areas. The floor of the old ramp was also slashed to proper height to accommodate larger 42-tonne trucks. The shaft, which was previously used for skipping and as a second egress, has been re-established as the second means of egress and ventilation exhaust, and is presently being converted to be the main fresh air intake for the mine.

The life-of-mine plan is to extend the ramp from its current depth to -810 m elevation. The LFZ will accessed via a 5 m wide by 5 m high ramp driven at a -15% grade from the existing ramp system to the bottom of Block 2 at -537 m elevation.

16.6.3 STOPE ACCESS

The planned access levels to all of the zones are illustrated on Figure 16.12. Main level accesses will be driven from the existing Ming ramp and existing levels. In the MMS, level intervals will vary between 10 and 20 m depending upon the stoping method and orebody geometry. Stope access drives in the MMS are planned to be 5.0 m wide x 4.5 m high, whereas sublevels will be spaced every 25 m in the LFZ. All stope access drives are planned to be 4.5 m high and 4.0 m wide.

16.6.4 LIFE-OF-MINE DEVELOPMENT SUMMARIES

Table 16.1 is a summary of the scheduled mine development. The raising represents the capital metres required for infrastructure and egress purposes. Longhole production slot raising is captured in the production drilling metres.

Table 16.1 Development Summary

Ore Zone	Total (m)	Ore (m)	Waste (m)	Raising (m)
LFZ	34,227	26,285	7,290	652
1807	3,331	1,052	2,279	
MNDP	1,540	418	1,122	
MSDP	4,723	3,093	1,580	50
	43,821	30,848	12,271	702

Note: *1806 and Pillar Recovery Zones will be accessed through rehabilitation of existing mine workings.*

16.7 PRODUCTION FORECAST

Production tonnages for this technical report update were obtained by updating the 2015 PFS study mine model with current Ming Mine block model information. The previous stoping areas were blocked out by level, and material that that fell outside these shapes were excluded from the production forecast and left in the resource category. The overall production schedule was prepared from planned development, blocked level shapes updated with new block model information, and individual production rate.

16.7.1 CURRENT DEVELOPMENT

One major economic advantage in bringing the LFZ into production is that the current development of the mine will be utilized for access to the upper blocks. During the production phase the main focus will be on accessing the higher grade massive sulphides of the LFZ. Associated mine ventilation and dewatering systems have been designed to follow this strategy.

16.7.2 MINE PRODUCTION RATE

Production rates were set out in life-of-mine prepared by Rambler. These rates were based on previous technical reports prepared for Rambler and operational experience gained since the restart of commercial production of the Ming Mine in November 2012.

16.7.3 PRODUCTION SCHEDULE

The daily steady state stope tonnage for each zone is summarized in Table 16.2.

Table 16.2 Summary of Daily Ore Production by Mining Zones - Years 2018 to 2037

Zone	Years											
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029 - 2037
LFZ	224,958	222,476	244,178	313,164	384,778	393,738	393,750	393,750	393,750	394,144	393,695	3,692,146
1806	-	-	-	-	-	-	-	-	-	-	-	129,809
1807	144,111	132,457	166,637	30,419	-	-	-	-	-	-	-	-
Pillar Recovery	-	-	-	-	-	50,012	50,000	50,000	50,000	49,606	50,055	22,450
MNDP	64,804	44,331	-	-	-	-	-	-	-	-	-	-
MSDP	-	44,466	32,997	100,166	58,972	-	-	-	-	-	-	-
Totals	433,873	443,730	443,812	443,750	443,750	443,750	443,750	443,750	443,750	443,750	443,750	3,844,405
Daily Production	**1,222**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	**1,250**	

***Note**: Daily mine production rate based on 355 days*

16.8 UNDERGROUND MINE PLAN

The life-of-mine schedule prioritizes the development to, and mining of, MMS material in 2018 up until the presently identified stoping areas are depleted in 2022, with the sole exception being 1806 Zone which will be mined near the end of LOM due to its proximity to the main ramp system. Block 1 of the LFZ is mined during 2018-2020.

LFZ Block 1 is currently being mined as post pillar cut and fill and represents the lowest grade block material in the LFZ reserve. Development of LFZ Block 2 is scheduled to begin in 2019 and will proceed to the bottom of LFZ Block 6 until 2022. LFZ longhole production is scheduled to begin in Block 6 in 2023 when the pastefill system becomes available.

16.8.1 SCHEDULED MINE PRODUCTIVITIES

Mine development rates were obtained from Rambler Ming Mine records and personnel, whereas production rates were developed from first principles. Underground mining shifts were assumed to be 10 hours as per present practice at the mine, whereas productive time per shift was approximately 6.3 hours allowing for delays such as travel time, blast clearing times, daily preventative maintenance on equipment, and lunch breaks. Table 16.3 summarizes the development advance rates as well as peak production capacity for major activities of the mining cycle.

Table 16.3 Scheduled Unit Productivities by Activity

Activity	Rate	Comments
Ramp and lateral development	3.5 metres per day	Single heading
Ramp and lateral development	7.0 metres per day	Two or more headings
Post pillar mining development	7.0 metres per day	Two or more headings
Vertical development: raises	3.2 metres per day	
Production (longhole, post-pillar and development) mucking	1,250 tonnes per day	Remuck bay 200 m allowance
Pastefill (average production)	757 tonnes per day	

16.8.2 MINING EQUIPMENT

The planned mobile face equipment fleet size was based on the following:

- Truck haulage fleet size.
- The haulage productivity study completed by Rambler in August 2014 which was used to estimate average haulage productivities by zone and level where applicable.

The above information was used to estimate average haulage productivities by zone and level where applicable. Anticipated underground mobile equipment fleet requirements for the LOM are summarized in Table 16.4. Note that this list does not include spares.

Table 16.4 Mobile Mining Fleet Requirements

Equipment List	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Development																				
Jumbo - 2 -boom	2.0	3.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-
LHD - 6.0 m^3 (8 cu.yd.)	2.0	3.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-
Rockbolter	2.0	3.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-
Jackleg	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Stoper	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Scissor lift	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Utility vehicle	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
42-tonne truck	2.0	3.0	3.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	1.0
Production																				
Production drill																				
LHD - 3.4 m^3 (4 cu.yd.)																				
LHD - 6.0 m^3 (8 cu.yd.)						1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0
36-tonne truck																				
20-tonne truck																				
Support - Development and Construction																				
Utility vehicle	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Scissor lift	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Maintenance vehicle	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Grader	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
TOTAL	**22.0**	**26.0**	**26.0**	**24.0**	**25.0**	**25.0**	**23.0**	**23.0**	**22.0**	**22.0**	**22.0**	**22.0**	**22.0**	**22.0**	**22.0**	**23.0**	**23.0**	**23.0**	**19.0**	**17.0**

16.8.3 PERSONNEL

The mine operating schedule is based on two 10-hour shifts per day for 355 days per year, with stope mucking and haulage crews working on holidays. The proposed mine roster will have 4 crews working 7 days on, 7 days off on a rotating schedules. Other mining departments such as the mine services, technical services, and some of the mine maintenance and electrical leaders will be regularly scheduled on a 5-day on, 2-day off schedule on 8-hour dayshifts only.

Mining personnel requirements are based on the equipment fleet size, whereas mine supervision requirements are based on crew size and allocation. Maintenance personnel requirements are based on the present mine personnel staffing levels. An additional allowance was provided for support services and construction. Table 16.5 presents the total underground mining personnel estimate over LOM.

Table 16.5 Underground Mining Personnel Estimated in 2018 at Full Production

Job Class	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Supervision	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Truck drivers	8	12	12	16	20	20	20	20	20	16	16	16	16	16	16	16	16	16	12	4
Development jumbo operators	8	12	12	8	8	8	4	4	4	4	4	4	4	4	4	4	4	4	-	-
Bolter operators	8	12	12	8	8	8	4	4	4	4	4	4	4	4	4	4	4	4	-	-
LHD operators	8	12	12	8	8	12	8	8	8	8	8	8	8	8	8	12	12	12	8	8
Production blasters	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Jackleg miners	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mine services	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Sub-Total	**53**	**69**	**69**	**61**	**65**	**69**	**57**	**57**	**57**	**53**	**53**	**53**	**53**	**53**	**53**	**57**	**57**	**57**	**41**	**33**
Mechanics	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Electricians	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Welders	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
TOTAL	**72**	**88**	**88**	**80**	**84**	**88**	**76**	**76**	**76**	**72**	**72**	**72**	**72**	**72**	**72**	**76**	**76**	**76**	**60**	**52**

16.9 MINING SUPPORT SERVICES

16.9.1 ORE AND WASTE HANDLING

It has been assumed that all ore and waste will be hauled to surface using 42-tonne haul trucks loaded by 6-yd and 8-yd LHD scoops from truck-load-bays located throughout the mine. A surface mill feed stockpile is located approximately 200 m from the portal. Material from this stockpile is loaded into tri-axle trucks and transported to the mill stockpile.

Some waste material from development work will be dumped into open stopes as backfill, while the balance will be hauled to a surface stockpile until it is returned underground as backfill material pending the availability of open stopes that may receive uncemented backfill. All underground waste rock brought to surface will be returned underground as backfill over LOM.

16.9.2 PRODUCTION SHAFT

The existing Boundary Shaft has not been re-established for production purposes in the technical report. The shaft is used only as a secondary means of egress and as part of the ventilation circuit. The ladder-way and landings in the manway compartment have been reconstructed as part of the second egress system.

16.9.3 VENTILATION

The Ming Mine LFZ will be ventilated utilizing a combination of existing ventilation systems, new infrastructure, and airways to ensure adequate air flow and quality where needed underground.

Rambler is presently reconfiguring their main ventilation system to use the Boundary Shaft and the main portal/ramp system as the main fresh air intakes for the mine while the old fresh air pathway through the old Ming Mine workings will become the main mine exhaust. This upgrade will fully resolve a number of issues associated with utilizing the main ramp system as the main mine exhaust pathway.

This change will potentially allow underground mining shift lengths to be increased from 10 to 12 hours once fully implemented although this effect has not been accounted for in the technical report update.

DESIGN CRITERIA

The peak air requirement for the Project is approximately 600 K cfm. The total required air supply was calculated based on Newfoundland and Labrador Regulations guidelines, fleet requirements, associated brake horsepower, and utilization. The utilization estimate for underground equipment is based on existing fleet usage and industry normal operating practices.

The ventilation requirements for the mine are based on the Occupational Health and Safety Regulations 5/12, Newfoundland and Labrador (2012). Table 16.6 presents the estimated peak ventilation requirements.

Fresh air will be supplied to the mining zones via the main ramps and will be exhausted up a series of ventilation raises tied-in to the main exhaust network. Airflow to and from active mining areas and headings will be achieved through the use of a combination of regulators, bulkheads, and auxiliary fans and ducting.

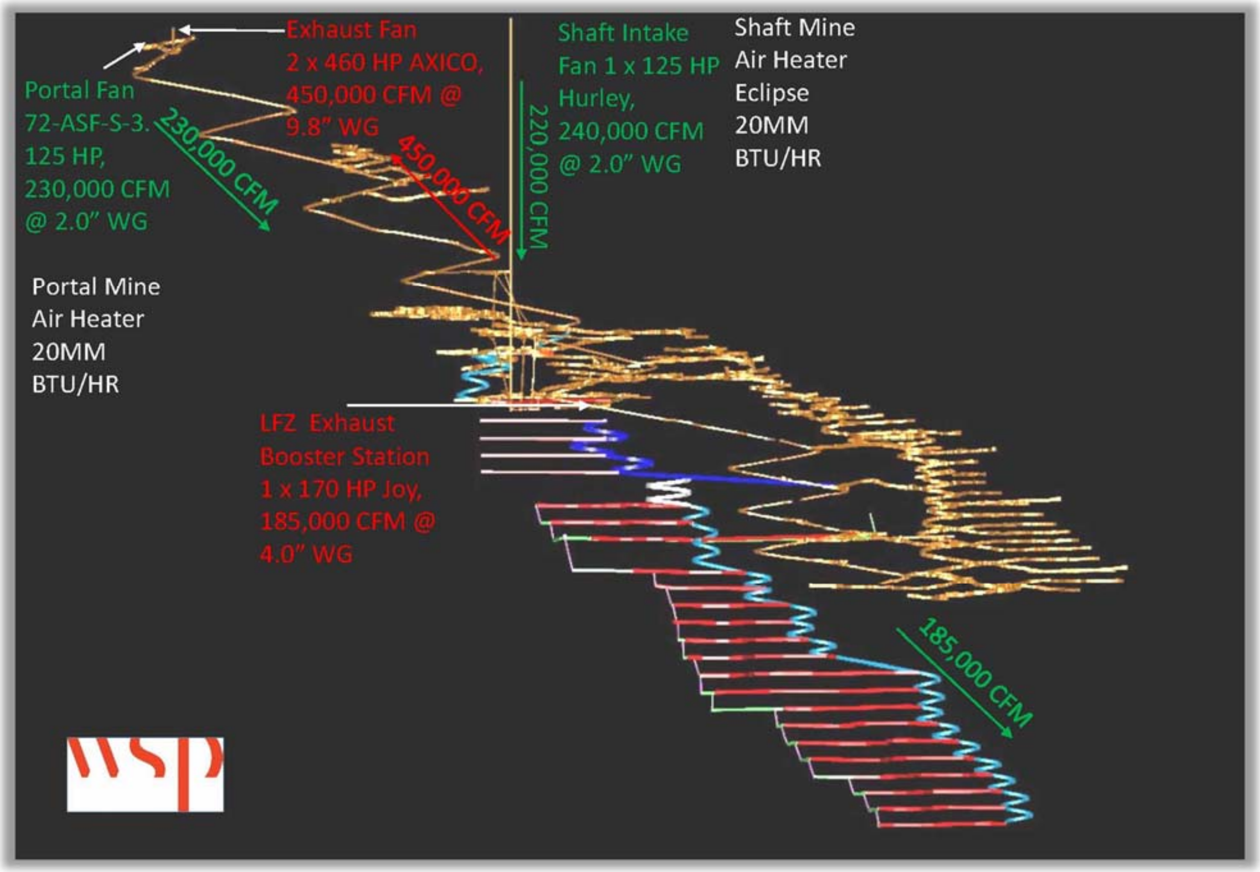
The LFZ ventilation raise system will be equipped with ladders to provide a secondary egress for the zone. The existing ramp, MMS extension ramp, and shaft will continue to be used as escape ways.

A schematic of the underground air flow direction and volumes is illustrated on Figure 16.13.

Table 16.6 Estimated Peak Ventilation Requirements

Unit Type	Quantity	HP	kW per Unit	Total kW	Utilization	Factored kW	cfm/BHP	m^3/min Required	Cfm Required
Jumbo	3	148	110	330	0.25	82.5	144	453	15,984
Rockbolter	3	154	115	345	55%	190	144	1,036	36,590
LHD 8-yd (6 m^3)	3	335	250	750	95%	713	144	3,893	137,484
42 tonne truck	5	520	388	1,940	95%	1843	144	10,072	355,680
Utility/Maintenance Vehicles	7	80	60	420	15%	63	144	343	12,096
Grader	1	139	104	104	15%	16	144	85	3,002
Scissor lift	2	119	89	178	25%	45	144	243	8,568
Sub-Total	**24**			**9,384**		**2,951**		**16,124**	**569,405**
Mine Air Losses	5%							806	28,470
							TOTAL MINE AIR REQUIREMENTS	**17,000**	**598,000**

Figure 16.13 Ventilation Schematic Underground Air Flow Direction and Volumes



16.9.4 COMPRESSED AIR SUPPLY

The mine currently has compressed air and water installed in the main ramp down to the -690 m elevation. Mine operating air and water capital installation costs are included in the direct material costs for development.

There are two 125 hp air compressors presently in use at the mine and they can be supplemented by a spare 100 hp air compressor. Table 16.7 indicates the compressed air requirements for the equipment underground.

Table 16.7 Peak Compressed Air Requirements

Equipment	Requirement (m^3/min)	Units	Total Requirements (m^3/min)
Jacklegs / Stopers	5.6	4	23
Jumbos	20	2	40
LH drills	10	2	20
Subtotal		8	83
Losses	20%		16.6
TOTAL PEAK COMPRESSED AIR			99.6

16.9.5 PROCESS WATER SUPPLY

The mine intake water is supplied from a surface pump-house feeding the main distribution line in the decline. The reported daily requirements are estimated to be 442 K l/day. Table 16.8 summarizes the water consumption by underground activities.

Table 16.8 Mine Water Consumption

Equipment	Requirement (l/day)	Units	Total Requirements (l/d)
LH drills	36,480	2	72,960
Jumbo drills	63,360	2	126,720
LH mucking	50,000	2	100,000
LH blasting	3,600	1	3,600
Refuge	1,920	4	7,680
Development crew	28,800	2	57,600
Diamond drills	36,480	2	72,960
TOTAL	**220,640**	**15**	**441,520**

Source*: Rambler Technical Report 2012*

16.9.6 POTABLE WATER SUPPLY

Potable water will be supplied to the refuge stations and shop in portable containers.

16.9.7 MINE DEWATERING

The current operations handle approximately 950 to 1,135 litres per minute, (570 litres per minute natural inflow – 380 litres per minute from production).

The current pumping system consists of 14 permanent and temporary sumps. Four sump installations are configured with dirty and clear water sumps and a 100 hp pump. The remaining sumps are equipped with a 58 hp pump. The water is pumped through a 150 mm diameter pipeline with a reported system capacity of 2,450 litres per minute to surface.

In order to meet increased production dewatering requirements, additional sumps will be put in place as new development is advanced. Each sump will generally consist of a clean and a dirty water side. The dirty water slimes will be cleaned out as required and trammed to an open stope for disposal during the waste fill cycle.

16.9.8 MINE ELECTRICAL DISTRIBUTION

The underground mine electrical distribution system is presently in place and is designed on a 4,160 high-voltage feed into the mine with distribution down the Boundary Shaft.

Mining equipment such as jumbos, production drills, bolters, pumps, and ventilation fans will operate at 600 volts and will be equipped with ground fault protection systems. The majority of the step-down transformers required are presently in place and operational.

The estimated underground power requirements at full production are 0.4 MW-hrs/month. Table 16.9 presents the estimated underground electrical power consumption.

Table 16.9 Estimated Underground Electrical Power Consumption

Item	Size hp	Size kW	Load Factor	Load (kW)	Utiliz Factor	2018	2034
Main dewatering pump-1	-	-	0.8	-	0.4	-	-
Main dewatering pump-2	-	-	0.8	-	0.4	-	-
Sump pumps	58	43	0.8	35	0.4	2	17
Definition diamond drill	75	56	0.9	50	0.7	1	1
Stope fan-1	50	37	0.7	26	1.0	1	1
Stope fan-2	50	37	0.7	26	1.0	1	1
Stope fan-3	50	37	0.7	26	1.0	1	1
Stope fan-4	50	37	0.7	26	1.0	1	1
Development duct fan-1	50	37	0.9	34	1.0	1	1
Development duct fan-2	50	37	0.9	34	1.0	1	1
Development duct fan-3	50	37	0.9	34	1.0	1	1
Development duct fan-4	50	37	0.9	34	1.0	1	1
Electric-hydraulic drill jumbo-1	150	112	0.8	90	0.6	1	1
Electric-hydraulic drill jumbo-2	150	112	0.8	90	0.6	1	1
MacLean roof bolter-1	100	75	0.8	60	0.6	1	1
MacLean roof bolter-2	100	75	0.8	60	0.6	1	1
Stopemaster-1	75	56	0.9	50	0.7	1	1
Stopemaster-2	75	56	0.9	50	0.7	1	1
Lunch room	20	15	0.8	12	0.3	1	1
Underground lighting	15	11	0.9	10	1.0	1	1
					Kw-hr/month	**406,691**	**556,225**

16.9.9 DIESEL FUEL SUPPLY AND STORAGE

Two diesel fuel storage areas will be constructed underground. Diesel fuel will be stored in SatStat storage and dispensing facilities equipped with either 500 or 1,000 US gallon fuel tanks.

Lubricants such as hydraulic and other oils will also be stored in a SatStat fuel tank stations. These containers can easily be transported and stored in a designated storage facility using a boom truck designed for such purposes.

16.9.10 EXPLOSIVE SUPPLY AND STORAGE

The existing underground explosives and detonator magazines are refurbished and commissioned. As new production areas are developed, new explosive and detonator magazines will be established. A surface magazine has been established on site.

16.9.11 UNDERGROUND EQUIPMENT MAINTENANCE

A new surface shop facility, complete with a five-tonne overhead crane, is established for the larger repairs and equipment re-builds. A warehousing facility is adjacent to the Maintenance Shop.

16.9.12 COMMUNICATION

An underground communication system is established using a leaky feeder system with a head-end in the Office Complex.

The leaky feeder cable is installed throughout the mine with repeaters on surface and will be extended as development advances.

16.10 BACKFILL

Stope backfill is critical in order to ensure the hanging wall up-dip span is mitigated by the confinement provided by the pastefill.

In general the LFZ longhole stopes will be backfilled with pastefill; cemented pastefill will be used in the primary stopes, and unconsolidated rockfill in the secondary stopes. This has been costed in the capital plan. The use of pastefill will improve recovery and dilution, and this has been taken into consideration in reserve calculations

The paste plant for the expansion project is based on the use of paste backfill made with waste residue from a nearby consolidated tailing pond from Old Rambler Consolidated Tailing (ORCT).

Kovit Engineering (Kovit) conducted laboratory testing utilizing a combination of excavated ORCT, aggregate material, general use cement, and blast furnace slag.

Based on laboratory results, available information on the project, and various assumptions, two paste backfill options have been compared:

— Paste backfill made from hundred percent ORCT; and

— Paste backfill made from a mix of ORCT and aggregate.

The laboratory results showed that backfill made from 100% ORCT is the most advantageous option for the project, for the following reasons:

— It has the lowest Capital and Operating total cost.

— It has a simple flowsheet requiring less equipment and maintenance.

— It will not require the manipulation and transportation of large amount of aggregate.

16.10.1 DESIGN CRITERIA AND ASSUMPTIONS

Table 16.10 presents the criteria and assumption used in the design of the paste plant for the LFZ.

Table 16.10 Design Criteria for LFZ

General			Source
Mine production	1,250	mtpd	Rambler
Paste plant availability	100	%	Assumption
Ore density (LFZ)	2.83	t/m³	Rambler
ORCT solid content	90	%	Assumption
Dry ORCT density	3.62	t/m³	Kovit
Portland cement density	3.2	t/m³	Cement Supplier
Backfill requirement			
Stopes that need to be backfilled	70	%	Assumption
Volume to backfill	309	m³/d	Calculation
Paste			
Unconfined compressive strength required	400	kPa	Assumption
Slump test	250	mm	Kovit
Paste backfill solid content	82	%	Kovit
Cement content (% w p/r dry material)	5	%	Kovit
Backfill density	2.45	t/m³	Calculation
Paste backfill required per day	757	mtpd	Calculation

The main assumptions are as follows.

— The ORCT are dry enough to be shoveled, trucked, and fed by conveyor to the paste mixer.

— The paste will be sent underground by gravity.

— The strength obtained after 28 days remains the same over time despite the acidic nature of the material.

— Only the primary stopes need consolidated pastefill; it is assumed that this represents 70% of the mining production.

16.10.2 PROCESS DESCRIPTION

The paste backfill will consist of ORCT, GU cement (general use cement), and water.

The ORCT will be shovelled, trucked from the consolidated tailings pond, and stockpiled by a local contractor into a new 186 m^2 tailings storage building. The building floor with be asphalted and drainage will be collected.

The storage building will stock the equivalent for 3.5 days of operation.

The ORCT will be fed by a contractor's loader into a hopper with a grizzly. A conveyor will bring the material into a 50 m³ silo located in the paste plant.

The residue will be mixed with cement and water in a continuous mixer to obtain a paste about 82% solid.

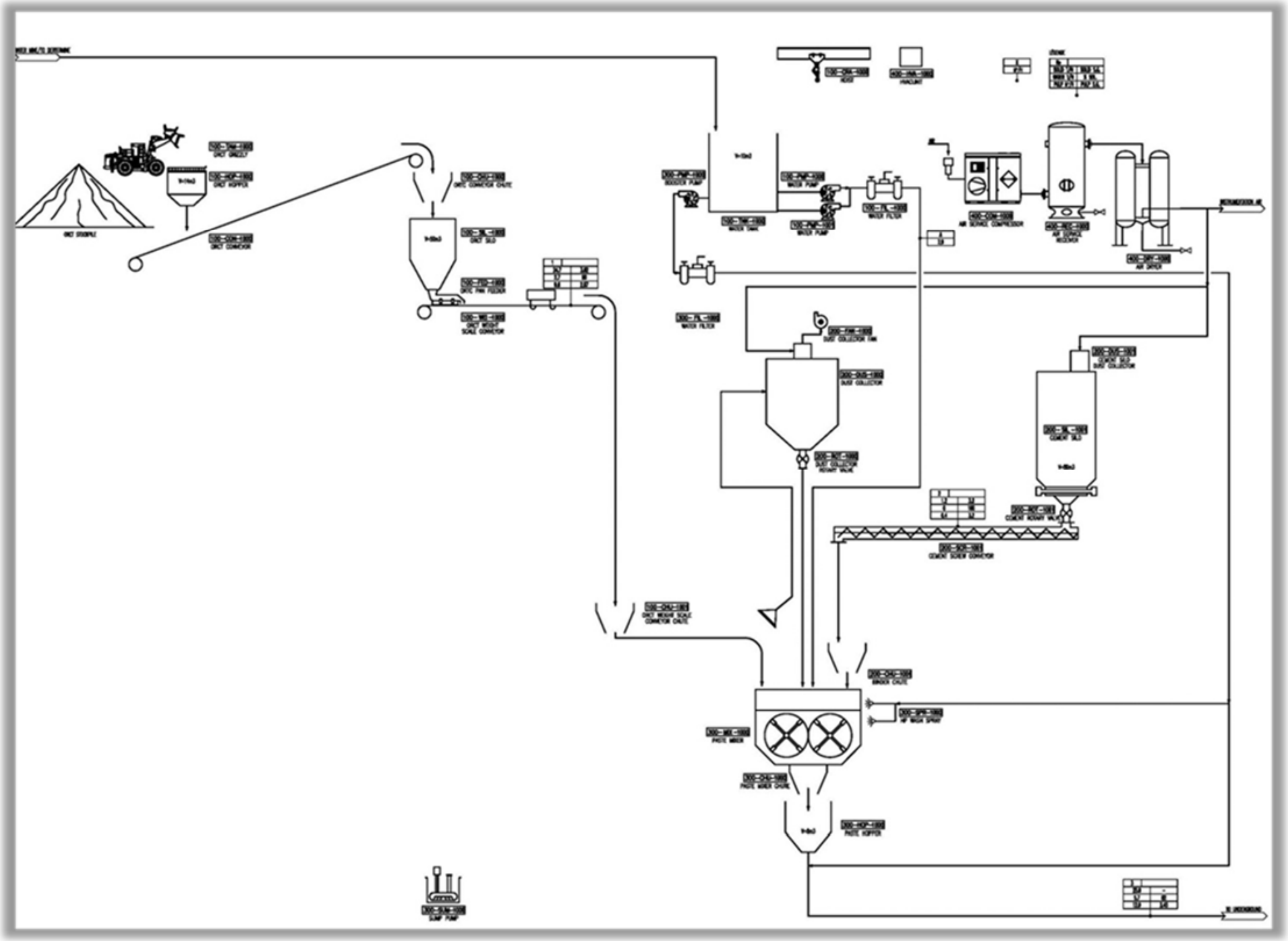
The process water (no potable water) will be pumped from a drilled well and will be accumulated into a water tank in the paste plant.

The ORTC will be fed into the mixer through a weight scale conveyor. The cement will be stored in a 80 m³ silo and will be fed by a screw conveyor to the paste mixer.

The paste will be distributed underground by gravity through a borehole and a piping network.

The borehole will bring the paste to a distribution tank at Level 312. Then, the paste will be distributed to each level by a drilled main piping network. A secondary piping system will distribute the paste to the stopes. Figure 16.14 illustrates the process diagram.

Figure 16.14 Process Diagram



17 RECOVERY METHODS

17.1 INTRODUCTION

The recovery of a copper-gold concentrate is based on using the existing copper concentrator located at Nugget Pond. The existing grinding and flotation circuits, and concentrate dewatering equipment will be used as-is without any modifications. Upgrades will be required for pumping tailings to new impoundment areas and for pumping reclaim water from the new tailings impoundment areas back to the concentrator.

17.2 PROCESS DESCRIPTION

17.2.1 MILL FEED STORAGE AND CRUSHING

Run-of-mine (ROM) mill feed from the Ming Mine is stored on an outdoor pad at the Nugget Pond site. It is fed through a two-stage crushing plant by front-end loader and the crushed material is conveyed into the crushed ore silo.

17.2.2 GRINDING

The grinding circuit consists of a semi-autogenous grinding (SAG) mill and a ball mill. The mill feed is conveyed to the SAG mill which operates in open circuit. A minimal amount of oversize material discharging from the SAG mill trommel screen is collected in a bin that is periodically dumped back on the mill feed stockpile. The ball mill operates in closed circuit with hydrocyclones for classification. Lime is added to the mill discharge pump box. The cyclone overflow is directed to the flotation circuit.

17.2.3 FLOTATION

The copper-gold flotation circuit is arranged in a conventional configuration and consists of rougher, rougher-scavenger, primary cleaner, cleaner-scavenger, secondary cleaner, and tertiary cleaner flotation cell banks.

Ground mill feed is received from the grinding circuit in the flotation feed holding tank, which provides some storage capacity for feed to the flotation circuit and allows the downstream processes to continue operating during short-term interruptions of the grinding circuit operation. Flotation collector (Aerophine 3418A) and additional lime is added to the flotation feed holding tank to adjust the pH to the optimum range for copper-gold recovery and pyrite rejection. The flotation feed holding tank also provides surge capacity to allow continued operation of the grinding circuit during temporary shut-downs of the flotation circuit.

From the flotation feed holding tank, the ground material is pumped to the rougher conditioning tank, where more conditioning time is provided and MIBC frother is added. The overflow from the rougher conditioning tank feeds the rougher flotation cells. Concentrate from the rougher cells is normally directed via the inside launder to the cleaner conditioning tank. Under certain conditions, the rougher concentrate grade from the first cells in the bank may be suitable as final concentrate and, under these conditions, the operator may direct this stream via the outside launder to the concentrate thickener. Tails from the rougher flotation cells are directed to the rougher-scavenger flotation stage.

Additional 3418A collector and MIBC frother are added to the rougher-scavenger feed box as the rougher-scavenger flotation cells are designed to maximize recovery of copper and gold from the rougher tailings. There is also a provision to add a supplementary scavenger flotation collector (currently Aero MX983) to the rougher-scavenger flotation stage. Concentrate from these cells is recycled to the rougher conditioning tank. Tailings from the rougher-scavenger cells are directed to the flotation tailings tank, with a provision to feed a portion of the tailings to an additional scavenger flotation contact cell. Aero MX983 is added to the contact cell feed, and the concentrate is advanced to the cleaner conditioning tank. The rest of the feed to the cleaner conditioning tank consists of rougher concentrate, cleaner-scavenger concentrate and secondary cleaner tails, all of which are conditioned once again with lime and 3418A collector prior to be being fed by gravity overflow to the primary cleaner flotation cells where MIBC frother is added. The concentrate from the primary cleaner stage is routed to the secondary cleaner stage, and the secondary cleaner concentrate is routed to the tertiary cleaner stage, from where the final concentrate product is directed to the concentrate dewatering section of the plant.

The tails from the primary cleaner stage are fed to the cleaner-scavenger flotation cells to minimize losses of recoverable copper and gold to tailings. Cleaner-scavenger concentrate is recycled to the cleaner conditioning tank and tailings are routed to the rougher-scavenger flotation cell feed to scavenge additional copper and gold. Tailings from the tertiary cleaner stage are routed to the secondary cleaner cells and secondary cleaner tails are recycled to the cleaner conditioning tank.

Hydrated lime slurry is added to the cleaner-scavenger, secondary cleaner, and tertiary cleaner feed boxes to maintain the optimum pH for copper-gold upgrading throughout the cleaner circuit and additional 3418A collector and MIBC frother is added to the cleaner-scavenger feed.

17.2.4 CONCENTRATE DEWATERING AND INTERMEDIATE STORAGE

Copper-gold concentrate from the flotation circuit is pumped to the copper concentrate thickener. Flocculant solution is injected in-line in the piping to the thickener feed well to promote rapid settling of the concentrate solids and overflow water clarity. The thickened concentrate solids are removed from the thickener underflow by a set of variable speed pumps. A density meter located in the common pump discharge line continuously measures the slurry density (percent solids) and adjusts the speed of the duty underflow pump to maintain the set-point underflow percent solids. The supernatant from the thickener is directed to the process water tank.

The thickened concentrate slurry is pumped on a continuous basis into the filter feed tank, where it is stored until the next filtration cycle begins. A conventional recessed plate filter press is operated on a batch basis for dewatering of the copper concentrate. After the filter press is filled, compressed air is used to further dry the filter cake. At the end of the dewatering cycle, the filter press is opened and the filter cake is discharged through the filter discharge gate into a storage area located directly beneath the filter. A front-end loader moves the concentrate from the intermediate storage area into trucks parked at the nearby concentrate transfer truck loading area. Once loaded, the trucks transport the copper concentrate to the Goodyear’s Cove Port Site for storage until final shipment.

17.2.5 REAGENT SYSTEMS

AEROPHINE 3418A COLLECTOR

Aerophine 3418A collector is a copper-gold collector reagent supplied in liquid form by Cytec Solvay and is purchased in 1000-litre tote tanks. Aerophine 3418A is added to the process neat (i.e. undiluted). Tote contents are transferred to the 3418A reagent storage tank. The collector reagent dosages for each injection point are set and controlled independently using diaphragm metering pumps.

METHYL ISOBUTYL CARBINOL (MIBC) FROTHER

MIBC frother is purchased in 200-litre steel drums. MIBC is not miscible with water and is best fed to the flotation process neat. Drum contents are transferred to the MIBC reagent storage tank. The frother reagent dosages for each injection point are set and controlled independently using diaphragm metering pumps.

HYDRATED LIME SLURRY

A hydrated lime slurry makeup and distribution system is used to supply lime to various unit operations within the copper concentrator building, and a separate similar system is used within the grinding area. Dry powdered hydrated lime (calcium hydroxide) is supplied in 1-tonne bulk bags. Lime is mixed in batches to the required 5 to 10 wt% concentration for distribution to the process. Lime slurry recirculation pumps continuously recirculate lime slurry through a hard-piped loop around the concentrator building (or grinding circuit) to deliver lime slurry to each of the injection points.

FLOCCULANT

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ZINC SULPHATE

Zinc sulphate solution is mixed up in batches from 1-tonne bags of the powder. Zinc sulphate solution is metered into the flotation feed holding tank when needed.

AERO MX983

The scavenger flotation collector AERO MX983 is received in liquid form in drums and is delivered to the process via a diaphragm metering pump pumping directly from the drum.

17.2.6 PROCESS WATER

Process water is currently reclaimed from the existing tailings pond at the Nugget Pond site. However, the future operation will use a new process water reclaim pump house located at Camp Pond which will eventually be relocated to The Steady later in the operation. Process water reclaim from the tailings impoundment areas will provide all of the process water required for the concentrator. The site location and infrastructure associated with process water reclaim is further described in Section 18.

17.2.7 TAILINGS DISPOSAL

Based on the proposed tailings management plan, tailings will be disposed of by pumping in slurry form to existing and new tailings impoundment areas to be developed adjacent to the Nugget Pond mill site. New tailings slurry distribution piping will be installed to suit the tailings disposal plan. The infrastructure associated with the tailings management plan is described in Section 18.

17.3 CONCENTRATOR PRELIMINARY PROCESS DESIGN CRITERIA

The overall process design criteria for the concentrator at the Nugget Pond site are summarized in Table 17.1.

Table 17.1 Overall Design Criteria – Nugget Pond Concentrator

Parameter	Units	Value	Comments
Concentrator design capacity ROM mill feed throughput	tonne/d (dry)	1,250	When running continuously 24 hours per day.
Concentrator annual availability at design capacity	%	95	Total availability over 365 days for design purposes. Based on average Nugget Pond operations from January 2016 to November 2017.
Crushed ore top size	mm	12.7	Feed to SAG mill
Ground ore 80% passing particle size	micron	120	Grind size achieved based on plant data for operation at 1,250 tpd
Average overall copper recovery to concentrate	wt%	96.0	Based on average Nugget Pond mill data 2016 and 2017
Copper concentrate grade dry basis	wt% Cu	27.7 avg. 25.0 min. 30.0 max.	Based on average Nugget Pond mill data 2016 and 2017 and typical range from Nugget Pond operations and bench test results.

17.4 CONCENTRATOR PROCESS CONTROL SYSTEM

A programmable logic controller (PLC) based process control system is used for the existing grinding circuit and the flotation plant. Control of the new process water reclaim pumps at Camp Pond and The Steady will be integrated into the PLC control system in the grinding area.

17.5 CONCENTRATE STORAGE AND BOAT LOADING SYSTEM (GOODYEAR'S COVE PORT SITE)

Copper concentrate is transported by truck from the Nugget Pond site, 142 km to the Goodyear's Cove Port site, where a truck dump station, concentrate storage building, and boat loading equipment are used to load ocean-going bulk carrier vessels.

17.6 NUGGET POND CONCENTRATOR PLANT AVAILABILITY ASSESSMENT

The operating history of the Nugget Pond concentrator for the last two years was reviewed to evaluate the average processing plant availability. The monthly availability factor for each year is presented on Figures 17.1 and 17.2. The availability factor is calculated as the total number of hours the mill was reported to be operating in a given month divided by the total number of hours in the month. In a few of the months, the mill had to be shut down temporarily as there was no ore available from the mine to process. These days were not counted against the plant availability since it was an issue of lack of feed rather than the availability of the mill.

The typical plant availability factor was determined to be 95% based on the average over the period of January 2016 through to November 2017, excluding April 2017. April 2017 was excluded because there was an extended shutdown unrelated to normal maintenance; this shutdown was required to install new equipment related to operating the plant at the increased 1,250 tpd capacity.

Figure 17.1 Monthly Nugget Pond Concentrator Availability in 2016

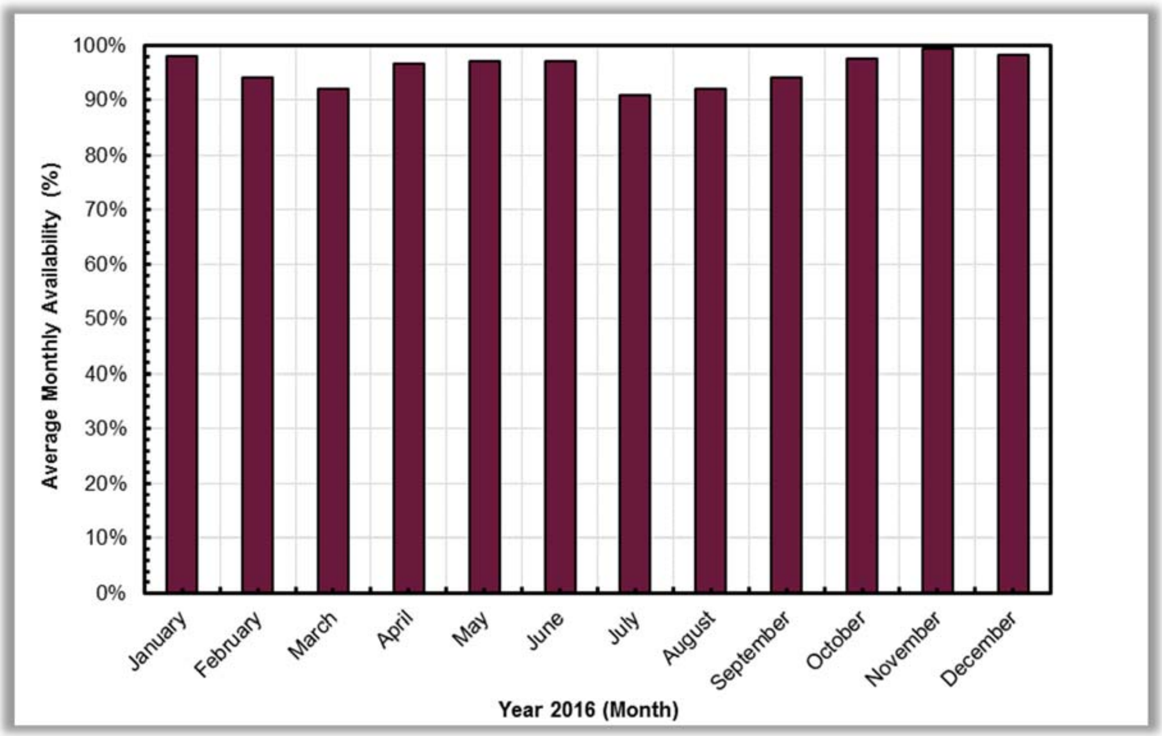
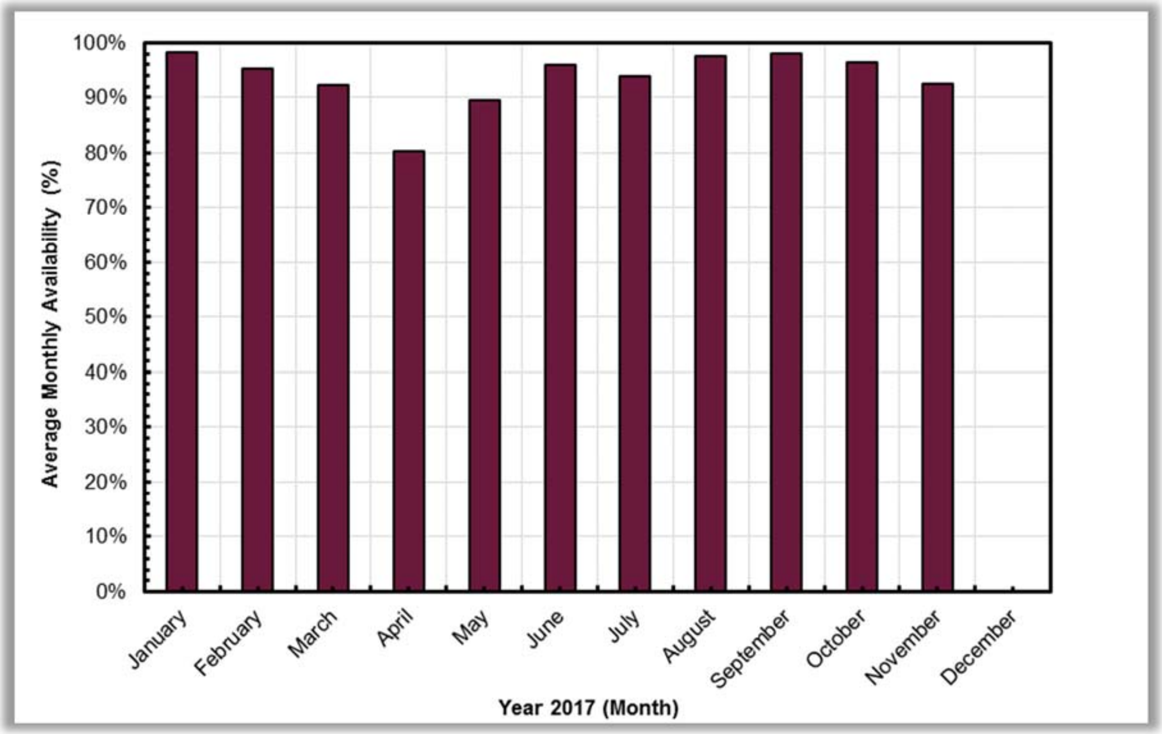


Figure 17.2 Monthly Nugget Pond Concentrator Availability in 2017



17.7 CONCENTRATE STORAGE AND BOAT LOADING SYSTEM (GOODYEAR'S COVE PORT SITE)

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18 PROJECT INFRASTRUCTURE

Figure 18.1 shows the Ming Mine site, the Nugget Pond Mill site (including the tailings management facility), and the Goodyear's Cove port facility.

Figure 18.1 Site Location

18.1 MING MINE SITE

The Ming Mine site is connected to the provincial electrical power grid, and is well equipped with mine related infrastructure (Figure 18.2). The disturbed site covers less than 10 hectares and includes the following:

- Roads, parking, and laydown areas;
- Effluent Treatment Plant (ETP);
- Maintenance shops;
- Surface electrical substation;
- Core storage building;
- Office building and mine dry/rescue;
- Mine portal;
- Scale/scale house;
- Waste rock storage;
- Ore storage pad;
- Ventilation raises;
- Fuel tank storage;
- Boundary shaft.

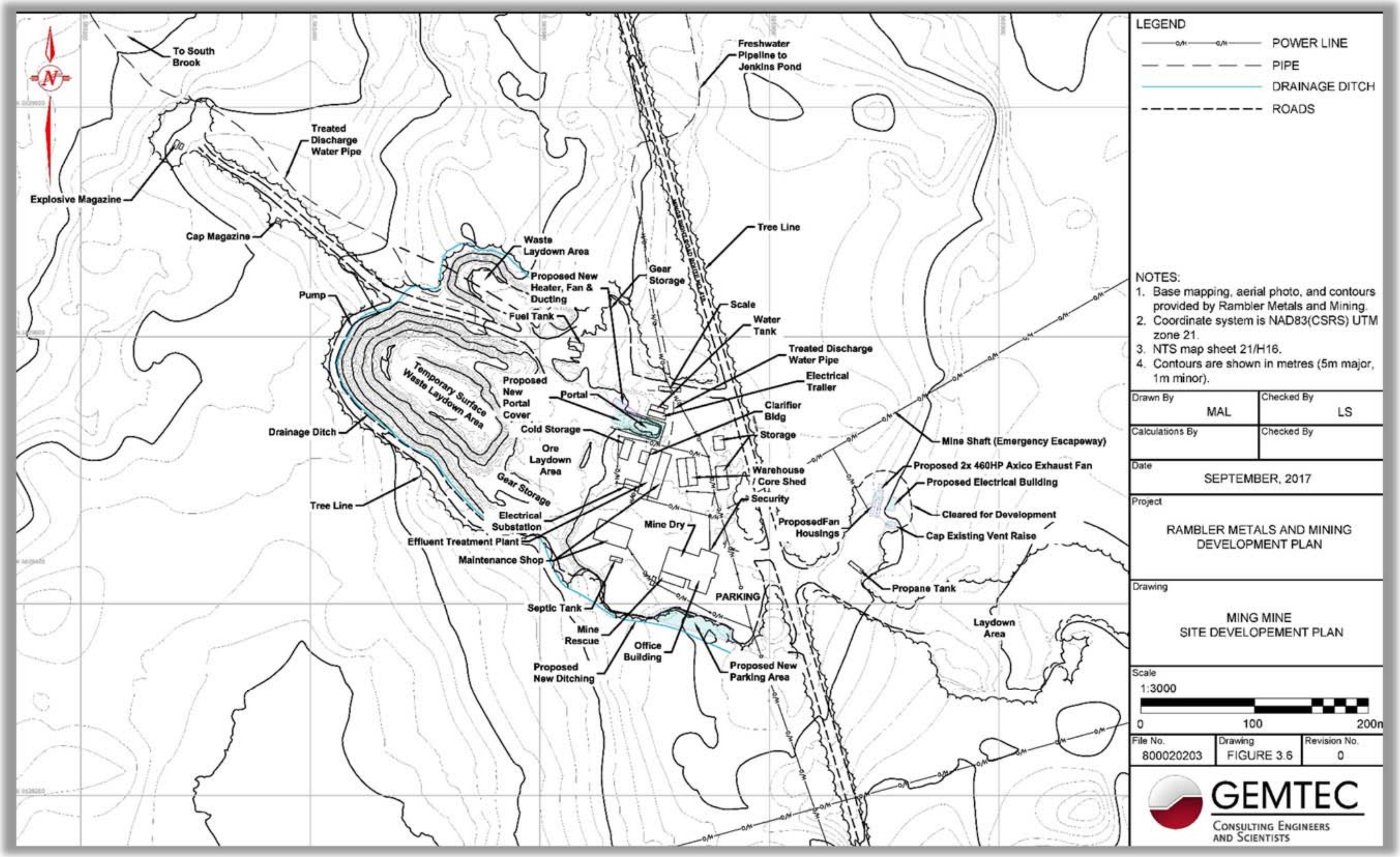
The site has an existing basic road network in place for access to the existing buildings and services supporting the previous mining operation. The existing main access road from Ming's Bight Road (Route No. 418) enters the site westward and extends past the core building and water treatment building northward to the mine portal. There are other existing roadways to the office building, dump areas, and core storage areas.

The maintenance shops are located on either side of the site entranceway. The shop to the south is a pre-engineered steel structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab-on-grade. A five-tonne overhead crane is supported on steel beams connected to the pre-engineered steel structure. The structure is enclosed with interior liner sheets, insulation and exterior steel wall cladding. Metal personnel doors and overhead doors are located around the perimeter of the building. The roof consists of a standing seam roof system. The ETP neutralizes and treats effluent at a continuous flow rate of up to 850 United States Gallon per Minute (USGPM). The ETP is located within the north maintenance shop.

The mine dry, rescue, and office building is located near the south entrance. The building is an engineered wooden structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab-on-grade.

Currently the boundary shaft is used as a secondary egress from the 1800 ft. level to surface. The existing headframe and collar house are only used for storage.

Figure 18.2 Ming Mine Site Layout



18.1.1 MAIN ACCESS AND SITE ROADS

Primary access to the Ming Mine site, which is located approximately 17 km by road east of the town of Baie Verte on the north coast of the island of Newfoundland, is by the existing La Scie Highway (Route 414) and the Ming's Bight Road (Route 418). Access to the Baie Verte Peninsula is via Route 410 (Dorset Trail) exiting the Trans-Canada Highway. Access roads currently have proper signage, including posted speed limits and caution signs.

The site has an existing basic road network in place for access to the existing buildings and services supporting the mining operation. The existing main gated access road (south entrance) from Ming's Bight Road (Route No. 418) enters the site westward and extends past the mine dry and office building, and then the maintenance shop and cold storage, and heads northward to the mine portal. Trucks enter and exit the site from the north entrance north of the portal where the scales are located. There are other existing roadways to the other maintenance shop, dump areas, and laydown and storage areas. The ventilation setup at the boundary site is accessed by an existing road across from the main gate at the Ming Mine.

Road grades vary with the topography of the site but generally are designed with cross slopes at 2% minimum in granular surfaces. Swales along the roadway direct drainage around existing structures.

No additional roads are required to be built to support Phase II of the Project. All waste rock used for road maintenance and upgrade will continue to be constructed from non PAG material.

Site drainage is provided, generally east to west, through surface grading and pipe culverts that direct run-off efficiently away from road, parking and yard areas. A drainage ditch is located south of the mine site to receive site surface water run-off and direct it to the former open pit site. Proper ditching and grading is set up to direct water from the waste rock pile to the ETP.

18.1.2 PARKING AND LAYDOWNS

Site buildings have limited space available adjacent to each of the buildings for parking, temporary or otherwise, of mine service vehicles.

Mine employees and visitors enter the Ming Mine site from the south entrance and proceed to the 2,000 m^2 parking space south of the office/dry building where there is space for approximately 40 passenger-car size vehicles.

A gear storage area is located east of the waste rock stockpile and south of the ore laydown area.

18.1.3 ORE AND WASTE STOCKPILES

Mine waste is hauled from underground and placed in the existing 1.8 ha waste rock stockpile located to the west of the portal. Waste will eventually be placed below ground, either as progressive or final closure, in accordance with the schedule.

Previous work has estimated that approximately 358,000 tonnes of waste rock will be stored on surface at any particular time, however upon further review of the work completed by WSP has determined that the tonnage calculations based on the volume of the stockpile are overly conservative, and therefore the available storage is understated in terms of tonnage. WSP used a placed density of approximately 1.8 tonnes m^3. Based on GEMTEC's experience and confirmatory work completed by Rambler, the placed density of waste rock from Rambler's operations is in the range of 2.3 t/m^3. Using the same volume calculated by WSP of approximately 225,500 m^3, up to 518,650 tonnes of waste rock can be placed in the stockpile while maintaining the same closure cover dimensions and cost.

The latest survey data (2016) indicates a volume of 205,811 m^3, however updated drone imagery will be collected in late 2017. New volume and surface area totals, as well as survey data, will be provided to Newfoundland and Labrador Department of Natural Resources (NLDNR) when available.

Ore is hauled to surface using low profile 42-tonne haul trucks from centralized truck load bays throughout the mine. A 6,000-tonne capacity surface ore laydown area is located approximately 50 m from the portal. From there, the ore is loaded into tri-axle trucks and transported to the mill stockpile.

18.1.4 SURFACE BUILDINGS AND INFRASTRUCTURE

A list of stationary equipment at the Ming Mine site is as follows:

- Back-up generator;
- Ventilation fan;
- Compressors (2);
- 100 hp Pioneer pumps (4);
- Substations (4 surface and 11 underground);
- 1 kV outdoor medium voltage breaker cubicle;
- 5 kV 600 amp Load break switches (6).

OFFICE BUILDING AND MINE DRY / RESCUE

The mine dry, rescue, and office building is located near the south entrance. The building is an engineered wooden structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab-on-grade.

MAINTENANCE SHOPS

The maintenance shops are located on either side of the south entrance.

The south maintenance shop is a pre-engineered steel structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab-on-grade. A five-tonne overhead crane is supported on steel beams connected to the pre-engineered steel structure. The structure is enclosed with interior liners sheets, insulation and exterior steel wall cladding. Metal personnel doors and overhead doors are located around the perimeter of the building. The roof consists of a standing seam roof system.

The north maintenance shop is a steel framed structure with metal siding and roofing, occupying a footprint of approximately 752 m^2. The building also accommodates the ETP. A 76 m^2 wood structure houses the clarifier and is attached to the west side of the building. The electrical substation is also connected to the west side of the building.

EFFLUENT TREATMENT PLANT (ETP)

The ETP, constructed in 2007, neutralizes and treats effluent at a continuous flow rate of up to 850 USGPM. The ETP will continue to be used to treat streams from mine dewatering, building sumps, and storm water and surface run-off directed to the Ming West catchment area. As noted, the ETP is located within the north maintenance shop.

CORE LOGGING AND CORE STORAGE BUILDING

The core logging building is a wood frame structure with metal siding and roofing, with a footprint of approximately 200 m^2. It accommodates all required activities associated with core logging and storage.

Additional core storage space is provided outside at various locations around the site using cross piled stacking and on core racks. Core storage areas are developed or relocated on site as needed.

STORAGE BUILDINGS

There is one warehouse, two cold storage buildings, and two general storage buildings on site. One cold storage is used for electrical storage (located adjacent to the mine portal) and the other spaces are for mine storage. The storage buildings are portable 'sea' containers with sufficient space projected to accommodate proposed storage.

SCALE / SCALE HOUSE

A portable, heavy duty, truck scale is located along the roadway at the north of the site for weighing the ore transfer trucks prior to their departure to the processing site at Nugget Pond.

SURFACE FUEL STORAGE

The existing fuel depot is nominal 60,000 litre, above-ground, double-walled, steel diesel fuel tank with secondary containment at a capacity of 110% and installed as per Gasoline and Associated Products (GAP).

18.1.5 UNDERGROUND MINE

The mine portal is located near the center of the site. The portal provides access to the underground mine. The following infrastructure is located below the surface.

MAINTENANCE GARAGE

An underground maintenance shop is located on the 1800 level in the location of the old shop. Smaller preventative maintenance jobs are handled on 1800 level with major maintenance taking place on surface when required.

MINE DEWATERING SYSTEM

The current operations handle approximately 950 to 1,135 litres per minute, (570 litres per minute natural inflow – 380 litres per minute from production).

The current pumping system consists of 14 permanent and temporary sumps. Four sump installations are configured with dirty and clear water sumps and a 100 hp pump. The remaining sumps are equipped with a 58-hp pump. The water is pumped through a 150 mm diameter pipeline with a reported system capacity of 2,450 litres per minute to surface.

In order to meet increased production dewatering requirements, additional sumps will be put in place as new development is advanced. Each sump will generally consist of a clean and a dirty water side. The dirty water slimes will be cleaned out as required and trammed to an open stope for disposal during the waste fill cycle.

MINE ELECTRICAL DISTRIBUTION SYSTEM

The underground mine electrical distribution system is designed on a 4,160 high-voltage feed into the mine with distribution down the Boundary Shaft.

Mining equipment such as jumbos, production drills, bolters, pumps, and ventilation fans will operate at 600 volts and will be equipped with ground fault protection systems. The majority of the step-down transformers required are presently in place and operational.

The estimated underground power requirements at full production, in the third year of ramp-up period, are 0.4 MW-hrs/month.

COMPRESSED AIR AND PROCESS WATER SUPPLY

The mine currently has compressed air and water installed in the main ramp down to the 2600 Level. Mine operating air and water capital installation costs are included in the direct material cost.

There are two 125 hp air compressors presently in use at the mine and they can be supplemented by a spare 100 hp air compressor.

The mine intake water is supplied from a surface pump-house feeding the main distribution line in the decline. The reported daily requirements are estimated to be 442 K l/day.

COMMUNICATIONS SYSTEM

An underground communication system is in place using a leaky feeder system with a head-end in the office complex. The leaky feeder cable is installed throughout the mine with repeaters on surface to extend communications to the entire site and will be extended as development advances.

CONSUMABLES SUPPLY AND STORAGE

Underground consumables (rock bolts, pipe and fittings, ventilation supplies, drill steel and bits, tools) are delivered to the surface warehouse by suppliers. Underground storage areas are set up in appropriate areas near to active workings.

18.1.6 BOUNDARY SHAFT

The Boundary Shaft is composed of three timbered compartments, two of which were used as hoisting compartments and one of which is a manway compartment. The shaft is 2,050 feet in depth and is located on the eastern edge of the previously mined orebodies. Other than the collar house, the shaft timbers, and the refurbished manway compartment, none of the previous fixtures of the shaft (e.g. headframe, hoist, electrical equipment, and underground crusher) are in existence.

The existing Boundary Shaft was used for ore extraction during historical mining operations. Currently the shaft is used as a secondary egress from the 1800 Level underground to surface. The existing collar house is only used for storage. The shaft below 1800 Level is currently flooded.

18.1.7 SECURITY

Security provisions at the Ming Mine site include gates, fencing, gate houses, signage, barriers, and lighting. The mine is generally operated on a 24-hour basis and area lighting is provided for all roadway, parking, and yard areas throughout the site. The south and north entrances from Ming's Bight Road have sliding, electric-operated gates controlled by a security person in a gate house facility. Fencing, barriers and signage are in place to supplement the intended functioning of the gates, to secure property and materials, and to direct staff/visitors to the proper areas.

18.1.8 POWER

Electrical power for the Ming Mine is provided by Newfoundland Hydro (Hydro) via the existing 25 kV transmission line. Power from the 25 kV transmission line is routed to the electrical substation where the voltage is transformed from 25 kV to 4,160 V. The substation is located adjacent to the north maintenance shop.

The backup diesel generator plant at Ming's Bight is sized at 1000 kW ((138 amps at 4160 v) approximately 950 amps at 600 v) and is sized to operate 6 x 60 HP Flygt pumps. The diesel generator plant is connected via a separate 5000 Volt Load break switch (manual transfer) to permit either normal electric utility power or the diesel generator power to operate these six pumps. The diesel generator is self-contained with an integral fuel day tank for 24-hour operation.

18.1.9 WATER USE / SUPPLY

Fresh water requirements for the mine site are supplied via pump and pipeline from V Pond Brook. Fresh water is required for potable water supply and underground mine and process supply. A fresh water intake consisting of a small wet-sump arrangement is located on the shoreline and protected by a small pump house. The in-water intake uses intake screens and arrangements as recommended by the Department of Fisheries and Oceans (DFO) to protect fish and fish habitat.

Water is pumped to the site using a 30 HP pump, with a second 30 HP pump on standby for emergency and maintenance requirements. Water is pumped to the site via a 150 mm diameter, heat-traced HDPE pipeline which delivers water to a potable water storage tank and the underground water supply system. Potable water is piped from the storage tank to facilities around the site as required.

POTABLE WATER

Water for showers, toilets, etc. is pumped to a 35,000 litre storage tank on site from where it is piped via buried pipeline to the surface buildings at the site for use in washroom facilities. The potable water supply also supplies minor industrial requirements for the wash bay and some minor requirements in the ETP for mixing flocculant.

The average requirement for fresh water for potable use is 51 litres per minute. Drinking water is bottled water supplied by a local contractor.

PROCESS AND MINE WATER

Water is required to supply underground mining equipment during operations. An average maximum requirement of 460 litres per minute is required to supply longhole drills, diamond drills, blasting, mucking, and development crews.

18.1.10 WASTE MANAGEMENT

Further information on waste management is provided in the Waste Management Plan (*Rambler*, *2010*), which will be updated for Phase II operations and will continue to be reviewed and updated on a regular basis throughout ongoing operations.

CHEMICALS

Chemical usage as part of the mining operations is contained in proper storage during development and operation, and will be removed from the site prior to closure. Further details on chemicals on site and their usage and disposal are provided in the WMP.

FUEL AND OIL

The above-ground fuel depot is a manufactured pump shed housing the fuel pump and dispensing facilities and is situated to the southeast of the existing core storage building.

During construction and operation a self-dyked fuel storage tank and dispensing facilities equipped with emergency spill kits will be located on site. The tank will be equipped with secondary containment at a capacity of 110% of the tank storage volume and installed as per the GAP Regulations (2003).

Two diesel fuel storage areas are located underground in the mine. Diesel fuel is stored in SatStat® storage and dispensing facilities equipped with 3,800 L (1000 US gal) fuel tanks, self-dyked to 110% capacity. Lubes are stored in SatStat® duel tank stations distributed by Rock-Tech.

Used oils and lubricants are contained in proper bins and disposed of by a licensed waste oil handler.

A grounding system is implemented for the fuel storage tanks to meet the requirements of the National Building Code of Canada. An electrical service is provided to this area to provide power for lighting and fill pumps. Wiring in this area is in accordance with the Canadian Electrical Code for fuel dispensing areas.

The fuel storage areas are permitted as required and all residual hydrocarbons will be removed or remediated as part of the closure activity.

EXPLOSIVES

Appropriately permitted surface explosives storage magazines on site are operated and monitored by explosives vendors/contractors in accordance with the applicable federal and provincial regulations and the Occupational Health and Safety Act. All transportation of explosives to and from the surface magazines are carried out respecting all applicable regulations. The surface explosives magazines are located approximately 250 m west of the waste rock storage area.

All explosives storage will be removed by the contractor once no longer required on site. Any spillage or other cleanup will be the responsibility of the contractor and will be completed prior to closure.

A second explosive storage area is located underground. There are separate magazine for caps and explosives. All transportation of explosives to and from the underground magazines is in conformance with all applicable regulations.

SANITARY / SEWAGE, DOMESTIC, HAZARDOUS, AND OTHER WASTES

Sewage Waste

Sanitary sewage effluent, including grey water, is piped to an engineered septic disposal system designed and approved in accordance with the requirements of the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC).

The system for handling and disposing domestic sewage effluent from the Ming Mine operation consists of a Cromaglass Model CA-30F Wastewater Treatment Module, complete with Cromaglass 1,300 gal aerated sludge processing tank, PVC piping, submergible pumping systems, etc. Discharge piping is laid in a bedding of crushed rock. The system is engineered in accordance with NLDECC requirements. The septic system handles domestic sewage and gray water produced daily (year round) from full shower/toilet/sink facilities.

Domestic Waste

All non-recyclable and non-reusable domestic and solid waste is stored in appropriate containers then trucked to either the Ming's Bight and/or the Baie Verte municipal garbage disposal land fill site for disposal. Where possible, waste materials that can be recycled or re-used are stored and/or trucked off site to a licensed recycling facility. Any non-hazardous process waste is similarly handled.

Hazardous Waste

Any hazardous waste generated on site is stored in accordance with the appropriate regulations and moved off site by a licensed contractor to an approved facility. Currently there are no approved hazardous waste facilities in Newfoundland; therefore any such waste is moved outside the Province. The Transportation of Dangerous Goods Regulations applies to the movement of such waste.

Other Waste

Other waste materials including non-hazardous industrial waste (tires, containers, pallets, etc.) and technology-related wastes (batteries, computers, etc.) are identified in the Waste Management Plan, which has been implemented to ensure these materials are re-used or recycled where possible and practical.

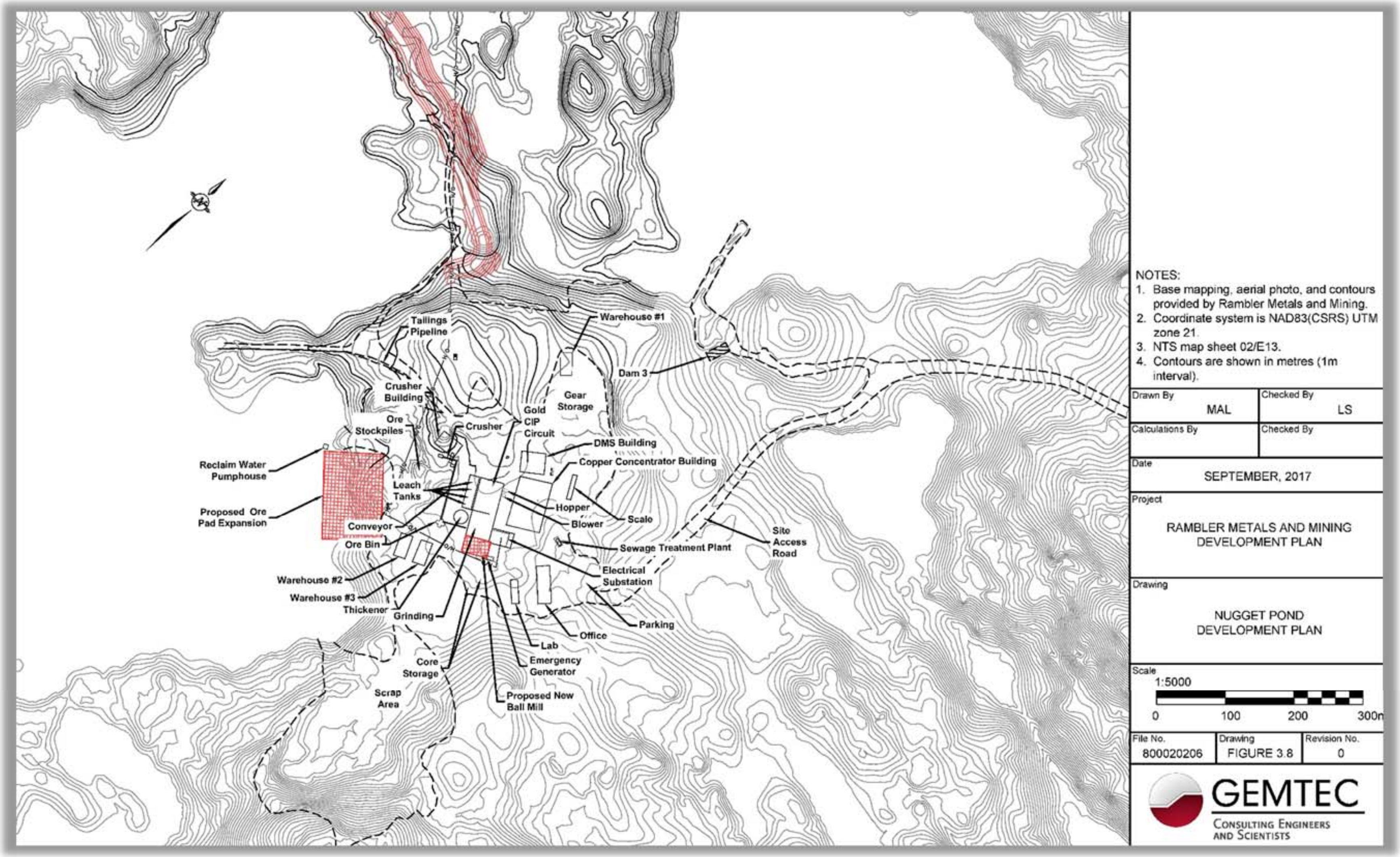
18.2 NUGGET POND MILL SITE

The present mill facility at Nugget Pond is a fully permitted base metal and gold mill with a nominal throughput rate of 1,250 mtpd (Figure 18.3). All existing infrastructure has been well maintained over the years and no serious environmental liabilities are associated with the Property.

The Nugget Pond property covers approximately 30 hectares and includes the following:

- Road and yard area;
- Office building;
- Assay laboratory;
- Sewage treatment plant;
- A large maintenance garage;
- Cold storage buildings;
- Mill building including crusher, ore bin, and thickener and leach tanks;
- Ore stockpile area;
- Fuel storage and dispensing facilities;
- Security house and gate;
- Reclaim and fire pump house;
- Emergency generator;
- Tailings pond, polishing pond, and associated infrastructure (TMF).

Figure 18.3 Nugget Pond Site Layout



18.2.1 ROADWAYS AND YARD AREAS

The site has an existing roadway in place, around all the Mill processing activities.

Substantial new roads will be required for the Tailings Management and water reclaim facilities. The site is fairly even, so the new road can be built by grubbing existing vegetation, and constructing the road of imported granular material similar to that used for continual road maintenance around the site.

The ponds downstream proposed for tailings storage and process water reclaim require about 2 km of new roads to access the sites. Roads will follow watercourse contours to minimize steep grades, or deep rock cuts. Roads will be constructed after clearing of recoverable timber in the forested areas. The terrain is rocky, but can likely be rough graded without the use of explosives, similar to the construction of other resource access roads throughout the province. Final grading will be accomplished with site material, mine waste shot rock or pit run sub grade material, and crushed stone for sub base. Roads will not be paved, and a good topping material is available, as produced for maintenance of existing roads by screening and crushing a high silt content pit run material.

18.2.2 DRAINAGE

Overall, site drainage will not be modified, except to the extent required of following the re-routed road location.

18.2.3 CRUSHER BUILDING

The existing crusher is enclosed with a pre-engineered steel building supported on a reinforced concrete foundation. The new building steel is equipped with a 5-tonne overhead crane to be used to help maintain the crusher's components and reduce downtime. In addition, the provision for a dust collection system has been included.

18.2.4 TAILINGS MANAGEMENT

The TMF is located at the Nugget Pond mill site and is made up of the Tailings Impoundment and the Polishing Pond. The TMF was constructed in 1996 by Richmont Mines Inc., the first owner and operator of the Nugget Pond site, and came into operation in 1997. The tailings deposited to date are potentially acid generating (PAG), and therefore must be deposited and retained under water cover.

CURRENT TMF INFRASTRUCTURE AND OPERATION

The TMF consists of the following infrastructure and operational activities developed to manage the tailings processed at the mill:

- **Tailings Discharge from Mill**: Overland to the Tailings Impoundment, the tailings discharge pipe is buried as it exits the mill and travels to the impoundment. Tailings are delivered into the impoundment by a floating slurry pipeline of fused polyethylene, held at the surface by a number of wooden rafts, constructed with plastic barrels to provide buoyancy. The discharge end of the pipe is maintained approximately one meter below the surface. The end of pipe is anchored in place, and is occasionally moved around for even distribution and water cover of the tailings throughout the impoundment. Maintaining the end of pipe below the surface ensures that the solids are not disturbed by wave action or other activity, during settling of the solids. Prior to discharge to the Tailings Impoundment, effluent treatment consists primarily of addition of lime for pH adjustment. Mill process water (reclaim) is extracted from the Tailings Impoundment.
- **Tailings Impoundment**: Tailings are deposited sub-aqueously in the Tailings Impoundment to provide water cover to inhibit oxidation of the PAG tailings. Effluent is discharged to the Polishing Pond via a decant structure located at Dam 1. Effluent release to the Polishing Pond has typically occurred as batch release or as required (by pond level) and each release from the Tailings Impoundment generally reduces the water level in the pond by approximately 0.2 m in depth. Over the past several years, the effluent release has generally been via constant discharge.
- **Polishing Pond**: Effluent discharged from the Tailings Impoundment enters and is held within the Polishing Pond prior to release to the downstream environment. Effluent is discharged from the Polishing Pond via a decant system at the dam. A small heated wooden structure constructed on the downstream outlet of the decant allows sampling of the discharge.
- **Dams**: The three containment dams that make up the TMF are zoned earthfill dams incorporating a low permeability glacial till core wrapped in a non-woven geotextile fabric, and are founded on bedrock. The upstream/downstream shells (slopes and driving surface) are constructed of a 600 mm layer of 125 mm minus free-draining crushed rock material. The dams are designed to be overtopped and thus do not have or require spillways. The dams are currently classified as low risk, in accordance with the Canadian Dam Association (CDA) Guidelines. Previous Dam Safety Review (DSRs) and Dam Safety Investigation (DSIs) have been conducted over the last 10 years.
- **Monitoring Wells**: Four monitoring wells have been installed at key locations around the TMF. These wells enable the collection and testing of groundwater levels and quality surrounding the TMF.

EFFLUENT MANAGEMENT AND MONITORING

All mine contact water, mill effluent, and tailings is discharged to the Tailings Impoundment. Tailings deposition is managed to maintain adequate water cover at all times. Effluent from the Tailings Impoundment is discharged to the Polishing Pond. Effluent released from the Polishing Pond is monitored and tested for discharge criteria and acute lethality as required under the operations Certificate of Approval and the MMER criteria for monitoring frequency and allowable concentrations as per Tables 18.1 and 18.2.

Table 18.1 Polishing Pond Water Discharge Criteria

Parameter	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentration in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
Total Suspended Solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
Radium	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

Table 18.2 Effluent Monitoring Program

Location	Parameters	Frequency
Polishing Pond (#2)	discharge criteria	Daily if Outflow/ (24-hour Composite Sample)
Polishing Pond (#2)	arsenic, lead, mercury, nickel, thiocyanate, cyanate, sulphate, and nitrate	Bi-monthly if Outflow/ (24-Hour Composite Sample)
Polishing Pond (#2)	ALT	Monthly if Outflow

TAILINGS STORAGE CAPACITY AND MANAGEMENT

When Rambler purchased the Nugget Pond Mill and TMF in 2009, it was determined that the existing TMF had sufficient capacity to store the tailings that would be produced from the Ming Mine production plan at that time. Based on continued exploration drilling, additional mine resources have been confirmed, requiring additional storage volume for tailings management. The new resources identified (LFZ) have not been fully assessed for ARD potential, however the updated mine plan requires that the LFZ be mixed with Ming Massive Sulphides (MMS), which are known to be PAG. Therefore, Rambler is conservatively assuming that all tailings are PAG and will continue to be deposited sub-aqueously.

A 2017 bathymetric survey of the existing Tailings Impoundment, process mass and water balance, and tailings gradations have been assessed and used to calculate the remaining capacity of the existing impoundment:

— The bathymetric survey, conducted in 2017, on an approximately 25 m by 25 m grid, indicated approximately 1.07 million m^3 of storage capacity remaining in the existing impoundment leaving only 0.5 m of water cover.

— In order to maintain a minimum of 1 m of water cover to inhibit tailings oxidation and sufficient 'free water volume' to provide sufficient retention for settling of tailings solids, the total available volume in the impoundment was adjusted to approximately 962,200 m^3.

— This storage capacity requirement was calculated using assumed, conservative values for the settled density of the tailings materials (1.4 to 1.5) compared to typical, published values for settled densities for similar mineral deposits (1.6 to 1.8).

Based on the current mine plan, the tailings storage requirements for the Project LOM based on a production rate of 1,250 mtpd over 21 years is approximately 6.3 Mm^3 assuming a conservative average settled density of 1.45. Based on bathymetric surveys of the existing TMF and adjacent ponds planned for use for tailings disposal, tailings storage will be managed over the LOM as shown in Table 18.3.

Table 18.3 LOM Tailings Storage Plan

Tailings Impoundment Area	Existing Water Elevation (m)	Dam Raise Required[1] (m)	Estimated Tailings Storage Capacity (Mm^3)	Cumulative Total Tailings (Mm^3)
Existing TMF	129	0	1.0	1.0
Camp pond	99	5	1.5	2.5
Existing TMF with raise	129	4	1.6	4.1
Horseshoe pond	80	5	1.1	5.2
Existing polishing pond with raise	119	4.5	1.2	6.4

Note: [1] Assumes 1 m minimum permanent water cover, and a 1.5 m dam freeboard at the permanent spillway elevation.

A general description of the development sequence and infrastructure requirements for LOM tailings management is as follows.

- 2017/2018 – Continued use of the existing Tailings Impoundment. Permitting and construction of the next phase of the TMF Expansion.
- 2019 through 2024 - Tailings deposition in Camp Pond, pumping tailings effluent back to the existing TMF for treatment prior to release. The following development will be required:
  - Upgrade the access road to Camp Pond.
  - Construct Camp Pond dam (possibly in two phases).
  - Construct tailings delivery line to deliver tailings from the Mill to the impoundment.
  - Construct a pump house, pump, and pipeline to decant tailings effluent from Camp Pond to the existing tailings impoundment.
  - The reclaim water system to the Mill will remain in the existing Tailings Impoundment.
- 2025 through 2029 – Tailings deposition in the existing Tailings Impoundment with continued use of the existing Polishing Pond for effluent treatment and release. The following development will be required:
  - Construction of the Tailings Impoundment dam raise and saddle dam to the east.
  - Move the reclaim water system from the existing Tailings Impoundment to the existing Polishing Pond.
- 2030 through 2033 – Tailings deposition in Horseshoe Pond, the Polishing Pond will move to The Steady. The following development will be required:
  - Extend the Camp Pond access road to Horseshoe Pond Dam and The Steady Dam.
  - Construct dams at both ponds.
  - Extend the tailings delivery line to Horseshoe Pond.
  - Extend the reclaim water pipeline, and move (or construct new if staging required to link with the pump at Camp Pond) pump and pump house to The Steady.
- 2034 through 2037/8 - Tailings deposition in the existing Polishing Pond, operating Polishing Pond to remain at The Steady:

– Tailings line to be relocated to existing Polishing Pond.
– Construction of the polishing pond embankment raised to crest.

Tailings deposition will continue within each of the impoundments as currently managed through floating tailings lines and placement of tailings throughout the impoundment to ensure all tailings are maintained a minimum of 1 m below the water surface. Tailings effluent will continue to be managed in accordance with the general principals of the existing operations, and will be held for sufficient duration to ensure that the discharge criteria are met.

In comparing the storage capacity of the existing impoundment and the storage requirements for the next 5 years, the available storage in the existing impoundment will be depleted by the end of 2019. Further, the additional storage requirements of approximately 530,000 m^3 will require 2 to 3 m of additional storage elevation based on similar storage efficiency. As such, RMM is currently planning for a 4 m raise on the existing dams to ensure sufficient capacity and water cover.

DAMS

The dams at the existing Tailings Impoundment and Polishing Pond were constructed using a glacial till core and rockfill shell. Based on the future dam construction requirements, and the lack of glacial till sources in proximity to the sites and the PAG nature of the mine waste rock, it is anticipated that the dams will be constructed using rockfill and granular fill produced from the existing quarry at the Nugget Pond Mill. In place of a till core, geosynthetic materials will be used. Based on the engineering work completed to date, the following preliminary design components have been determined:

— New dams will be constructed in the dry using cofferdam and/or water level drawdown construction techniques. For the dam raises, downstream raises will be the preferred approach.
— The dams will be gravity earthen dams to be constructed on the underlying bedrock, or in some cases thin layers of glacial till.
— Dam slopes are currently planned to be 2.5 horizontal to 1 vertical on the upstream face and 2 horizontal to 1 vertical on the downstream face with appropriately graded rockfill and armour stone to prevent erosion from precipitation and wave/ice action. Dams will be approximately 6 m wide at the crest.
— Each dam will include an appropriately sized emergency spillway, and decant system (where required).

All dam designs will be completed in accordance with CDA guidelines and industry standards.

18.2.5 MAIN ACCESS AND SITE ROADS

The Nugget Pond site is accessed via an existing road (Route 416 - Round Harbour Road) that leaves the La Scie highway (Route 414) and travels south towards Snook's Arm for approximately 5 km before heading west for another 5 km. The access roads have proper signage, including posted speed limits and caution signs.

The site has a road network in place for access to the existing buildings and services supporting the milling operation. The main access road (Route 416) enters the site from the northeast and extends throughout the operational areas. It is used for ore delivery to the ore laydown area and for concentrate removal from the concentrator building. Additional roadways and yard areas provide access around the concentrator building including provision for building services, concentrate load-out, and truck scale operations.

Site drainage is generally west to east, and is provided through surface grading that directs run-off efficiently away from road and yard areas. A 600 mm diameter concrete culvert, located south of the building area, receives roof drainage and directs it to the area drainage regime on the east side of the site.

Road and yard cross slopes are at 2% minimum in granular surfaces where possible. Swales along the east roadway direct drainage sufficiently past the existing sewage treatment plant and parking area.

18.2.6 PARKING AND LAYDOWN AREAS

Vehicle parking is available adjacent to the office building at the south end of the Nugget Pond site. Equipment laydowns are available at various locations on site.

18.2.7 SITE BUILDINGS AND INFRASTRUCTURE

A list of stationary equipment at the Nugget Pond mill site is provided in Table 18.4.

Table 18.4 Nugget Pond Stationary Equipment Inventory

Nugget Pond Stationary Equipment Inventory	
Ore Handling	**Flotation Tailings Dewatering / Filtration**
Vibrating Grizzly Feeder	Thickener
Primary Crusher	Thickener U/F Pump
Primary Crusher Discharge Conveyor	Filter Feed Storage Tank Agitator
Crushed Ore Stockpile Feed Conveyor	Filter Feed Pump
Plant Feed Conveyor	Filter
Secondary Crusher	Filtrate Pump
Crushed Ore Silo	Filter Cake Conveyor
Feed Delivery Conveyors	Dewatering Area Sump Pump
Vibrating Screen	
Grinding & Flotation	**Water and Air Services**
Cyclone Feed Pump 1	Process Water Pump 1
Cyclone Feed Pump 2	Process Water Pump 2
Cyclone Cluster	Fire Water Pump Module
Ball Mill	Fresh Water Pump
Grinding Area Sump Pump	Gland Seal Water Pump
Rougher Conditioner Agitator	Plant Air Compressor
Rougher Flotation Cell 1	Flotation Air Blower
Rougher Flotation Cell 2	
Rougher Flotation Cell 3	**Plant Services**
Rougher Flotation Cell 4	Plant Control System
Rougher Concentrate Pump 1	Process Plant HVAC
Rougher Concentrate Pump 2	
Rougher Tailings Pump 1	**Dense Media Separation**
Rougher Tailings Pump 2	DMS Feed Conveyor
Flocculant Dosing System	DMS Separator
Lime Dosing System	Sinks Screen 1
MIBC Dosing System	Sinks Screen 2
3418A Dosing System	DMS Concentrate Conveyor
Flotation Area Sump Pump	Floats Screen
	DMS Tailings Conveyor

(table continues on next page)

Nugget Pond Stationary Equipment Inventory	
Flotation Concentrate Dewatering/Filtration	
Thickener	**Correct Medium Pump**
Thickener U/F Pump	Densifier Feed Pump
Filter Feed Storage Tank Agitator	Densifier
Filter Feed Pump	Dilute Medium Pump
Filter	Magnetic Separator
Filtrate Pump	DMS Effluent Pump
Filter Cake Conveyor	DMS Spillage Pump
Dewatering Area Sump Pump	Correct Medium Pump

MILL (CRUSHER, ORE BIN, THICKENER, AND LEACH TANKS)

The crusher is located on the west side of the mill area. It is enclosed with a pre-engineered steel building supported on a reinforced concrete foundation. The building is equipped with a 5-tonne overhead crane to be used to help maintain the crusher's components and reduce downtime. A dust collection system (17000 CFM Dust-Off®) is on site and has been pad mounted, and all of the electrical has been completed. Rambler is waiting on the trunk work for the collection system inside the building. Once this has been installed and commissioned, the siding on the building will be completed.

Conveyors run from the crusher building to the ore bin for processing in the mill building. Housed within the mill building is the grinding circuit and the gold CIP (carbon-in-pulp) circuit. Support infrastructure including leach tanks, thickener tank, ore bin, and electrical substation are located adjacent to the mill. The building is a steel-framed structure with a concrete foundation occupying a footprint of approximately 835 m^2.

CONCENTRATOR BUILDING

The copper flotation circuit and associated equipment is housed in a stand-alone building (approximately 20 m x 44 m) adjacent to the existing mill building via piping, conduits and a manway. The building is a braced frame steel structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab-on-grade and equipment foundations. The second floor consists of steel beams and columns with metal floor grating and reinforced concrete slabs. Three sets of metal stairs, two of which are enclosed with masonry block to provide a fire separation, provide access from the ground floor. Masonry block walls enclose the MCC and the compressor/blower rooms.

The structure is enclosed with an interior liner sheet, rigid insulation, and exterior steel wall cladding. Metal overhead doors and man doors are located around the building perimeter.

The roofing system consists of metal deck, fiberboard, rigid insulation, and a three-ply membrane. Metal roof drains are located around the roof perimeter.

OFFICE BUILDING

The existing office building is a wood frame structure with crawl space occupying a footprint of approximately 380 m^2. A portion of the building is used as a gate house for the access road gate, site gate, and the truck scale. A security checkpoint and gate along the access road is operated remotely from the existing office building.

ASSAY LABORATORY

The assay laboratory, a wood frame structure, has a crawl space, occupies a footprint of approximately 122 m^2, and has sufficient space to accommodate the laboratory testing required by the proposed new Phase II processing operation.

SEWAGE TREATMENT PLANT

The existing sewage treatment plant has a footprint of approximately 27 m^2 and is constructed with a wood frame structure. It has an in-ground sewage treatment unit. It is located north of the parking area.

WAREHOUSE STORAGE

There are three existing cold storage warehouse buildings on site, occupying a combined footprint of approximately 600 m^2. Two buildings are wood frame structures with gravel floor and the last building is also a wood frame structure but with a concrete dyked foundation and is currently being used for chemical storage.

SECURITY AND GATE HOUSE

A manual swinging vehicle gate and fencing at the roadway near the office building is normally kept open, but is closed when needed. The main gate is located further out the access road. Space in the office is used as a security or gate house, particularly in response to monitoring and remotely operating the electric gate located at the security checkpoint along the access road to the ore processing site.

SCALE AND SCALE HOUSE

A portable, heavy duty, truck scale is located at the yard area east of the concentrator building. It is used for weighing the concentrate transfer trucks prior to their departure to the shipping site at the Goodyear's Cove port facility. The scales are operated from inside the office building.

RECLAIM AND FIRE PUMP HOUSE

The reclaim pump house is a portable metal building with a concrete foundation housing a reclaim water pump and fire pump, and is located at the Tailing Pond, adjacent to the mill building. The building occupies a footprint of approximately 7 m^2.

18.2.8 ORE STOCKPILE AREA

Run-of-mine (ROM) mill feed is stored in the ore stockpile area located between the mill building and the Tailing Pond. The stockpile is founded on a till pad that drains directly to the Tailings Pond. The pad can currently accommodate approximately 6,000 tonnes of ore and will be expanded to accommodate 10,000 tonnes as part of Phase II.

18.2.9 WATER USE / SUPPLY

POTABLE WATER

An existing artesian well system supplies potable water to the site. This well is routinely tested to ensure it meets or exceeds Canadian Drinking Water Guidelines. There have been no issues to date.

MILL RECLAIM WATER

Mill reclaim water is extracted from the Tailings Pond.

PROCESS WATER MAKE-UP

Process water make-up for the copper flotation concentrator is supplied by on onsite water well.

FIRE PROTECTION WATER

The mill building is protected by smoke detection and fire suppression systems. Multiple fire extinguishers are placed in strategic areas as are hose boxes and stand pipes on Floors 1 and 2. Around the site there are four fire hydrants and hose boxes complete with hoses, nozzles, and wrenches. A fire pump and jockey pump are located at the reclaim pump house which maintains pressure within the system. All emergency response equipment is inspected and kept up to date on a regular basis. The fire suppression requirements for the mill building extension were evaluated to ensure compliance with all applicable codes.

18.2.10 FUEL STORAGE

There is a nominal 4,000 litre, self-dyked fuel storage tank and dispensing facility located on site. The storage tank is equipped with secondary containment at a capacity of 110% of the tank storage volume and installed as per the GAP Regulations.

18.2.11 POWER SUPPLY

The power supply for the site is connected to the power grid. A main power feed is routed from the MCC to the supply power for the copper flotation system. The concentrator has an independent grounding grid.

The operation has a backup diesel power generator. The backup power requirements will be utilized from the existing emergency power generator.

18.2.12 WASTE MANAGEMENT

Further information on waste management is provided in the WMP, which will be updated for Phase II operations and will continue to be reviewed and updated on a regular basis throughout ongoing operations.

CHEMICALS

Chemical usage as part of the reagents necessary in the milling / flotation process is contained in proper storage during operation. All remaining chemicals will be properly removed from the site prior to closure.

FUEL AND OIL

A self-dyked fuel storage tank and dispensing facility equipped with an emergency spill kit is located on site. All storage tanks used on the Project are equipped with secondary containment at a capacity of 110% of the tank storage volume and installed as per the GAP Regulations.

Used oils and lubricants are contained in proper bins and disposed of by a licensed waste oil handler.

A grounding system is in place for the fuel storage tanks to meet the requirements of the National Building Code of Canada. An electrical service is situated in this area to provide power for lighting and fill pumps. Wiring is in accordance with the Canadian Electrical Code for fuel dispensing areas.

The fuel storage areas are permitted as required and all residual hydrocarbons will be removed or remediated as part of the closure activity.

EXPLOSIVES

No explosives are required at the Nugget Pond facility.

SANITARY / SEWAGE, DOMESTIC, HAZARDOUS, AND OTHER WASTES

Sewage Waste

This site is currently operating a Cromaglass sewage treatment system that returns treated sewage to the reactor and then discharges to the Polishing Pond.

Domestic Waste

All non-recyclable and non-reusable domestic and solid waste will be stored in appropriate containers then trucked to Snook's Arm municipal garbage disposal land fill site for disposal. Where possible, waste materials that can be recycled or re-used will be stored and/or trucked off site to a licensed recycling facility. Proper on-site storage and transportation will be provided. Any non-hazardous process waste will be similarly handled.

Hazardous Waste

Any hazardous waste generated on-site will be stored in accordance with the appropriate regulations and moved off site by a licensed contractor to an approved facility. Currently there are no approved hazardous waste facilities in Newfoundland; therefore any such waste will have to be moved outside the Province. The Transportation of Dangerous Goods Regulations will apply the movement of such waste.

Other Waste

Other waste materials including non-hazardous industrial waste (tires, containers, pallets, etc.) and technology-related wastes (batteries, computers, etc.) will be identified and a WMP will be implemented to ensure these materials are re-used or recycled where possible and practical.

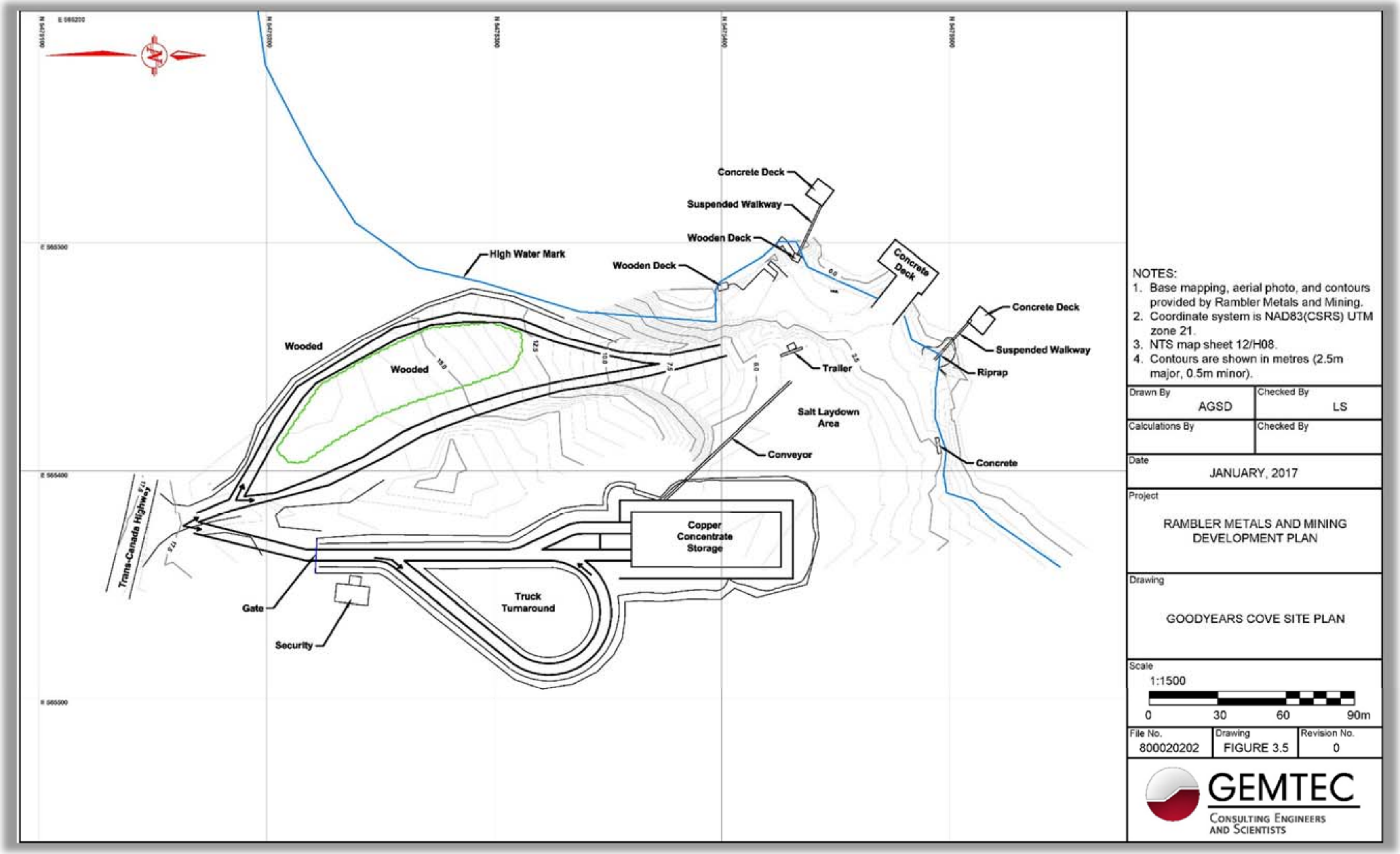
18.3 GOODYEAR'S COVE PORT SITE

The port site is owned by the town of South Brook, with the adjoining land owned by Mrs. Joan Brown (Figure 18.4). The port is used primarily as a shipping port, and provides deep water loading in a semi-sheltered harbor. It has a well maintained docking facility that is available to the public. The site has an existing basic gravel road and laydown network in place for access to the existing buildings and services supporting the shipping operation.

Infrastructure at the Goodyear's Cove Port includes the following:

- Concentrate storage facility capable of handling approximately 10,000 wmt;
- Mobile conveyor loading system capable of loading up to 800 mtph;
- A nominal 1,200 litre, above-ground, double walled steel fuel storage tank;
- Dock with concrete top and bollards;
- Two smaller docks with bollards and suspended walkways;
- Two shore bollards;
- Small slipway;
- Electrical shed; and
- Semi-existent concrete pad (partially buried, part of previous operations).

Figure 18.4 Goodyear's Cove Port Site Layout



18.3.1 MAIN ACCESS AND SITE ROADS

Primary access to the Goodyear's Cove site, which is located at the head of Halls Bay approximately 1.4 km west of the community of South Brook in the Green Bay District, is by the Trans-Canada highway (Route 1). A gravel access road runs north for approximately 500 m to the site.

The site has an existing basic gravel road and laydown network in place for access to the existing buildings and services supporting the shipping operation.

18.3.2 SITE INFRASTRUCTURE

Infrastructure at the Goodyear's Cove Port includes the following:

- Concentrate storage facility capable of handling approximately 10,000 wmt;
- Mobile conveyor loading system capable of loading up to 800 mtph;
- A nominal 1,200 litre, above-ground, double walled steel fuel storage tank;
- Dock with concrete top and bollards;
- Two smaller docks with bollards and suspended walkways;
- Two shore bollards;
- Small slipway;
- Electrical shed; and
- Semi-existent concrete pad (partially buried, part of previous operations).

The concentrate storage building at Goodyear's Cove is approximately 25 m wide by 50 m long and consists of a clear span pre-engineered MegaDome structure supported on reinforced concrete foundations. The interior floor is reinforced asphalt-on-grade. Reinforced concrete perimeter push walls extend 2.4 m above the finished floor slab elevation. Architectural features include canvas dome roof, steel main doors and overhead doors, aluminum wall louvers, and roof exhaust fans.

A second floor on the east end of the building, for unloading of concentrate, consists of a heavy duty steel grating floor supported on steel beams and reinforced concrete walls. Steel stairs provide access from the ground floor. Metal handrails are attached to the stairs and also on the north and west sides of the second floor.

19 MARKET STUDIES AND CONTRACTS

19.1 MARKET STUDIES

No market studies have been performed as part of this project. The Nugget Pond mill will produce a copper concentrate containing approximately 28.5% copper.

19.1.1 METAL PRICING ASSUMPTIONS

Metal pricing assumptions for economic analysis varied by year and are tabulated in Table 19.1. Price assumptions were set by senior executives at Rambler and based on market research conducted by a number of financial institutions including their Nominated Advisor, Cantor Fitzgerald.

Table 19.1 Metal Pricing Assumptions

Metal	Unit	FY2018	FY2019	FY2020	FY2021	FY2022	Long-Term
Copper	US$/lb	3.06	2.99	2.99	2.99	2.99	2.99
Gold	US$/oz	1305	1300	1300	1300	1300	1300
Silver	US$/oz	17.65	17.00	17.00	17.00	17.00	17.00

19.1.2 METAL PRICING HISTORICAL TRENDS

Copper prices are affected by global trends in supply and demand, and determined by trading on the major metals exchanges, including the New York Mercantile Exchange (COMEX) and the London Metals Exchange (LME). Table 19.2 summarizes the current metal pricing trends.

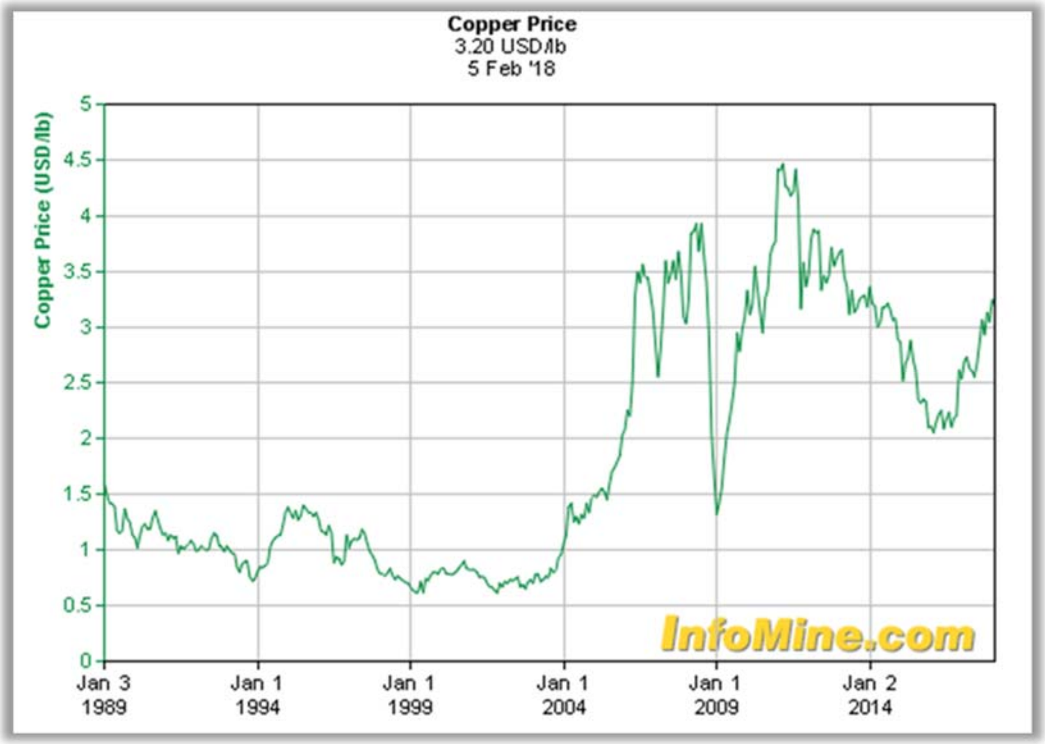
Table 19.2 Metal Pricing Historical Trends (as of Feb. 6, 2018)

Metal	Unit	Spot Price Feb 6, 2018	52-Week Low	52-Week High
Copper	US$/lb	3.20	2.48	3.27
Gold	US$/oz	1,330	1,200	1,362
Silver	US$/oz	16.66	15.37	18.49

***Source**: Infomine.com*

Figures 19.1 to 19.3 show the trend in copper, gold, and silver prices respectively since 1989.

Figure 19.1 Copper Price Chart

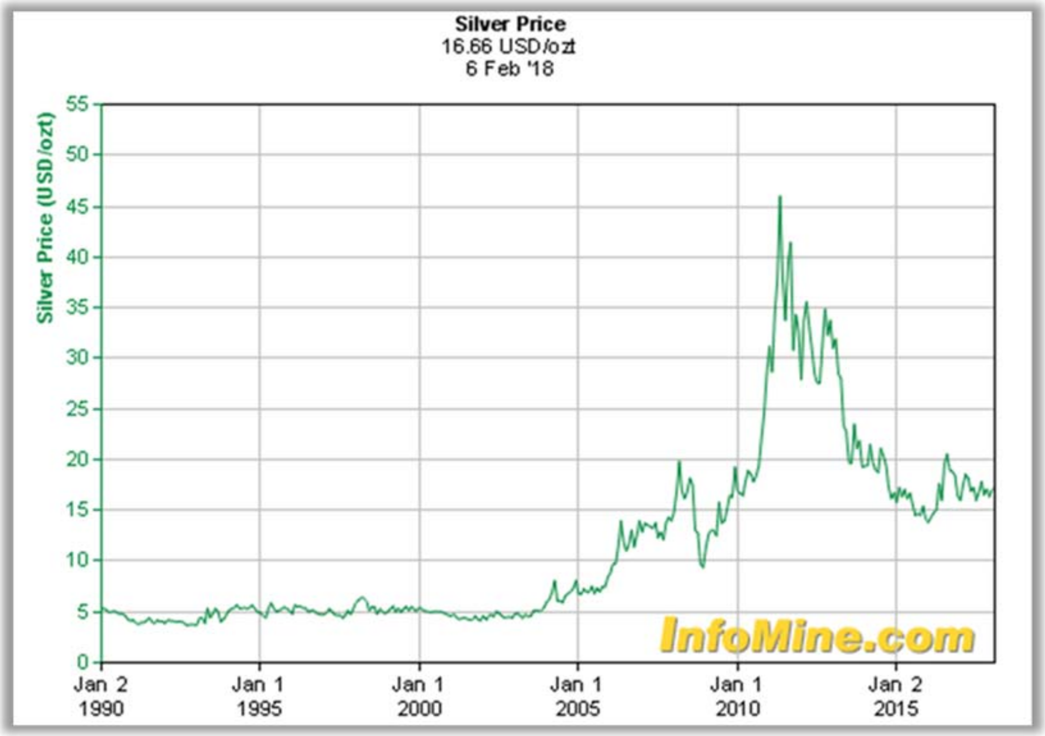


Source: *Infomine.com*

Figure 19.2 Gold Price Chart

Source: *Infomine.com*

Figure 19.3 Silver Price Chart



***Source**: Infomine.com*

19.2 CONTRACTS

As part of Rambler's ongoing socio-economic commitment to the region and other local stakeholders, Rambler's preference is to award contracts to local businesses as well as other businesses on the island of Newfoundland. Rambler will continue to focus on opportunities for the residents and businesses of the region to participate in the Project, thereby establishing a role as an active member of the community and participant in the sustainable development of the region.

The following is a list of notable service contracts that Rambler has entered into:

- White Wulf Drilling for diamond drilling services.
- Guy J Bailey Ltd for ore and concentrate loading and transportation, general surface construction contracting.
- CSJ Contracting for underground mine services.
- Springdale Forest Resources Inc. for production drilling.

19.2.1 SMELTING, REFINING, TRANSPORTATION

For the cost analysis, the following assumptions have been made with respect to Smelting, Refining and Concentrate Transportation.

- Accountable Metal:
  - copper: 96.5% of content;

  – gold: 97% of content, min. 1 g/t deduction;
  – silver: 90% of content, min. 30 g/t deduction.

- Average Life-of-Mine Treatment and Refining Charges (TC/RC) of US$67.73/t- Cu concentrate and US$0.085/lb-Cu, respectively.
- Average Life-of-Mine Refining costs for gold and silver are US$5.00/oz-Au and US$0.50/oz-Ag, respectively.
- Average Life-of-Mine Transportation costs of US$60/t Cu Concentrate (dry).

Also included in the smelter terms are the following penalty assumptions:

- Lead & Zinc - 3.00 US$ for each 1% above 4.0% ;
- Mercury - 1.50 US$ for each 10 ppm above 30 ppm ;
- Fluorine - 1.50 US$ for each 100 ppm above 350 ppm ;
- Cadmium - 1.00 US$ for each 100 ppm above 100 ppm ;
- Arsenic - 1.50 US$ for each 0.10% above 0.20%;
- Bismuth - 1.50 US$ for each 100 ppm above 100 ppm;
- Antimony - 1.50 US$ for each 100 ppm above 500 ppm;
- Alumina & Magnesium Oxide - 4.50 US$ for each 1% above 6%;
- Silica - 1.00 US$ for each 1% above 10.

The actual content of the copper concentrate is not expected to reach these thresholds and as such no penalties are anticipated.

19.2.2 EQUIPMENT LEASING CONTRACTS

Rambler currently has lease arrangements with Epiroc, CAT, MacLean Engineering, and other manufacturers.

20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 ENVIRONMENTAL BACKGROUND

The current Ming Copper-Gold Mine Project includes the Ming Mine Site, the Nugget Pond Mill Site, and the Goodyear's Cove Port Site as previously described. RMM has owned and/or operated these sites for approximately seven years; this has required numerous permits, approvals, and authorizations. The two key authorizations associated with the Project include:

- NL Environmental Protection Act Certificate of Approval (C of A) No. AA13-035580, issued March 13, 2013. NLDMAE has been consulted with respect to the planned changes to the project and how they will impact the C of A, and a subsequent application was submitted in November 2017 to update/renew the C of A in early 2018.
- NL Mining Act Mill Licence which is currently being renewed in association with NLDNR's required five year update of the Project Development and Rehabilitation and Closure Plans.

RMM has, and continues to operate these sites in accordance with the required Federal and Provincial Acts, Regulations, and Guidelines, and maintains an Environmental Management System which includes a number of environmental protection and response plans (e.g., Waste Management, Contingency, MMER Emergency Response, and others), environmental monitoring programs, and other environmental protection measures.

Based on the increase in mineral resources, and as part of RMM's ongoing operational reviews and planning studies, it has been determined that a number of operational and infrastructure changes are required over the LOM. The key Project change that will require further environmental assessment and permitting is the need for further tailings storage capacity to accommodate LOM tailings production based on the updated resource estimate. Other, less significant changes to buildings, infrastructure, and operational protocols may require some environmental assessment or permitting, however these requirements are expected to be relatively minor.

20.2 REGULATORY AND PERMITTING FRAMEWORK

20.2.1 PROVINCIAL ENVIRONMENTAL ASSESSMENT PROCESS

Mining projects and changes to existing mining projects in NL may be subject to environmental assessment under the NL Environmental Protection Act (EPA) and the Environmental Assessment Regulations. Further EA review may be required when current operating mines propose to increase production significantly beyond their original operating approval limit or when new components, such as a new Tailings Impoundment, are added to the mining footprint.

The Environmental Assessment (EA) process is initiated with the formal registration of the Project, submitted in a prescribed format, to Newfoundland and Labrador Department of Municipal Affairs and Environment (NLDMAE). The registration is then made available to the public and government agencies for review for a maximum period of 35 days. Based on these reviews, the Environmental Assessment Division will recommend to the Minister a particular course of action. Within 45 days of registration of the Project with the EA Division, the Minister may choose one of the following options:

- Release the Project from EA, with or without conditions;
- Require additional work in the form of an Environmental Preview Report or an Environmental Impact Statement; or
- Recommend that the Project be rejected (a Cabinet decision).

Environmental Preview Report: An Environmental Preview Report (EPR) is ordered by the Minister when additional information is required to determine the potential for a project to result in significant adverse environmental effects. The project proponent is responsible for preparing a project-specific EPR, in response to government-issued guidelines. The EPR is then made available for public, Indigenous, and government review. At the completion of the review period, the Minister decides if the EPR is sufficient. If it is not sufficient, the proponent is required to revise and/or amend it. Upon a determination of sufficiency, the Minister will either release the project, conditionally release the project, or call for an Environmental Impact Statement (EIS).

Environmental Impact Statement: An EIS is required in cases where potential exists for a project to cause significant adverse environmental effects. The project proponent is responsible for preparing a project-specific EIS and conducting the associated component or baseline studies in response to the government-issued guidelines. Field work is typically required for the completion of an EIS. The component studies and EIS are then made available for public, Indigenous, and government review. At the completion of the review period, the Minister decides if the component studies and/or EIS are sufficient. If they are not sufficient, the proponent is required to revise and/or amend the document. Upon a determination of sufficiency, Cabinet will either release the project, conditionally release the project, or not release the project. Once the project is released from the EA process and prior to project construction, the proponent can proceed with obtaining the necessary permits and authorizations. A release from the provincial EA process is then valid for three years.

NLDMAE is currently reviewing its Acts, Regulations, and Guidelines pertaining to EA and other environmental legislation and changes are expected in the next 12 to 18 months. A review of the potential impacts to developing and expanding projects should be completed following the update.

20.2.2 FEDERAL ENVIRONMENTAL ASSESSMENT PROCESS

Federally, the Canadian Environmental Assessment Act (CEAA 2012) is triggered if a proposed activity appears on the Schedule of Physical Activities under the Regulations Designating Physical Activities. The Act also has a provision whereby the Minister can exercise discretion in choosing to subject a particular activity to federal EA review even if it doesn't appear in the Schedule of Physical Activities.

It should be noted that CEAA 2012 and aspects of the Fisheries Act are currently undergoing a legislative review and changes are anticipated to be announced by early 2018. Any changes made may affect future regulatory requirements.

In general, when a proponent considers undertaking a project that may require a federal review, i.e., it is listed on the Schedule of Physical Activities under the Regulations Designating Physical Activities, it is recommended that they engage formally with the Canadian Environmental Assessment Agency (the Agency). The proponent will need to provide the Agency with project information sufficient for a determination relative to the need for a federal EA review.

The Agency may require that the proponent provide a Project Description in accordance with the Prescribed Information for the Description of a Designated Project Regulations (SOR/2012-148). When the Project description is provided to the Agency, there are legislated timelines that will be followed. Specifically, the Agency will take 10 days to review a Project Description to determine if it is complete, they will then take 45 days to conduct a screening of the Project Description to determine whether a formal EA review is required and, if an EA is required, they will take 365 days from the start of the EA to determine whether a project is likely to cause significant adverse environmental effects. If a federal EA is required, it is anticipated that the overall process could take two to three years (including proponent and government time).

ECCC has also developed an Environmental Code of Practice for Metal Mines that describes operational activities and associated environmental concerns of this industrial sector. The document applies to the complete life cycle of mining, from exploration to mine closure, and environmental management practices are recommended to mitigate the identified environmental concerns. The recommended practices in the Code include the development and implementation of environmental management tools, the management of wastewater and mining wastes, and the prevention and control of environmental releases to air, water and land.

20.2.3 PROVINCIAL PERMITS, APPROVALS, AND AUTHORIZATIONS

Following release from the NL EA process for any phase of the project expansion, the Project will require new or updated permits, approvals and authorizations from NL, and potentially from nearby municipalities (e.g., Baie Verte or others), to reflect any changes in the mine operation. Table 20.1 summarizes the permits, approvals and authorizations that may be required or need to be updated for expansion activities.

Note that recent changes to permitting fees, and expected near-term changes in existing environmental legislation may increase the costs associated with obtaining permits for development and expansion activities and operating costs. Two specific examples include new fees (as of 2016) for water use/consumption under newly issued or updated Water Use Licenses (pay by volume), and the ‘carbon tax’ that will be implemented in 2018.

Table 20.1 List of Potential NL Permits, Approvals, and Authorizations

Permits, Approvals and Authorizations	Issuing Agency
Release from EA	DMAE –Environmental Assessment Division
Permit to Occupy Crown Land	DFLR – Crown Lands Division
Permit to construct a Non-domestic well **Water Resources Real-Time Monitoring** **Permit to alter a Body of Water** **Culvert Installation** **Fording** **Stream modification or Diversion** **Other works within 15 meters of a body of water**	DMAE- Water Resources Management Division
Certificate of Approval for Construction and Operation **Certificate of Approval for Generators** **Industrial Processing Works** **Approval of Waste Management Plan** **Approval of Environmental Contingency plan (Emergency Spill Response)** **Approval of Environmental Protection Plan**	DMAE- Pollution Prevention Division
Permit to Control Nuisance Animals	DFLR –Wildlife Division
Pesticide Operators License	DMAE – Pesticide Control Section
Blasters Safety Certificate **Magazine License** **Approval for Storage and Handling Gasoline** **Temporary Fuel Cache** **Fuel Tank Registration** **Approval for Used Oil Storage Rank System (Oil/water separator)** **Fire, Life and Safety Program** **Certificate of Approval for a Waste Management System**	Government Services Centre (GSC)
Approval of Development Plan, Closure plan and Financial Security **Mining Lease** **Surface Rights Lease** **Quarry Development Permit**	DNR
Permit to cut Crown Timber **Permit to burn**	DFLR –Forest Resources
Storing, Handling, and transportation of dangerous goods	Department of Transportation and Works

20.2.4 FEDERAL PERMITS, APPROVALS, AND AUTHORIZATIONS

The MMER are promulgated under the federal Fisheries Act, pursuant to subsections 34(2), 36(5) and 38(9) and are administered by ECCC. The MMER Regulations apply in respect of mines and recognized closed mines that:

(a) at any time after June 6, 2002, exceed an effluent flow rate of 50 m^3 per day, based on effluent deposited from all the final discharge points of the mine; and

(b) deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act.

For discharge of effluent to the environment, the MMER require that:

- Concentrations of deleterious substances in the effluent do not exceed the limits prescribed by MMER;
- The pH of the effluent is between 6.0 and 9.5; and
- The effluent is not acutely lethal to fish.

The MMER also defines specific conditions for depositing a deleterious substance in a Tailings Impoundment Area, including the requirement for the Owner to conduct Environmental Effects Monitoring (EEM) studies. Details of the MMER can be found on the ECCC website at http://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-222/FullText.html.

When a proponent wishes to use a natural fish bearing waterbody for tailings deposition, a federal authorization under the MMER is required (Schedule 2). In addition, s.27.1 of the MMER requires the Project proponent to develop and implement a fish habitat compensation plan to offset the loss of fish habitat that would occur as a result of the proposed addition of a water body to Schedule 2. The proponent must consult with officials from the Department of Fisheries and Oceans (DFO) and submit the proposed plan during the EA review for consideration as part of the EA. The plan must describe, among other things:

- Fish habitat that would be lost as a result of the proposed Tailings Impoundment;
- Compensation measures that would be implemented, if approval is given to use the water body as a Tailings Impoundment, to offset the loss of fish habitat that would result;
- Plans to monitor the implementation of the compensation plan; and
- A breakdown of estimated costs for implementation and monitoring of the plan.

ECCC also administers the National Pollutant Release Inventory (NPRI) and manages the Canadian Environmental Quality Guidelines, including the Canadian Water Quality Guidelines for the Protection of Aquatic Life, which can be applied to the release of industrial effluent to aquatic environments under certain circumstances.

20.3 ENVIRONMENTAL ASSESSMENT AND PERMITTING REQUIREMENTS

Based on the study and planning work conducted to date, RMM intends to advance the TMF expansion using a phased approach to ensure the smooth transition of operations throughout the expansion, and to permit sufficient timelines for the required EA and permitting requirements. Further, RMM will continue to study tailings storage requirements with respect to the need for tailings in paste backfill in the mine, and other factors that may increase or decrease the storage capacity requirements over the LOM. The phased approach to tailings expansion is described in Section 18.2.5 and, in terms of EA and permitting, the requirements will likely be carried out in two phases:

- Expansion to include Camp Pond as a new Tailings Impoundment with the effluent being treated within the existing TMF. Camp Pond has been shown to have no fish presence and therefore it is anticipated that the EA and permitting requirements are relatively straightforward. The process to obtain the necessary EA Release, approvals, and permits commenced in mid-2017 and is ongoing.
- Expansion to include Horseshoe Pond and The Steady as a new Tailings Impoundment and Polishing Pond, respectively. The regulatory timeline for this Phase will be substantially longer as these two waterbodies are known to be productive fish habitat.

Other relatively minor changes to RMM's Project have been presented to the NLDMAE Divisions and Newfoundland and Labrador Department of Natural Resources (NLDNR), and approvals for these changes have either been obtained, or are in progress, and are expected in early 2018. These changes include:

- An increase in permitted production from 850 mtpd to 1,250 mtpd.
- An expansion to the existing ore pad at the Nugget Pond Mill to allow for additional storage and space to blend ores from the mine.
- A small dam raise (estimated to be 4 m) at the existing Tailings Impoundment Dam.
- Upgrades to the mine ventilation infrastructure to improve air flow for underground mine expansion.
- The future installation (2019) of a paste backfill plant at the Boundary Shaft.

The anticipated EA and permitting requirements related to the TMF expansion are described below.

20.3.1 BASELINE STUDIES REQUIRED

All proposed TMF expansions relative to Ming Mine tailings storage will require regulatory approvals. A project Registration document for the proposed new Tailings Impoundment at Camp Pond was submitted to the NLDMAE in mid-December 2017.

As part of the Project Registration document for the proposed Camp Pond TMF expansion, RMM completed baseline investigations relative to a number of Valued Ecosystem Components (VECs) that may be affected by the proposed work. Baseline studies for VECs are routinely carried out to characterize the existing environment prior to the start of Project related activities. If TMF expansion plans proceed for The Steady and Horseshoe Pond, baseline studies for Project specific VECs will be required and will be similar to the list below.

- Regional climate analysis;
- Bathymetric assessment of any waterbody proposed as tailings impoundments (completed);

- Water quality assessments (partially completed);
- Aquatic assessments (fish presence/species, habitat and benthic assessments) (partially completed);
- Flora and fauna, including species at risk (partially completed);
- Terrestrial habitat surveys (completed);
- Avian surveys (completed);
- Archaeological review;
- Geological context.

With the Camp Pond TMF expansion, no significant changes will be required to RMM's current and approved mining and milling infrastructure. Future TMF expansions are proposed based on current production levels as well and are unlikely to be linked to any significant increase or a modification to RMM's current and approved mining and milling infrastructure. Some level of environmental monitoring will be required during construction and also once proposed TMFs are operating to ensure any changes to environmental baseline are captured. Detailed baseline information for The Steady and Horseshoe Pond will also be important when requesting approval under the MMER to convert fish bearing waterbodies into tailings storage impoundments.

20.3.2 ENVIRONMENTAL ASSESSMENT AND PERMITS

Based on the current TMF expansion plans, it is expected that EA will be required for several components of the work. The currently planned TMF expansion into Camp Pond is subject to the NL EA process, however it is not expected to be subject to the federal EA process. Relative to the federal EA review process, RMM reviewed the Schedule of Physical Activities under the Regulations Designating Physical Activities (CEAA 2012) and determined that there were no formal federal triggers for the proposed Camp Pond TMF expansion project. A Registration into the NL EA process was submitted to NLDMAE on December 14, 2017, and correspondence was also submitted to CEAA to update them on the Project. The provincial EA process is expected to be concluded in 2018. This phase of the TMF expansion will address tailings storage from approximately 2019 through 2025.

For TMF operations anticipated for 2025 through 2029, after the proposed Camp Pond Tailings Impoundment has reached capacity, RMM proposes construction of a Tailings Impoundment dam raise in the existing Tailings Impoundment as well as a saddle dam to the east. As previously noted, RMM has consulted with NLDMAE and NLDNR regarding these changes and no EA or special permits will be required. Standard approvals related to this work have been received or are expected to be received in late 2017 or early 2018, as they were applied for in conjunction with other minor expansion plans to be completed in 2017 through 2019.

The proposed TMF expansion plan beyond 2025, to include the use of Horseshoe Pond and The Steady, is expected to be reviewed under the NL and federal EA processes based on RMM's intention to propose the use of these natural water bodies frequented by fish for tailings disposal. Using a natural waterbody frequented by fish for mine waste disposal also requires a regulatory amendment (Schedule 2) to the MMER. The MMER were developed under subsections 34(2), 36(5), and 38(9) of the Fisheries Act and are meant to regulate the deposit of mine effluent, waste rock, tailings, low-grade ore and overburden into natural waters frequented by fish.

In addition to the federal EA, RMM will also be required to:

- Prepare an assessment of alternatives for mine waste disposal for consideration;

- Prepare a fish habitat compensation plan for consideration as part of the EA;
- Participate in public and Indigenous consultations on the EA, including on possible amendments to the MMER.

Other permits and approvals that will need to be addressed as RMM's expansion plans, and/or other projects, are expected to include, but may not be limited to, the following:

- The list of permits provided in Table 20.1, above.
- Development and Rehabilitation and Closure Plan updates at the required five year interval, or at any point a significant change in the Project is proposed if it doesn't coincide with the five year schedule.
- Updates to the TMF management and safety plans required by NLDMAE Water Resources Division and NLDNR in accordance with the Canadian Dam Association Dam Safety Guidelines and other pertinent regulations and guidelines.
- Updates to the monitoring locations and ongoing requirements for surface and groundwater quality within and surrounding the TMF.

20.4 SOCIAL AND COMMUNITY REQUIREMENTS

20.4.1 ECONOMIC IMPACT

The Ming Mine is located in the heart of the Baie Verte Peninsula and currently employs approximately 195 full-time employees. Mining operations provide significant benefits to the local economy through direct and indirect employment and RMM anticipates adding approximately 27 full-time positions during construction and operations associated with the TMF expansions and by maintaining milling production at current levels. The requirements for goods and services will change over time for construction, operations, and post-closure, depending on the phase of the Project, and the potential economic benefits of expansion activities will be outlined in greater detail in the provincial EA project registration document.

PURCHASING POLICIES

RMM currently purchases goods and services on a local, regional and provincial level to the extent that it is economically viable, and this practice will continue for all planned expansion activities. RMM's purchasing policy has been developed with a view to increasing local capacity and ensuring RMM continues to be a good corporate citizen. This approach also demonstrates RMM's efforts to maximize economic benefits for the province. RMM has also developed and implemented a regular supplier form and electronic notification for the purchasing of goods and services, and the local supplier database will continue to be used to match the suppliers with Project needs for all expansion activities.

20.4.2 PUBLIC CONSULTATION

Rambler has conducted public consultation in Baie Verte, Ming's Bight, and South Brook throughout the development and operations phases of the Ming Mine and these meetings have generally focused on the physical, environmental, and socio-economic aspects of the Project. The proposed Camp Pond TMF expansion, and all future expansion activities, will be presented as part of this communication process with such groups as:

- Municipal Councils;
- Community and Stakeholder Groups;
- Chamber of Commerce and other business associations;
- Environmental groups.

Public presentation of the proposed TMF expansion is important for RMM in order to obtain social acceptability, and also satisfies the regulatory requirements and expectations under the NL EA process. Rambler will convene a public meeting during the preparation of the EA to provide an opportunity for stakeholders to learn about the proposed expansion activities and to request any additional information. Other means of communication such as brochures, pamphlets, web page, and open houses will also be considered by RMM during the NL EA process.

20.5 REHABILITATION AND CLOSURE PLAN

20.5.1 REGULATORY REQUIREMENTS

The Rehabilitation and Closure Plan is a provincial requirement of the Newfoundland and Labrador Mining Act, Chapter M-15.1, sections (8), (9) and (10). Under the Mining Act, the 'Rehabilitation and Closure Plan' is defined as a plan which describes the process of rehabilitation of a project at any stage of the project up to and including closure. Rehabilitation is defined as measures taken to restore the property as close as is reasonably possible to its former use or condition or to an alternate use or condition that is considered appropriate and acceptable by the NLDNR.

There are three stages of rehabilitation activity that occur over the life of a mine:

1 Progressive rehabilitation;
2 Closure rehabilitation;
3 Post closure monitoring and treatment.

Progressive rehabilitation includes rehabilitation activities completed, where possible or practical, throughout the mine operation stage, prior to closure. This would include activities that would contribute to the rehabilitation effort that would otherwise be revised upon cessation of mining operations (closure rehabilitation). In some cases a crossover between 'progressive rehabilitation' activities and operational activities may exist.

Closure rehabilitation would include the measures remaining after progressive rehabilitation activities required to fully restore or reclaim the property as close as reasonably possible to its former condition or to an approved alternate condition. This would include demolition and removal of site infrastructure, revegetation, and all other activities required to achieve the requirements and goals detailed in the Rehabilitation and Closure Plan.

Upon completion of the closure rehabilitation activities, a period of 'post-closure monitoring' is then required to ensure that the rehabilitation activities have been successful in achieving the prescribed goals. At this stage of rehabilitation, some treatment requirements may continue until conditions are restored and these conditions would then persist without additional treatment. Once it can be demonstrated that practical rehabilitation of the site has been successful, the site should be closed-out or released by the NLDNR, and the land relinquished to the owner or the Crown.

The Rehabilitation and Closure Plan is directly linked to mine development and operation over the life of a mine and therefore must be considered a 'live' document. It is common practice in the industry to review and revise the Rehabilitation and Closure Plan throughout the development and operational stages of the Project. The process of reviewing and updating the Plan is required by NLDNR on a five-year cycle after the start of operations; however additional reviews may be required where substantial changes to the Project are proposed.

The final review of the Rehabilitation and Closure Plan generally occurs once the mine closure schedule is known (typically 12 months or more before end of mining). This final review forms a 'Closure Plan' which defines in detail the actions necessary to achieve the Rehabilitation and Closure objectives and requirements. This Plan uses the actual site conditions and knowledge of the operation of the site and can therefore provide specific reference to activities and goals.

20.5.2 OBJECTIVES AND APPROACH

The overall objectives of the Rehabilitation and Closure Plan proposed for the Project include:

- Restoration of the health and fertility of the land to a self-sustaining, natural state;
- Provision of an agreeable habitat for wildlife (including fish) in a balanced and maintenance free ecosystem;
- Creation of a landscape which is visually acceptable and compatible with surrounding terrain;
- Mitigation and control to within acceptable levels, the potential sources of pollution, fire risk, and public liability; and
- Provision of a safe environment for long-term public access.

The Rehabilitation and Closure Plan (the Plan) addresses the physical stability aspect of the site components which remain after operations have ceased. In the case of the Ming Copper-Gold Mine project, these components will include the TMF; underground workings, mine openings; the waste rock stockpile and ore pads; and construction features associated with buildings and site infrastructure. The Plan considers the deterioration of rehabilitated site components over the long term, by perpetual forces such as precipitation, wind, chemical weathering, and seismic events.

To meet rehabilitation and closure objectives, it is necessary to ensure long-term chemical stability of the rehabilitated mine site. The Plan design must contain appropriate methods to ensure that onsite water, drainage, and surface run-off from the site meet acceptable water quality standards.

In the case of the Ming Copper-Gold Mine project, acid rock drainage (ARD) is not expected to be a significant issue post-closure as all waste rock will ultimately be disposed of within the underground workings, leaving the long-term fate of chemicals and reagents used in mining and mineral processing as the principal concern to be addressed. In the event of a premature closure resulting in waste rock remaining at surface, costing to provide a permanent cover over these materials has been included in the closure estimate. Other significant chemical stability issues relate to erosion and surface water sedimentation that may degrade water quality.

Project development did not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities. These historical effects have been considered as part of the baseline environment, and the assessment and evaluation of the cumulative environmental effects of the Project in combination with other projects and activities considers the nature and degree of change from these existing environmental conditions. The cumulative environmental effects of the Project in combination with other projects and activities in the area will be not significant.

Visual impact of a mine site is an important consideration. As part of the Plan, the primary objective is to return the site to pre-mining conditions. Rambler will work towards returning the area to as close to pre-mining conditions as practical with due consideration to the natural aesthetics that existed pre-mining.

20.5.3 CURRENT STATUS OF PROGRESSIVE REHABILITATION AND CLOSURE

Rambler has carried out various progressive rehabilitation activities throughout the mine life, including:

- Rehabilitation of existing mine site conditions due to historical mining operations (i.e. controlling effects of PAG material placed on site by spreading non-PAG material).
- Backfilling of the Ming West open pit site.
- Development and implementation of a Waste Management Plan.
- Boundary Shaft Head Frame Removal.
- East Pit Vent Raise.
- Reclamation of exploration trails.
- Removal of ore bin at Boundary Shaft area.
- Removal of polychlorinated biphenyls (PCB) transformers that were in place before Rambler took over.

Rambler is committed to minimizing the environmental impact and footprint of its operations.

20.5.4 REHABILITATION AND CLOSURE APPROACH

All aspects of mine development including design, infrastructure location and design, and mining and operations planning will be carried out with full consideration of progressive and final closure opportunities and requirements throughout the course of and at the end of the life of the mine. Baseline environmental studies conducted prior to site construction works will continue, or be refined as required, through the mine development and construction stage. The Project has been planned and designed to minimize the disturbed are of the site, to incorporate areas disturbed by previous mining activities where possible, and to minimize the environmental impact prior to mine operations.

As operations progress, Rambler will undertake progressive rehabilitation measures wherever possible or practical. Progressive rehabilitation is defined as rehabilitation completed, where possible or practical, throughout the mine operation stage, prior to closure. This includes activities that contribute to the rehabilitation effort that would otherwise be carried out at mine closure. Progressive rehabilitation opportunities identified for this Project within the Rambler development footprint include:

- Rehabilitation of any exhausted areas.
- Rehabilitation of the waste rock stockpile area by relocating material underground as backfill when possible.
- Rehabilitation, if required, of exploration drilling sites.
- Vegetation studies / revegetation trials.

A comprehensive environmental monitoring program will be conducted as part of the mining operations and this data will be utilized to evaluate the progressive rehabilitation program on an ongoing basis. Additional studies, such as revegetation trials, will be conducted over the operational phase of the mine which will be integrated into ongoing progressive rehabilitation activities and will be used in the development of the final closure rehabilitation design.

Part of the rehabilitation and closure activities conducted during mine operations will include scheduled review and updates of the Rehabilitation and Closure Plan, as required. These scheduled reviews will incorporate any new or revised data gained from operating experience, progressive rehabilitation activities, environmental monitoring, and rehabilitation-related operational studies.

MING MINE SITE

Once mining is completed and all reserves depleted, all surface and underground infrastructure will be removed, all underground openings will be properly sealed, and the ground surface will be reclaimed and revegetated. The rehabilitation and closure work at this site will address historical liabilities, including mine waste at surface, unprotected mine openings, and deteriorated surface infrastructure.

Closure rehabilitation at the Ming Mine and surrounding areas (Boundary Shaft, Vent Raise, etc.) will generally include:

- Removal of hazardous chemicals, reagents and materials.
- Equipment will be disconnected, drained and cleaned, disassembled and sold for re-use or to a licensed scrap dealer. This includes tanks, mechanical equipment, electrical switchgear, pipes, pumps, vehicles, equipment and office furniture.
- Dismantling and removal/disposal of all buildings and surface infrastructure, including the new ventilation, exhaust, and heating equipment at portal, boundary shaft, and exhaust raise. This Plan assumes that all surface buildings and infrastructure to be demolished or removed have been cleaned of process materials and after all potentially hazardous material have been removed.
- Material and equipment with salvage value will be removed and sold for its value. The expected salvage value has not been used to reduce the decommissioning cost estimate provided herein. Equipment and demolition material with no marketable value will be disposed of in a manner consistent with the disposal of other building demolition waste.
- Removal of the septic system.
- Demolishing all concrete foundations to 0.3 m below surface grade, at a minimum and disposal of concrete debris underground or in an appropriate landfill.
- Backfilling / capping mine openings.
- Removal of metal portal cover, demolition or removal of all portal ventilation and heating equipment.
- Removing the fresh water intake pump house and equipment.
- Removing of ETP effluent discharge lines.
- Removal of fuel storage and dispensing facilities.
- Assessing soil and groundwater conditions in areas that warrant assessment (i.e. fuel dispensing facility, ore and waste rock stockpile locations etc.) and implementing remedial measures where necessary.
- In general, site drainage patterns will be re-established, as near as practical, to natural, pre-mining conditions.

- Grading and/or scarification of disturbed areas to promote natural revegetation, or the placement and grading of overburden for revegetation in areas where natural revegetation is not sufficiently rapid to control erosion and sedimentation.
- Attending to any rehabilitation requirements associated with the site such as removal of culverts and power lines, and infilling of any drainage or diversion ditches which are no longer required.

A post-closure monitoring program will continue from the operational monitoring program incorporating appropriate changes. The post-closure monitoring program will continue for an anticipated period of five years after final closure activities are completed or until Rambler and the appropriate regulatory bodies are satisfied that all physical and chemical characteristics are stable. When the site is considered physically and chemically stable, the land will be relinquished to the Crown.

NUGGET POND MILL SITE

In general, all buildings and infrastructure will be removed, dams will be re-contoured to re-establish natural flow patterns, and all disturbed areas will be reclaimed and revegetated.

Closure rehabilitation will generally include the following.

- Removal of hazardous chemicals, reagents and materials. This includes materials in reagent mixers and tanks, pipelines, unused stocks, and laboratory chemicals. The hazardous materials will be for re-sale, if possible, and if not properly disposed of at an approved facility.
- Equipment will be disconnected, drained and cleaned, disassembled and sold for re-use or to a licensed scrap dealer. This includes tanks, mechanical equipment, electrical switchgear, pipes, pumps, vehicles, equipment, and office furniture.
- Any equipment deemed potentially hazardous will be removed from the site and disposed of in accordance with appropriate regulations.
- Dismantling and removal/disposal of all buildings and surface infrastructure.
- Material and equipment with salvage value will be removed and sold for its value. This expected salvage value will not be used to reduce the decommissioning cost estimate. Equipment and demolition debris with no marketable value will be disposed of in a manner consistent with the disposal of other building demolition waste.
- Demolishing all concrete foundations to 0.3 m below surface grade, at a minimum, and disposal of concrete debris underground or in an appropriate landfill.
- Removing the reclaim water intake pump house and equipment.
- Removing the tailings discharge lines.
- Decommissioning of the artesian well.
- Removing fuel storage and dispensing facilities.
- Assessing soil and groundwater conditions in areas that warrant assessment (i.e. fuel dispensing facility, chemical storage buildings, ore storage areas etc.) and implementing remedial measures where necessary.
- Tailings Pond dams will be left in place and the decant systems removed and replaced with a permanent spillway to ensure a permanent water cover of over the impounded tailings. The Polishing Pond dam and associated decant structure will be removed and the area will be re-graded and stabilized against erosion.

- Decommissioning of groundwater monitoring wells.
- In general, site drainage patterns will be re-established, as near as practical, to natural, pre-development conditions.
- Grading and/or scarification of disturbed areas to promote natural revegetation, and the placement and grading of overburden for revegetation in areas where natural revegetation is not sufficiently rapid to control erosion and sedimentation.
- Attending to any special rehabilitation requirements associated with the site such as removal of culverts and power lines, and infilling of any drainage or diversion ditches which are no longer required.

A post-closure monitoring program will continue from the operational monitoring program incorporating appropriate changes to the program. The post-closure monitoring program will continue for an anticipated period of five years after final closure activities are completed or until Rambler and the appropriate regulatory bodies are satisfied that all physical and chemical characteristics are stable. When the site is considered physically and chemically stable, the land will be relinquished to the Crown.

GOODYEAR'S COVE PORT

This site is currently owned by the Town of South Brook and an individual property owner, and once the facility is no longer needed by Rambler, the lease agreements will be terminated. As part of the termination of the lease, Rambler has indicated to the Town and property owner that they will assess whether or not they want to move the building, if not it will be turned over to the Town/owner. If the Town/owner doesn't want the building it will be sold and/or removed and the site will be returned to the condition at the time of commencement of the lease.

Closure rehabilitation will generally include the following:

- Equipment will be disconnected and cleaned, disassembled and sold for re-use or to a licensed scrap dealer. This includes mechanical equipment and electrical switchgear.
- Dismantling and removal/disposal of buildings and surface infrastructure.
- Material and equipment with salvage value will be removed and sold for its value. This expected salvage value will not be used to reduce the decommissioning cost estimate presented herein. Equipment and demolition debris with no marketable value will be disposed of in a manner consistent with the disposal of other building demolition waste.
- Demolishing and removal of all concrete foundations for disposal in an appropriate landfill.
- Removal of fuel storage and dispensing facilities.
- The surface area of the site will be left in similar condition as existed prior to Rambler's occupation.

20.5.5 MONITORING PROGRAM AND POST-CLOSURE MONITORING

Post-closure monitoring and treatment will be conducted to ensure the chemical and physical stability of the rehabilitation work and general site after close-out and prior to the proposed relinquishment of the land to the Crown and/or the owner. Rambler is fully committed to conducting post-closure monitoring as defined in this Plan and the final Rehabilitation and Closure Plan that will be developed and tailored to the conditions and requirements at that time. Rambler will complete post-closure monitoring in cooperation with the regulatory agencies having authority and following the standards in force at the time.

EFFLUENT TREATMENT AND DISCHARGE

When mining operations cease at the Ming Mine site, mine dewatering operations may continue for a period of time until underground infrastructure has been removed. General site drainage may still contain some chemistry as a result of small amounts of PAG materials remaining on site, until these materials can be moved underground. Once the ETP is decommissioned, it is anticipated that the former Ming West Pit will gradually flood to the low point at the northwest end of the pit and will eventually overflow. Until the site is fully rehabilitated and drainage chemistry stabilizes, a small settling pond may be required to be constructed downstream of the Ming West Pit.

The pit and settling pond will drain to the underground workings and this effluent will then be pumped to the waste water treatment plant and treated prior to release. As part of post-closure monitoring, Rambler will assess water levels and drainage patterns associated with these features and work with NLDNR/NLDMAE to address overflow to the surface if this occurs. However, given that groundwater levels in this area of the property are relatively low, it is currently expected that the water from the pit/pond will continue to report underground. The discharge would be monitored and treated until it is shown that the chemistry has stabilized which would be estimated to be one to two years from the completion of site closure activities.

When milling operations cease at the Nugget Pond site, standard operating procedures will be followed with respect to recently discharged effluent from the mill to the TMF. As it is part of the final operation cycle of the plant, the costs of disposal are carried under operations, not as rehabilitation costs.

During closure rehabilitation activities, water accumulation within the TMF and discharge chemistry will be monitored as part of the post-closure monitoring program to determine when effluent treatment can be discontinued.

VEGETATION MONITORING

Monitoring will be carried out to evaluate the success of revegetation activities. Fertilizer and/or replanting would be conducted as required and where practical, to maintain the vegetation cover until it became self-sustaining.

PHYSICAL MONITORING

The general physical aspects of the rehabilitated sites including drainage patterns, slope and embankment stability, soil surface stability and revegetated areas will be monitored to ensure that all rehabilitation work is performing as designed. Physical monitoring will involve a review of rehabilitation and revegetation efforts to identify erosion concerns and evaluate the sustainability and success of the vegetation programs.

CHEMICAL MONITORING

Quarterly sampling and analysis will be conducted at the Ming Mine for surface water quality. Sample concentration obtained during closure will be compared to samples collected during pre-mining and operations. Should the samples reveal that site conditions are equal to or less than concentrations obtained during pre-mining and in consultation with the NLDMAE, chemical monitoring will be discontinued and/or reduced.

It is not anticipated that any significant chemistry will be present in the water discharging from the Nugget Pond site upon mine closure. Quarterly sampling and analysis will be conducted for surface water quality at the required locations. If poor water quality is detected, additional samples will be collected to identify the source area. If the poor water quality is a result of operations at the site, the problem will be investigated and appropriate measures taken to mitigate the issue.

TAILINGS MANAGEMENT FACILITY

Rambler is adopting the approach to long term closure as proposed in the 2014 CDA Bulletin on Mining Dams, whereby the proposed closure plan is comprised of a transitional closure phase, an active closure phase, and a passive closure phase.

Based on the Canadian Dam Association (CDA) Guidelines and previous dam inspections, the existing dams have been classified as low risk. As part of the proposed TMF expansion, the detailed designs will include hydrotechnical analysis and inundation mapping to formalize the classification of the all dams. This classification will confirm the requirements for DSI/DSRs during operations and following into the closure phases of the facility.

The transitional closure phase will span approximately one year and includes the time to close and remediate the site. Once the effluent treatment cycle is completed, TMF rehabilitation will generally include complete inspection of the TMF, removing the control structures at the Polishing Pond, and regrading the area to maintain a stable slope to prevent erosion of the dam and create a definite spillway/channel for water outflow from the pond. The spillway/channel may be lined with armour stone or equivalent. Contouring and revegetation will also be completed, where required. Prior to the transition phase, a closure DSR will be carried out on the dams and will guide the final closure design (water cover, spillway design, etc.) for the TMF.

The active closure phase will take place following the transitional closure year, and will span approximately five years or until steady state has been achieved at the site. Active closure will consist of semi-annual DSIs and monitoring (same frequency as required during operations in accordance with CDA Guidelines for low risk dams). Additionally, an allowance for periodic maintenance of the dams such as vegetation removal will be included. Once steady state has been achieved, the passive closure phase will be instated for the remaining years of the 100 year post-closure term. Passive closure will require DSIs every five years (and after any major rainfall/run-off events), a DSR every ten years, and maintenance as needed to maintain steady state conditions.

Specific inspection procedures and schedules for the long-term maintenance program will be developed and will include the use of any existing monitoring instrumentation (monitoring wells). Accurate inspection and maintenance records have and will be maintained from the operational stage through the post-closure monitoring program.

GOODYEAR’S COVE PORT

No post-closure monitoring and treatment is anticipated at the Goodyear’s Cove facility. An ESA will be conducted and soil contamination will be remediated, if present and in accordance with the lease agreements held with the property owners and post-closure monitoring may be required.

20.5.6 FINANCIAL ASSURANCE

Under the Newfoundland and Labrador Regulation 42/00, Mining Regulations under the Mining Act 42(/00, Section 8), a Financial assurance based on the Rehabilitation and Closure Plan shall be submitted to DNR. The financial assurance proposal is included with the rehabilitation and closure plan, and shall include costs for ongoing monitoring and site maintenance. The closure cost estimate does not account for any residual (salvage) value of equipment, building, structure, land, etc.

The financial assurance in place with NLDNR for the existing and approved Rehabilitation and Closure Plan has been updated to reflect the modifications in the Updated 2017 Rehabilitation and Closure Plan, dated December 5, 2017 and further updates will be required as components of the Project are progressed (e.g. Camp Pond Tailings Impoundment). Regular review and update of the Rehabilitation and Closure Plan is conducted as substantive changes to the Project are made, or at a minimum of every five (5) years. This amount can be recovered by the operator after the minimum post-closure monitoring period and once DNR has judged the mine closure satisfactory.

The closure estimate provide in the financial section of this document includes the closure cost estimate including the future TMF expansion, for which the FA amount will be adjusted in the future.

21 CAPITAL AND OPERATING COSTS

21.1 CAPITAL COSTS

Pre-feasibility capital costs are based on preliminary mine and process design criteria and engineering and cost information derived from various sources. The sources include vendor quotations, historical data, similar projects, and empirical factors. Man-hour costs for installation of equipment were based on local field labour rates for journeyperson millwrights and supervision is included as a percentage of the total estimated man-hour cost.

The estimates were prepared or advised by the following contributors.

— Rambler for Sustaining Capital.

— WSP for Underground Mine Development, Ming Mine Surface Capital, Exploration,

— Thibault and Associates for Nugget Pond Mill Upgrades – Process Equipment, Piping and Controls.

— Gemtec Limited for Nugget Pond Mill Upgrades – Tailings Lift.

All costs are estimated in United States dollars (US$) as of fourth quarter 2017 and, unless otherwise stated, are referred to as '$'. All costs are estimated to within -10% / +30% accuracy unless specified otherwise.

Table 21.1 summarizes the sustaining and capital cost estimated for the Project (which includes exploration, reclamation, closure, plant, and equipment residual value).

Table 21.1 Summary of Sustaining and Project Capital Cost Estimate

Item	Total (M $)
Sustaining capital	8.2
Project capital	93.6
Total project Indirect + Contingency	18.3
Sub-total	**120.1**
Exploration	3.6
Reclamation & Closure	0.3
Residual value of plant and equipment	-5.8
TOTAL	**118.1**

***Note**: Numbers may not add exactly due to rounding.*

21.1.1 PROJECT CAPITAL

A summary of the Project capital estimate (excluding exploration, reclamation, closure, plant, and equipment residual value) is shown in Table 21.2.

Table 21.2 Summary of Project Capital Cost Estimate

Item	Total M (US$)	Fiscal Year 2018	Fiscal Year 2019 - 2020	Fiscal Year 2021 - 2037
Ming Mine –UG Development Capital	86.0	2.1	10.6	73.4
Mine Development	11.8	1.0	3.8	6.8
Staff and Labour	22.2	0.6	2.7	18.9
Mine Infrastructure	1.0	0.0	0.3	0.6
Ventilation	0.7	0.0	0.2	0.5
Mobile Equipment - Purchase/Replace/Rebuild/Parts	48.6	0.3	3.0	45.3
Fixed Equipment	0.1	0.0	0.0	0.1
Power and Fuel	1.7	0.1	0.5	1.1
Ming Mine – Surface Capital	6.7	0.0	6.6	0.0
Paste plant	6.0	0.0	6.0	0.0
Ventilation upgrades	0.0	0.0	0.0	0.0
Infrastructure	0.6	0.0	0.6	0.0
Nugget Pond Mill upgrades	3.0	0.6	0.2	2.1
Process facility and equipment	0.8	0.5	0.0	0.3
Tailings lift	2.2	0.2	0.2	1.8
Indirect Costs	5.7	1.0	3.8	1.0
Contingency	12.6	0.6	3.4	8.6
TOTAL	113.9	4.2	24.6	85.1

Note: *Numbers may not add exactly due to rounding.*

UNDERGROUND DEVELOPMENT CAPITAL

The underground capital costs of $107.4 million, covers the costs of construction and development work to ramp-up the Lower Footwall Zone (LFZ) and maintain production of 1,250 mtpd over the LOM. The basis for the estimate includes the following.

— Rock development unit costs were developed from first principles.

— Specialty work, such as drop raises or inverse raises, unit rates were obtained from existing contracts.

— Major equipment costs were based on budgetary quotes.

— The mobile equipment requirements for the LFZ underground development were based on leasing the equipment.

The underground capital cost comprises project capital of $84.6 million which includes the cost to cover construction (including ventilation), development work and equipment required to maintain a production rate of 1,250 mtpd. The estimated costs will be expended over 19 years commencing in Year 1.

PASTE PLANT

Capital expenditure for the paste plant is expected to be required during year 2020. Table 21.3 summarizes the paste plant capital estimate.

Table 21.3 Paste Plant Capital Cost Estimate

Item	Material Cost K$	Labour Cost K$	Total Estimate K$
Structural	**1,657**	**108**	**1,765**
Paste plant building	1,091		1,091
Tailings building (foundation and structure)	566	108	674
Mechanical and Piping	**1,648**	**1,076**	**2,724**
Process water	48	21	69
Piping - tailings storage building	39	7	46
Mechanical - tailings storage building	36	16	51
Mechanical equipment	1,498	990	2,489
Piping equipment	26	42	69
Electrical	**471**	**242**	**714**
Power and control	81	45	126
Communication	26	4	30
Electrical equipment	364	194	558
Piping Underground Distribution Network	**823**		**823**
TOTAL PASTE PLANT	**4,599**	**1,426**	**6,026**

***Note**: Numbers may not add exactly due to rounding.*

- The capital estimate for the paste plant building and storage building is based on the mass balance and preliminary equipment sizing described in Section 16.
- All equipment is new.
- Material and installation costs were based on similar projects completed by WSP.
- An average labour rate of $85/hr was applied to estimated man-hours.
- Mechanical equipment procurement and installation costs were based on WSP's project database.
- Electrical equipment cost of material was based on similar projects, manpower estimate based on Corporation of Master Electrician Estimate Handbook, previous studies, and construction experience.
- The horsepower for the motors and service loads are based upon WSP's previous experience in backfill plant design and upon estimated process design parameters.
- The instrumentation was evaluated for a fully automated PLC control system. The instrumentation includes all safety switches, controls, and camera surveillance to ensure safe operation of the plant.
- The underground piping distribution system was based on a preliminary design with the assumption that the paste is distributed underground by gravity.
- Drilling costs were based on local contractor rates.

VENTILATION UPGRADES

Ventilation upgrade expenditures were undertaken during 2016 and 2017. In the Economic Analysis $5,000 per year has been allotted for timbered bulkheads as mining progresses at depth.

INFRASTRUCTURE

The infrastructure item in Table 21.2 includes Pumping Station building, substation, and other infrastructure (additions to mine dry and associated work).

NUGGET POND UPGRADES

No upgrades besides normal maintenance and sustaining capital projects are anticipated for the Nugget Pond grinding and flotation process facility. However, the proposed tailings disposal plan will require upgrades for tailings transfer to new impoundment areas and process water reclaim. Three stages of process upgrades at the Nugget Pond site include the following.

Upgrade 1 (Year 2018)

- Install new reclaim water pumping system at Camp Pond to return all excess water to the existing tailings pond.
- Ethernet communications between existing grinding circuit control system and the new reclaim water pump house, along with control system programming modifications.
- Install new tailings disposal piping to Camp Pond and new water reclaim piping from Camp Pond to the existing tailings pond.

Upgrade 2 (Year 2029)

- Relocate process water reclaim pumping system to The Steady.
- Extend Ethernet communications for process control to pump house at The Steady.
- Extend water reclaim pumping to The Steady pump house and all the way to the reclaim water tank at the mill building. Extend tailings piping to Horseshoe Pond, re-using Camp Pond piping where possible.

Upgrade 3 (Year 2033)

- Relocate tailings piping from Horseshoe Pond to deliver tailings to the current Polishing Pond.

The modifications at the existing Ming Mine wastewater treatment plant are limited to the supply and installation of a new sulphuric acid metering system for pH control of the final treated effluent water.

Table 21.4 details the capital estimate for the three stages of upgrades. The table also shows the portion of Indirect Costs and Contingency estimated for this item.

Table 21.4 Nugget Pond Upgrades, Process Facility and Equipment Capital Cost Estimate

Description	Amount ($)			
	Upgrade 1	Upgrade 2	Upgrade 3	Total
Direct Costs				
Process equipment procurement - including delivery	122,060	-	-	122,060
Installation of process equipment	30,034	28,720	-	58,754
Process piping supply and install	274,794	215,476	26,319	516,590
Manual and control valve procurement (delivered)	4,770	4,770	-	9,539
Field instrumentation procurement (delivered)	4,471	-	-	4,471
Installation of valves and instruments	5,335	3,994	-	9,329
Process control system and control wiring supply and installation	29,533	23,726	-	53,258
Sub-Total Direct Capital Cost	**470,998**	**276,685**	**26,319**	**774,002**
Contingency (20%)	94,199	55,337	5,264	154,800
TOTAL DIRECT CAPITAL COST	**$565,197**	**$332,022**	**$31,583**	**$928,802**
Indirect Costs				
Process engineering, design, procurement	36,943	28,734	16,419	82,096
Process control engineering, design, procurement	23,718	4,105	-	27,822
Construction management	-	-	-	-
Construction monitoring / site support	16,830	16,419	-	33,249
Plant Commissioning management	-	-	-	-
Check-out and commissioning	9,774	6,568	-	16,342
Operator training	-	-	-	-
Sub-Total Indirect Cost	**87,265**	**55,826**	**16,419**	**159,510**
Contingency (20%)	17,453	11,165	3,284	31,902
TOTAL INDIRECT COST	**$104,718**	**$66,990**	**$19,703**	**$191,411**

***Note**: Numbers may not add exactly due to rounding.*

- Process equipment pricing is based on vendor budget quotes for all new equipment, estimated man-hour requirements for installation, local field rates for trades plus supervision and other materials and equipment rentals required for installation.
- Piping, valve and instrumentation/controls pricing is based on material take-offs from preliminary sketches, vendor budgetary quotes for unit costs, estimated man-hour requirements and local field rates for trades and supervision.
- Indirect costs for process equipment, piping and controls were factored relative to the total direct costs.

TAILINGS LIFT UPGRADE

Capital expenditures for tailings pond expansions and upgrades have been scheduled in the economic analysis to occur during the year prior to when the tailings deposition is scheduled to begin at each of the facilities. Table 21.5 details the total cost estimate.

Table 21.5 Tailings Pond Upgrades Capital Cost Estimate

Item	Expenditure Year	Total K $
Direct Costs		
Camp Pond	2018	200
Camp Pond	2020	240
Raise on Existing	2024	720
Horseshoe Pond	2029	456
The Steady	2029	276
Raise on Polishing Pond	2033	300
	TOTAL	**$2,192**

***Note**: Numbers may not add exactly due to rounding.*

The above cost estimates do not include road access construction as this component has either been included within the Process Facility and Equipment capital cost estimate or the road access is already established.

21.1.2 OTHER CAPITAL

In addition to the Project capital, Table 21.6 summarizes the other capital items included in the economic analysis for the Ming Mine project.

Table 21.6 Summary of Other Capital Items

Item	Total M $	Fiscal Year 2016	Fiscal Year 2017 - 2018	Fiscal Year 2019 - 2036
Nugget Pond Mill	3.1	0.2	0.5	2.4
Goodyear's Cove Port	0.3	0.0	0.1	0.2
Ming Mine surface capital	4.8	0.4	0.8	3.6
Exploration	3.6	0.2	0.5	3.0
Reclamation and Closure	0.3	0.2	0.1	0.2
TOTAL	12.0	1.0	1.8	9.3

***Note**: Numbers may not add exactly due to rounding.*

SUSTAINING CAPITAL

Sustaining capital estimates for milling, port, and surface capital were based on budget amounts provided by Rambler and are reflective of the costs associated with the ongoing operation. Sustaining capital gradually decreased from FY2024 to FY2036.

RECLAMATION AND CLOSURE

Reclamation and closure costs have been estimated for the Property at $3.7 million. Rambler had previously set aside $3.4 million for closure purposes. Hence, an additional $0.3 million is required. Table 21.7 summarizes the cost estimate. For the purposes of the economic analysis, the reclamation and closure estimate and return of guarantees have been applied in the final year of the mine plan (FY2037).

It is planned that the additional requirements for Reclamation and Closure would be held in reserve in the first year and then released in the second year once a guarantee agreement can be entered into.

Table 21.7 Reclamation and Closure Cost Estimate

Rehabilitation Cost Element	Total Cost (CAN$)	Total Cost (US$)
Nugget Pond Mill		
Tailings management facility	91,950	73,560
Site infrastructure	1,251,000	1,000,800
Ground surface rehabilitation	142,625	114,100
Goodyear's Cove Port		
Site infrastructure	103,000	82,400
Ground surface rehabilitation	5,000	4,000
Ming Mine		
Site infrastructure	443,750	355,000
Mine surface openings and ventilation	255,431	204,345
Open pits and waste rock stockpiles	862,620	690,096
Ground surface rehabilitation	170,000	136,000
Engineering (@3%) & Project Management (@7%)	**332,538**	**266,030**
Post-Closure Monitoring		
Nugget Pond (Allowance)	200,000	160,000
Ming Mine (Allowance)	90,000	72,000
Dam Inspections/Reviews and Maintenance for 100 years *Fund Calculation Based on SER, commencing 2017*	200,000	160,000
Sub-Total	**4,147,914**	**3,318,331**
Contingency (@15% for all items except Waste Rock Stockpile)	369,413	295,531
Contingency On Waste Rock Stockpile (30% as per WSP letter)	258,786	207,029
TOTAL REHABILITATION COST	**$4,776,113**	**$3,820,891**
Original closure and remediation costs(and guarantee) (2010)	4,353,955	3,483,164
Additional closure guarantee for Technical Report	**422,158**	**337,727**

***Note**: Numbers may not add exactly due to rounding.*

INDIRECT CAPITAL AND CONTINGENCY COST ESTIMATE

Indirect costs are expected to include Engineering, Procurement, Construction, and Commissioning fees, freight, insurance, and Owner's Costs. They were estimated at approximately 20% of Direct Capital costs for Ming Mine Surface Capital and Nugget Pond Mill Upgrades items, and 4% of the Ming Mine –UG Development Capital.

The indirect capital also includes 750k CAN$ for environmental assessment and permitting associated with using the Horseshoe Pond and the Steady for the TMF expansion.

Contingency is defined as additional capital costs allowed for over and above the base estimate, to account for unexpected items and unforeseen activities and requirements not anticipated in the cost estimate. Contingencies were factored from the total direct costs as follows.

- 10% contingency on Mining Mobile Equipment capital.
- 12.5% contingency on UG development, stationary and other equipment, infrastructure and electrical.
- 20% contingency on Ming Mine Surface capital and Nugget Pond Upgrade items.

21.1.3 FIVE-YEAR CAPITAL PLAN

Table 21.8 summarizes the Project's five-year capital plan.

Table 21.8 Five-Year Capital Plan

Capital Item	5-Yr Total ($)	FY2018 ($)	FY2019 ($)	FY2020 ($)	FY2021 ($)	FY2022 ($)
Project Capital						
Ming Mine: surface capital						
Paste plant	6,026	-	-	6,026	-	-
Ventilation upgrades	16	-	4	4	4	4
Other infrastructure	590	-	-	590	-	-
Ming Mine: U/G Capital	-	-	-	-	-	-
Mine development	8,193	986	1,904	1,948	1,893	1,461
Staff and labour	6,951	607	1,297	1,385	1,744	1,918
Mine infrastructure	955	-	-	324	340	291
Ventilation	384	-	200	60	92	32
Mobile equipment - purchase/replace/rebuild/parts	9,611	341	762	2,184	2,350	3,975
Fixed equipment	87	-	11	22	22	33
Power and fuel	1,081	92	230	242	262	255
Indirect capital (surface and U/G)	4,537	793	2,417	1,327	-	-
Nugget Pond Mill Upgrades	-	-	-	-	-	-
Process upgrades	464	464	-	-	-	-
Tailings expansion	437	197	-	240	-	-
Indirect capital	573	125	-	48	200	200
Contingency	-	-	-	-	-	-
Ming Mine	5,405	403	1,016	2,309	780	897
Nugget Pond Mill upgrades	295	157	-	58	40	40
TOTAL PROJECT CAPITAL	**$45,605**	**$4,166**	**$7,842**	**$16,765**	**$7,725**	**$9,106**
Sustaining Capital	-	-	-	-	-	-
Milling	1,196	236	240	240	240	240
Port	100	20	20	20	20	20
Ming Mine: surface capital	1,994	394	400	400	400	400
TOTAL SUSTAINING CAPITAL	**$3,290**	**$650**	**$660**	**$660**	**$660**	**$660**
Exploration	1,597	197	200	240	360	600
Reclamation and closure	198	150	-	48	-	-
TOTAL EXPLORATION, RECLAMATION AND CLOSURE	**$1,794**	**$346**	**$200**	**$288**	**$360**	**$600**
TOTAL CAPITAL	**$50,689**	**$5,162**	**$8,702**	**$17,713**	**$8,745**	**$10,366**

***Note**: Numbers may not add exactly due to rounding.*

21.2 OPERATING COSTS

Operating costs in this technical report update are based on a combination of actual and design mining and processing cost information derived from various sources. The sources include the operating mine and mill, vendor quotations, historical data, similar projects, and empirical factors. The estimates were prepared or advised by the following contributors:

— Rambler and WSP for mine operating cost actuals and estimates.

— Rambler for general and administrative operating cost actuals from the current operation.

— Rambler and Thibault & Associates for Milling, Port and Ming Mine WWTP operating cost actuals and estimates.

All costs are estimated in US dollars (US$) as of Q4 2017 and, unless otherwise stated, are referred to as '$'. All costs are estimated to within -15%/+30% accuracy unless specified otherwise. Operating costs for the entire life-of-mine (LOM) period is estimated at $671.8 million. Total LOM Operating costs are summarized in Table 21.9.

Table 21.9 Summary of Operating Cost Estimate (LOM)

Category	Total (K$)	Average Cost (LOM), $/t Milled	% of Total Cost
Mining	274,661	31.5	41
Haulage to Mill	63,750	7.3	9
General and Administrative	110,232	12.7	16
Sub-total, Ming Mine	**448,642**	**51.5**	**67**
Milling	111,686	12.8	17
Port Operations	3,835	0.4	1
Royalties	13,762	1.6	2
Sub-total, Nugget Pond and Goodyear's Cove	**129,283**	**14.8**	**19**
TOTAL OPERATING COSTS	**$577,925**	**$66.3**	**86**
Treatment and Refining Charges (incl. Transportation Costs)	93,870	10.8	14
TOTAL CASH COSTS (Operating + Royalties + Treatment and Refining Charges)	**$671,795**	**$77.1**	**100%**

***Note**: Numbers may not add exactly due to rounding.*

21.2.1 MING MINE SITE

The average combined mining operating cost estimate for the both the MMS and LFZ is $38.2 /dmt.

Basis of operating cost estimate:

— **Fixed operating costs**: Labour costs were based on a broad assessment of personnel requirements and labour rates set out in Rambler's 2018 fiscal budget. Maintenance, and consumables cost estimates were based on in-house data and Rambler's 2018 fiscal budget.

- **Variable operating costs**: Labour costs were based on equipment requirements and shift schedule and wages as set out in Rambler's 2018 fiscal budget. Maintenance repair parts and consumables were based on daily development and production rates as set out by the Technical Report Mine Plan.
- **Contingency**: The operating cost estimate does not include any contingency at this stage of the study.

LOWER FOOTWALL ZONE

Haulage Cost Assumptions

The haulage costs include backhauling surface waste rock stockpiles to underground.

Labour Cost Assumptions

- Manpower requirements for the mine have been estimated from first principles based on the mine design and productivity estimates found in Section 16.
- The study was based on the underground operations, for both the development and operating phase, to operate two 10-hour shifts per day, seven days per week. This would allow approximately 6.3 hours at the face and also allow sufficient time for the blasting gases to escape the mine workings.
- Wages for the miners have been based on Rambler's current Ming Mine 2017 Fiscal Budget. Bonus was set at a percentage of the wages classification. Fringe benefits amounted to approximately 18% of the gross annual wages. Overtime premium was scheduled at 5%.

Operating Supplies

Operating supplies include bits and steel, explosives, ground support, pipe and fittings, ventilation ducting and fittings, electrical cable, and fuels and lubricants. The unit costs were estimated based on unit consumption and pricing.

Maintenance Supplies

Maintenance supplies include mechanical and electrical repair parts, hydraulic hoses and fittings, operating supplies, filters, and tires. The estimated cost was based on suppliers' budgetary quotations and in-house data.

Paste Plant

- A paste plant designed to accommodate a 240 dry mtpd design backfill production rate (or 10.0 mtph) was estimated by WSP. The operating cost of the paste system includes backfill materials, power, and labour.
- Cement was estimated at 5%. Cement delivered cost was $250/tonne. Manpower of one operator per shift was also included in the cost.
- The daily power requirements were estimated at 2,802 kW/hr at a rate of $0.08 per kW/hr.

Propane and Electrical Power

Propane and electrical power consumption and pricing was based on heating and electrical loads from the 2018 Fiscal Budget unit rates.

MING MINE WASTEWATER TREATMENT PLANT

The Operating costs for the wastewater treatment plant at the Ming Mine site is defined in Table 21.10.

Table 21.10 Ming Mine Wastewater Treatment Plant Operating Cost Summary

Item	Cost ($) (annually)	Cost ($) (per tonne ore)
Reagents	176,000	0.41
WWPT Electrical Power	25,122	0.06
Labour - WWTP Only	96,000	0.22
Support Laboratories Cost	19,200	0.04
Health & Safety	2,400	0.01
Technical Support / Met & Enviro	8,000	0.02
Sub-Total	**326,722**	**0.75**
Contingency (5%)	16,336	0.04
OPINION OF PROBABLE OPERATING COST *(probable range of cost at -15% to +25%)*	**$343,058**	**$0.79**

- Reagents and labour cost were based on 2017 budget costs for the current operation of the WWTP.
- Electrical power is based on the electrical loads within the WWTP and 2017 electricity rates.
- Support laboratories includes the cost of using external laboratories to assess WWTP operation.

21.2.2 NUGGET POND MILL

Table 21.11 summarizes the estimate for the Mill Operating costs.

Table 21.11 Summary of Mill Operating Costs

Item	Cost ($) (annually)	Cost ($) (per tonne ore)
Reagents	261,573	0.60
Concentrator Consumables	712,315	1.64
Concentrator Electrical Power	737,845	1.70
Labour - Process Facilities *based on RMM's Labour Budget for 2015*	2,719,053	6.27
Process Operations	*1,244,497*	*2.87*
Support Personnel	*834,334*	*1.92*
Management and Laboratory	*429,406*	*0.99*
Contract	*210,816*	*0.49*
Contractor Equipment	597,592	1.38
Maintenance Consumables	226,590	0.52
Support Laboratories Cost	72,742	0.17
Insurance	-	-
Health & Safety	36,000	0.08
Technical Support / Met & Enviro	40,000	0.09
Marketing & Sales	-	-
Process Technology Royalties	-	-
Packaging and Shipping	-	-
Site Administration	-	-
Sub-Total	$5,403,710	$12.46
Contingency (5%)	270,186	0.62
OPINION OF PROBABLE OPERATING COST *(probable range of cost at -15% to +25%)*	**$5,673,895**	**$13.08**

***Note**: Numbers may not add exactly due to rounding.*

Mineral processing operating costs includes the cost of reagents, concentrator consumables, electrical power, labour, maintenance consumables, external analytical services, basic health and safety training and supplies, and technical support for metallurgical consulting. The operating cost estimate includes the Nugget Pond concentrator operation, the Goodyear's Cove Port site operation and the wastewater treatment plant only at the Ming Mine site.

The Annual Mill Operating cost estimate, in the final year, was reduced by 30% to account for the partial year of operation.

REAGENTS

Reagent consumption rates for the operation of the copper flotation concentrator are based on the actual average consumption rate per tonne of ore processed in the 2017 where a blend of MMS and LFZ ore was treated.

Reagent costs for lime, MIBC, Aerophine 3418A, zinc sulphate, Aero MX983 and flocculant are based on current delivered prices to Nugget Pond and costing of sulphuric acid is based on vendor budget quotes including delivery.

PROCESS CONSUMABLES

The cost for wear parts in the mineral processing operations at the Nugget Pond site includes periodic replacement of ball mill liners and lifters, SAG mill liners, lifters and trommel, ball mill and SAG mill grinding media consumption, filter media for the filter, and miscellaneous sampling consumables. The frequency of replacement of wear parts has been estimated based on mill feed abrasion indices and data from the existing operation. The mill feed abrasion index was taken as a weighted average of the MMS and LFZ test samples. Pricing of consumables was based on recent pricing as purchased for the Nugget Pond operation.

ELECTRICAL POWER

The electrical power consumption rate is based on current billing demand and energy use at Nugget Pond, with an allowance for the small increase in power for the new reclaim water pump house. The Goodyear's Cove Port site electrical cost is based on previous billing from operation of the facility.

The electrical power cost is based on the industrial power rates from Newfoundland Power Inc. including the basic customer charge, demand charge and energy charge as shown in Table 21.12.

Table 21.12 Newfoundland Power Inc. Electricity Rates for Service Over 1000 kVA (Effective July 1, 2017)

Power Charge Description	Unit	Unit Cost ($)
Basic Customer Charge	Monthly	69.11
Demand Charge Winter (1)	monthly per kVA	5.97 per kVA
Demand Charge Summer (1)	monthly per kVA	3.97 per kVA
Energy Charge	kWh	0.0684 for first 75,000 kWh

***Table note**:*

(1) Winter is defined as December, January, February, and March. Summer charges apply to other months.

LABOUR

The mineral processing labour cost for Ming Mine wastewater treatment operations, Nugget Pond, and Goodyear's Cove is based on current staffing levels for the operation. Labour includes management and technical support staff, sampling technicians, process operators (including labourers), and maintenance staff (including tradespersons and labourers). The hourly labour costs were provided by Rambler based on its 2017 labour budget including payroll burden, overtime and bonuses. Labour costs are based on non-unionized personnel employed by Rambler. The number of employees required and annual cost to Rambler for each position is summarized in Table 21.13.

The operation at Goodyear's Cove does not require year-round employees and therefore the labour cost for Goodyear's Cove was provided by Rambler based on past experience for the portion of the year that labour is required for equipment operators, security, labourers and maintenance.

Table 21.13 Number of Employees Required for Mineral Processing and WWTP Operation

Personnel	Quantity for Ming Mine Site WWTP	Quantity for Nugget Pond Mine Concentrator
Management, Support, and Technical Staff		
Mill Superintendent	-	1
Metallurgist/Mill Foreman	-	1
Administrative/Mill Clerk	-	1
Warehouse Attendant	-	1
Lab Technician	-	2
Lab Technician	-	1
Sub-total	**-**	**7**
Operations, Labourers, and Supervision		
Crew Leaders	-	4
Ore Loader Operators	-	4
Crushing Operators	-	3
Grinding Operators	-	1
Flotation Operators	-	6
Filter Press Operators	-	3
Tailings/Dewatering Operators	-	2
Samplers	-	1
Mill Operator Trainees	-	2
Wastewater Treatment Operator	3	-
Sub-total	**3**	**26**
Maintenance and Labourers		
Lead Electrician	-	1
Electrician	-	2
Maintenance Supervisor	-	1
Millwright/Pipefitter	-	6
Welder	-	1
Yardman/Maintenance	-	1
Sub-total	-	12
TOTAL MINERAL PROCESSING PERSONNEL	**3**	**45**

MAINTENANCE CONSUMABLES

Maintenance consumables include repairs and maintenance for process equipment such as bearings, belt, motors, and pump impeller replacement, etc. Parts used annually for mechanical and controls equipment were estimated as 2.5% of the initial equipment capital cost. Similarly, annual repair parts for process piping, control valves and instruments were estimated as 2.5% of the initial capital cost for these items. An allowance has also been made for grease and lubricants.

SUPPORT LABORATORIES

Based on the current operation, some of the assays are conducted in-house and others samples are sent to an external laboratory. The cost for assays has been included based on an estimated number of assays each year to confirm metallurgical performance.

21.2.3 GOODYEAR'S COVE PORT

Table 21.14 summarizes the estimate for the Port Operating costs.

Table 21.14 Summary of Port Operating Costs

Item	Cost ($) (annually)	Cost ($) (per tonne ore)
Port Electrical Power	7,296	0.02
Labour - Port, Goodyear's Cove		
Operators	42,417	0.10
Security	2,517	0.01
Labour	16,780	0.04
Maintenance	29,832	0.07
Electrician	4,474	0.01
Month PM	8,950	0.02
Sub-Total - Labour	**104,970**	**0.24**
Contract Personnel	15,920	0.04
Maintenance Consumables	39,500	0.09
Support Laboratories Cost	14,400	0.03
Travel & Accommodations	3,480	0.01
Sub-Total	**185,566**	**0.43**
Contingency (5%)	9,278	0.02
OPINION OF PROBABLE OPERATING COST *(probable range of cost at -15% to +25%)*	**$194,844**	**$0.45**

***Note**: Numbers may not add exactly due to rounding.*

The final year of the Mine Plan, which incorporates feeding the mill from a low grade stockpile, the Annual Port Operating cost estimate was reduced by 30% to account for the partial year of operation.

21.2.4 GENERAL AND ADMINISTRATIVE

General and administrative costs (G&A) have been estimated based on budgeted and actual costs incurred during Fiscal Year 2017. The general services include general management (not included within mining and milling), accounting, human resources, purchasing, Health and Safety, environment, engineering, geology, planning & logistics, and insurance and property taxes at Goodyear's Cove. Table 21.15 summarizes the estimated annual cost.

Table 21.15 Summary of General and Administrative Costs

Category	Annual Amount K $	% of Total Cost
Administration	2,902	53
Engineering	481	9
Environmental	520	9
Geology	964	17
Health and Safety	511	9
Planning and Logistics	61	1
Goodyear's Cove Insurance and Property Tax	81	1
TOTAL	**$5,520**	**100%**

The Annual General and Administrative operating cost estimate, in the final year, was reduced by 30% to account for the partial year of operation.

22 ECONOMIC ANALYSIS

The economic results of this report are based upon the work performed by WSP (resource and reserve estimation, mine plan, civil, structural, and project economic analysis), Thibault (metallurgical and processing aspects), Gemtec Limited (environmental aspects), and Rambler.

The Project indicates an after-tax NPV (7%) of US$83 million and pre-tax NPV (7%) of US$100. There is no IRR to report as the Project produces positive cumulative cash flows. The Project is most sensitive to factors impacting revenue, which are commodity prices and exchange rates. The Project shows least sensitivity to capital costs.

22.1 CAUTIONARY STATEMENT

The results of the Economic Analysis are based on forward-looking information that are subject to a number of known and unknown risks, uncertainties, and other factors that may cause actual results to differ materially from those presented here.

Forward-looking statements in this section include, but are not limited to, statements with respect to:

- Future prices of copper, gold, and silver.
- Currency exchange fluctuations.
- Estimation of Mineral Reserves.
- Realization of Mineral Reserve estimates.
- Estimated costs and timing of Capital and Operating expenditures.

22.2 PRINCIPAL ASSUMPTIONS

The cash flow estimate includes only revenue, costs, taxes, and other factors applicable to the Project. Corporate obligations, financing costs, and taxes at the corporate level are excluded.

The model was prepared from mining schedules estimated on an annual basis.

The cash flow model was based on the following:

- The annual amounts shown in the Model represent Rambler's fiscal year. The year begins January 1 and ends December 31. The Project is defined as starting at the beginning of Fiscal Year 2018.
- 100% equity ownership by Rambler.
- All costs are estimated to 2017 and referenced as 'US$', unless otherwise stated.
- No pre-production period since the mine is presently operating at 1,250 tonnes per day.
- Copper concentrate grading 28.5% Cu.
- Zinc does not contribute to the revenues.
- No cost escalation beyond 2017, Constant 2017 dollar analysis.

PRODUCTION

The LOM plan envisages steady state production of 1,250 mtpd from 2018 onwards with majority of the planned tonnage coming from longhole bulk mining of the LFZ.

The Economic Model presented in this section includes proven and probable reserves only.

MILL RECOVERIES

Mill recoveries are based on:

- Current operations at Nugget Pond Concentrator at 96.5%, 65%, and 60% for copper, gold, and silver respectively.
- LFZ material with recoveries of 98.9%, 63.6%, and 62.0% for copper, gold, and silver respectively, from lock cycle testing in 2015.
- Concentrator recoveries are used in the cash flow model for the blended mill feed in Years 2018 through 2023. LFZ recoveries are used in the cash flow model for Years 2024 and onwards when the mill feed is sourced almost solely from the Lower Footwall Zone.

COMMODITY PRICING

The following commodity pricing and exchange rate assumptions were used:

- Commodity pricing for 2018 is reflective of the RMM's fiscal forecast; US$3.06/lb copper, US$1,305/oz gold and US$17.65/oz silver.
- Long-term metal prices of US$2.99/lb copper, US$1300/oz gold, and US$17.0/oz silver.
- A long-term exchange rate of 1 CAN$: 0.8 US$.

22.3 TAXES AND ROYALTIES

TAXES

The Project has been evaluated on an after-tax basis. It must be noted that there are many potential complex factors that affect the taxation of a mining project. The taxes, depletion, and depreciation calculations in the Technical Report economic analysis are simplified and only intended to give a general indication of the potential tax implications; like the rest of the Technical Report economics, they are only preliminary.

The Project will be subject to the following taxes as they relate to the Project:

- A federal income tax rate of 15%.
- A provincial income tax rate of 15%.
- A provincial mining tax rate of 16%.

The following assumptions were used with respect to the Mining Tax:

- No amounts paid to persons subject to mineral rights tax.
- Depreciable assets all qualify for processing allowance.
- Processing allowance is the minimum of 8% of the cost of the processing facility and 65% of income before the processing allowance.
- All expenses deducted from before-tax cash flow are directly attributable to mining operations.
- In the final year of mining, it is assumed that a terminal loss will be triggered equal to before-tax income provided there is sufficient Undepreciated Capital Cost remaining in the pool.
- Both mining and milling assets were depreciated at 25% per annum.

ROYALTIES

The following royalty has been included in the economic analysis:

- 1.5% on the Net Smelter Return.

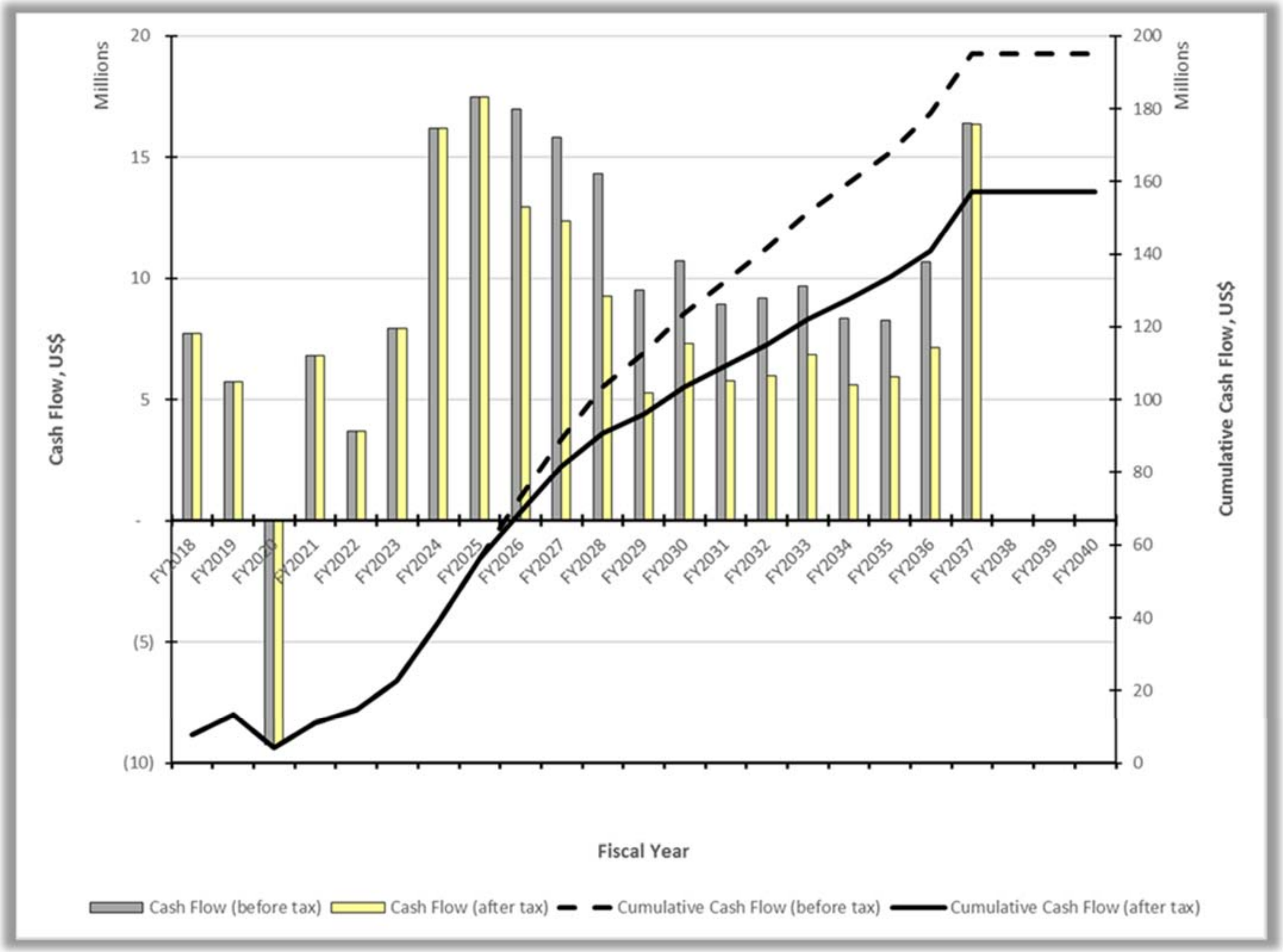
22.4 ECONOMIC RETURNS

The results of the economic analysis are presented in Table 22.1 and on Figure 22.1. The results are derived from the Life-of-Mine schedule presented in Section16, and Capital and Operating costs presented in Section 21.

Table 22.1 Project Economics

Item	Units	Value (CAN$)	Value (US$)
Assumptions			
Average copper price	$/lb	3.74	2.99
Average gold price	$/oz	1626	1301
Average silver price	$/oz	21.38	17.10
Average $US/$CAN exchange rate		1:0.8	1:0.8
Production			
Copper	M lbs	312	312
Gold	oz	57,000	57,000
Silver	oz	210,000	210,000
Mine life	years	2018 – 2037 20	2018 – 2037 20
Net revenue	M$	1,265	1,011
Net cash flow from operations	M$	347	277
Total capital cost, over LOM	M $	150	120
Net cash flow, before tax	M$	244	195
Net cash flow, after tax	M$	197	157
Discount rate		7%	7%
Net present value, before tax	M$	125	100
Net present value, after tax	M$	104	83

Figure 22.1 Cash Flow Model Results



The complete cash flow model is presented in Table 22.2.

Table 22.2 Cash Flow Model

	Total	Units	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Production - Mill Feed	**8,716**	**kt**	**434**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**444**	**294**
Copper	1.71	%	1.40	1.42	1.28	1.50	1.64	1.85	2.06	2.10	2.08	1.92	1.86	1.83	1.76	1.75	1.71	1.72	1.70	1.70	1.68	1.08
Gold	0.41	g/t	0.86	1.18	0.88	0.66	0.30	0.25	0.31	0.31	0.32	0.31	0.31	0.20	0.10	0.11	0.11	0.11	0.10	0.11	0.11	2.07
Silver	2.98	g/t	6.23	8.81	7.05	5.10	2.76	1.77	1.55	1.53	1.48	1.36	1.34	1.54	1.59	1.59	1.39	1.39	1.42	1.39	1.23	12.25
Concentrate Production																						
Copper produced	146.6	kt	5.9	6.1	5.5	6.4	7.0	7.9	9.0	9.2	9.1	8.4	8.2	8.0	7.7	7.7	7.5	7.6	7.4	7.4	7.4	3.1
Cu Conc. @ 28.5% Grade tonnes	514.3	kt	20.5	21.3	19.3	22.6	24.6	27.9	31.7	32.3	32.0	29.6	28.6	28.2	27.0	27.0	26.3	26.5	26.1	26.1	25.9	10.8
Gold	73.7	k oz	7.8	10.9	8.1	6.2	2.8	2.4	2.8	2.8	2.9	2.8	2.8	1.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0	12.7
Silver	506.3	k oz	52.2	75.4	60.3	43.7	23.6	15.2	13.7	13.6	13.1	12.0	11.9	13.6	14.0	14.0	12.3	12.3	12.6	12.3	10.8	69.6
Accountable Metal - Concentrate																						
Copper	141.5	kt	5.7	5.9	5.3	6.2	6.8	7.7	8.7	8.9	8.8	8.1	7.9	7.8	7.4	7.4	7.2	7.3	7.2	7.2	7.1	3.0
Gold	57.2	k oz	7.1	10.3	7.5	5.4	2.0	1.5	1.8	1.8	1.9	1.9	1.9	0.9	0.0	0.1	0.2	0.1	0.1	0.1	0.1	12.4
Silver	210.0	k oz	32.4	54.8	41.8	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.2
Commodity Prices																						
Copper	2.99	US$/lb	3.06	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Gold	1301	US$/oz	1305	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
Silver	17.10	US$/oz	17.65	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Revenue - Concentrator																						
Copper	933.3	M US$	38.1	38.6	34.9	41.0	44.6	50.5	57.5	58.6	58.1	53.7	51.9	51.1	49.0	48.9	47.7	48.0	47.3	47.4	46.9	19.5
Gold	74.4	M US$	9.3	13.3	9.8	7.1	2.6	1.9	2.3	2.3	2.4	2.4	2.5	1.1	0.1	0.2	0.2	0.2	0.1	0.2	0.2	16.1
Silver	24.4	M US$	3.0	4.4	3.2	2.3	0.9	0.6	0.8	0.8	0.8	0.8	0.8	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	5.3
Net Revenue	**1011.3**	**M US$**	**48.0**	**52.9**	**45.4**	**48.4**	**47.3**	**52.4**	**59.8**	**60.9**	**60.5**	**56.1**	**54.3**	**52.3**	**49.1**	**49.1**	**47.9**	**48.2**	**47.5**	**47.5**	**47.1**	**36.6**
Net Smelter Return	**917.4**	**M US$**	**44.3**	**49.0**	**41.8**	**44.2**	**42.8**	**47.3**	**54.1**	**55.0**	**54.6**	**50.7**	**49.1**	**47.1**	**44.2**	**44.1**	**43.1**	**43.4**	**42.7**	**42.8**	**42.3**	**34.6**
Operating Expenses	**577.9**	**M US$**	**28.4**	**30.3**	**30.2**	**26.4**	**27.8**	**30.1**	**30.5**	**30.7**	**29.1**	**29.2**	**29.0**	**29.5**	**28.8**	**29.8**	**28.6**	**30.1**	**30.0**	**31.7**	**29.0**	**18.8**
Financing charge (payable gold)	24.4	M US$	3.0	4.4	3.2	2.3	0.9	0.6	0.8	0.8	0.8	0.8	0.8	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	5.3
Taxes	37.9	M US$	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	3.4	5.0	4.3	3.4	3.2	3.2	2.8	2.7	2.3	3.5	0.0
Total Capital Cost	**120.1**	**M US$**	**5.2**	**8.7**	**17.7**	**8.7**	**10.4**	**8.7**	**6.6**	**6.1**	**7.8**	**4.9**	**5.0**	**7.7**	**4.6**	**5.4**	**5.3**	**3.5**	**4.3**	**2.7**	**2.6**	**-5.8**
Before-Tax Cash Flow Results																						
Net Cash Flow (before-tax)	195.0	M US$	7.7	5.7	-9.2	6.8	3.7	7.9	16.2	17.5	17.0	15.8	14.3	9.5	10.7	8.9	9.2	9.7	8.4	8.3	10.7	16.4
Cumulative Cash Flow		M US$	7.7	13.4	4.2	11.0	14.7	22.6	38.8	56.3	73.3	89.1	103.4	112.9	123.6	132.5	141.7	151.3	159.7	168.0	178.6	195.0
After-Tax Cash Flow Results																						
Net Cash Flow (after-tax)	157.1	M US$	7.7	5.7	-9.2	6.8	3.7	7.9	16.2	17.5	13.0	12.4	9.3	5.3	7.3	5.8	6.0	6.9	5.6	5.9	7.1	16.4
Cumulative Cash Flow		M US$	7.7	13.4	4.2	11.0	14.7	22.6	38.8	56.3	69.2	81.6	90.9	96.2	103.5	109.2	115.2	122.1	127.7	133.6	140.7	157.1

Table 22.3 summarizes the economic indicators, both before-tax and after-tax for the estimated cash flow model (Table 22.2).

Table 22.3 Economic Indicators, Base Case

Variable	Before-Tax (M CAN$)	After-Tax (M CAN$)	Before-Tax (M US$)	After-Tax (M US$)
NPV @ 0%	244	197	195	157
NPV @ 5%	149	123	119	98
NPV @ 8%	115	96	92	77
NPV @ 10%	98	83	78	66
NPV @ 12%	84	72	67	58

22.5 SENSITIVITY ANALYSIS

The before-tax cash flow was evaluated for sensitivity to commodity prices, grade of milled ore, currency exchange rates, operating costs, and capital expenditures. All sensitivities were analyzed as mutually exclusive variations.

The Project's before-tax NPV was most sensitive to commodity pricing and exchange rate and least sensitive to capital expenditures.

Figure 22.2 and Tables 22.4 and 22.5 summarize the before-tax sensitivity results.

Figure 22.2 Before-Tax Sensitivity Analysis on NPV7%

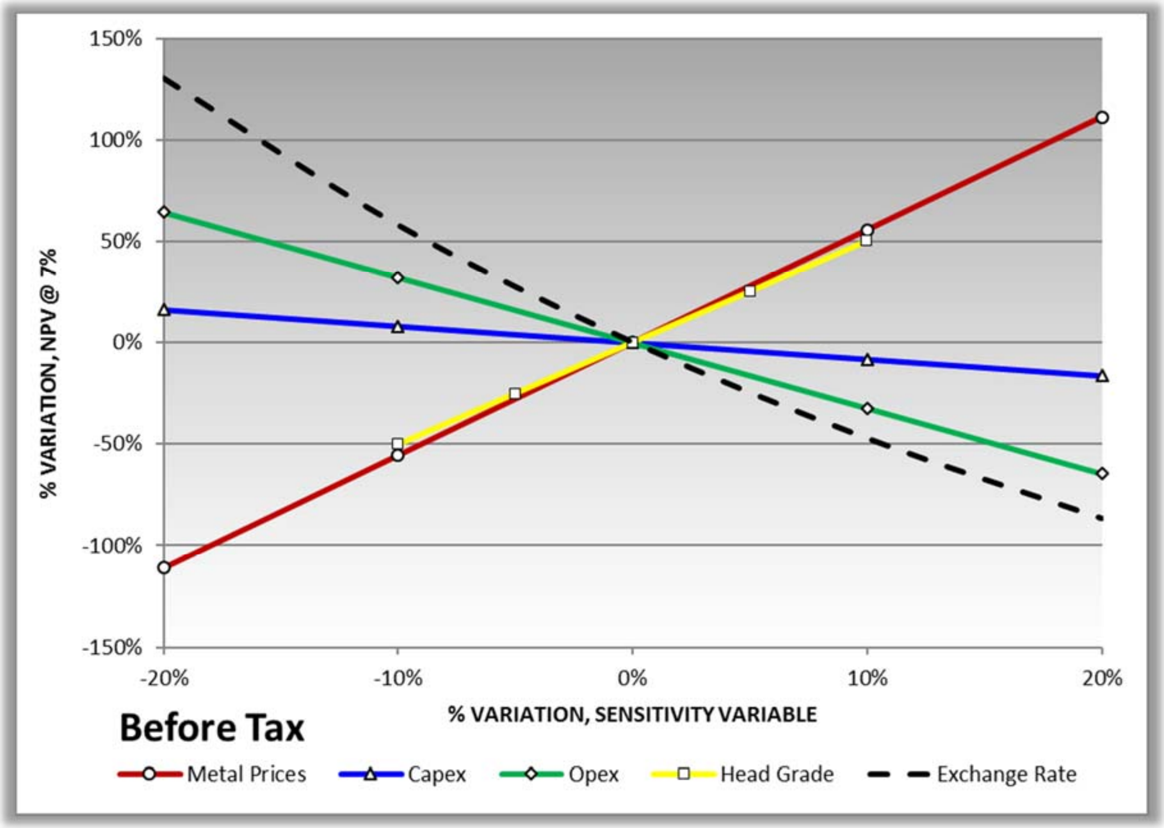


Table 22.4 Before-Tax Sensitivity Analysis on NPV7%

Variable	-10% (M US$)	Base NPV7% (M US$)	+10% (M US$)	Range (M US$)
Metal prices	44	100	155	111
Exchange rate	157	100	53	105
Grade to mill	49	100	150	100
Operating cost estimate	132	100	68	64
Capital cost estimate	108	100	92	16

Table 22.5 Sensitivity Analysis on Discount Rate

Variable	Before-Tax (M US$)	After-Tax (M US$)
NPV @ 0%	195	157
NPV @ 5%	119	98
NPV @ 8%	92	77
NPV @ 10%	78	66
NPV @ 12%	67	58

22.6 FIVE-YEAR CASH FLOW RESULTS

Table 22.6 summarizes the cash flow results for the first five years of the study.

Table 22.6 Five-Year Cash Flow Results

	5-Yr. Total	Units	2018	2019	2020	2021	2022
Net Revenue	**242.0**	**M US$**	**48.0**	**52.9**	**45.4**	**48.4**	**47.3**
TC, RC, transportation and penalties	19.8	M US$	3.7	3.9	3.6	4.2	4.5
Net Smelter Return	**222.2**	**M US$**	**44.3**	**49.0**	**41.8**	**44.2**	**42.8**
Operating Costs							
Mining - all zones	66.4	M US$	13.3	14.8	14.8	11.0	12.5
Ore haulage to mill	16.1	M US$	3.1	3.2	3.2	3.2	3.2
General and administration	27.9	M US$	5.5	5.6	5.6	5.6	5.6
Milling	28.3	M US$	5.6	5.7	5.7	5.7	5.7
Port operations	1.0	M US$	0.2	0.2	0.2	0.2	0.2
Royalties	3.3	M US$	0.7	0.7	0.6	0.7	0.6
Total Operating Expenses	**143.0**	**M US$**	**28.4**	**30.3**	**30.2**	**26.4**	**27.8**
Cash Flow Calculation							
Earnings before interest, tax and depreciation	79.2	M US$	15.9	18.8	11.7	17.9	14.9
Financing charge (payable gold)	13.8	M US$	3.0	4.4	3.2	2.3	0.9
Net Cash Flows from Operations	**65.4**	**M US$**	**12.9**	**14.4**	**8.5**	**15.6**	**14.1**
Capital Costs							
Sustaining capital							
Milling	1.2	M US$	0.2	0.2	0.2	0.2	0.2
Port	0.1	M US$	0.0	0.0	0.0	0.0	0.0
Ming Mine: surface capital	2.0	M US$	0.4	0.4	0.4	0.4	0.4
Total Sustaining Capital	**3.3**	**M US$**	**0.6**	**0.7**	**0.7**	**0.7**	**0.7**
Project Capital							
Ming Mine: surface capital	6.6	M US$	0.0	0.0	6.6	0.0	0.0
Ming Mine: U/G capital	27.3	M US$	2.0	4.4	6.2	6.7	8.0
Ming Mine: indirects	4.5	M US$	0.8	2.4	1.3	0.0	0.0
Ming Mine: contingency	5.4	M US$	0.4	1.0	2.3	0.8	0.9
NP Mill upgrades: process equipment	0.5	M US$	0.5	0.0	0.0	0.0	0.0
NP Mill upgrades: tailings lift	0.4	M US$	0.2	0.0	0.2	0.0	0.0
NP Mill: indirects	0.6	M US$	0.1	0.0	0.0	0.2	0.2
NP Mill: contingency	0.3	M US$	0.2	0.0	0.1	0.0	0.0
Total Project Capital	**45.6**	**M US$**	**4.2**	**7.8**	**16.8**	**7.7**	**9.1**
Exploration	**1.6**	M US$	0.2	0.2	0.2	0.4	0.6
Reclamation and Closure	**0.2**	M US$	0.1	0.0	0.0	0.0	0.0
Total Capital Cost	**50.7**	**M US$**	**5.2**	**8.7**	**17.7**	**8.7**	**10.4**
Before-Tax Cash Flow Results							
Net cash flow (before-tax)	14.7	M US$	7.7	5.7	(9.2)	6.8	3.7
Cumulative discounted cash flow (before-tax)		M US$	7.7	13.4	4.2	11.0	14.7
After-Tax Cash Flow Results							
Net cash flow (after-tax)	14.7	M US$	7.7	5.7	(9.2)	6.8	3.7
Cumulative discounted cash flow (after-tax)		M US$	7.7	13.4	4.2	11.0	14.7

23 ADJACENT PROPERTIES

There are several active and inactive mineral claims adjacent to the Project, as well as an active mining lease in the region.

Unity Resources has one claim group totaling 19 claims. The claims were staked in 2017. There is no reportable activity on the claims.

Fair Haven Resources has three claim groups totaling 39 claims. The claim blocks were staked in 2005 and 2011. Fair Haven is a private company and there is no public information on the Properties.

Triassic Properties Resources has two claim groups totaling 17 claims. The claim blocks were staked in 2003 and 2012. Fair Haven is a private company and there is no public information on the Properties.

New Found Gold Corp has a claim group totaling 15 claims. The claim block was staked in 2015. There is no reported activity on the claims.

Atlantic Zinc Resources has a claim group totaling 32 claims. The claim block was staked n 2017. There is no reported activity on the claims.

Anaconda Mining Inc. operates the Pine Cove gold mine and concentrator in the Baie Verte Mining District approximately 6 km north of the Project. The Property consists of 48 mining claims and two mining leases. In fiscal 2017, the Pine Cove operation milled an average of 1,340 tpd at an average grade of 1.75 g/t gold. The open pit is a truck and shovel operation run by a contract mining company. The concentrator has a flotation circuit which produces a gold-pyrite concentrate that advances to the leach circuit. Leaching is conducted in a series of four 70-cubic-metre mechanically-agitated leach tanks. Two drum filters and a Merrill-Crowe circuit are used for gold recovery from pregnant solution, and cyanide destruction of leach tailings is achieved through the Inco SO_2 process. Anaconda has been active exploring in the region and acquiring additional land packages.

Patrick Laracy, Gary Lewis, Ryan Kalt, and Alex Bailey are individual prospectors who hold claim groups in the region. There is no description of activity for these claims.

24 OTHER RELEVANT DATA AND INFORMATION

There is no other relevant data or information that will impact the Property.

25 OPPORTUNITIES, INTERPRETATION AND CONCLUSIONS

25.1 OPPORTUNITIES

25.1.1 HAULAGE OPTIMIZATION

The project envisages all of the reserve material being hauled to surface with 42-tonne capacity trucks. As there is a decommissioned shaft (the Boundary Shaft) on the Property, there may be an opportunity to reduce mine operating costs by re-activating the shaft with hoisting capacity.

25.1.2 ADDITIONAL LOWER GRADE LFZ M&I RESOURCES

Significant tonnages of lower grade Lower Footwall Zone (LFZ) measured and indicated resource exist outside of the planned reserves defined in this study. The majority of this material has not been sterilized as a result of this study, and as a result is available for extraction should future economic conditions warrant.

25.1.3 INCLUSION OF LFZ BLOCK 2 MATERIAL

There is an opportunity to further defer capital requirements (construction of the pastefill plant, capital development to set up LFZ Block 3) by optimizing the LFZ material in Block 2 to be mined earlier in the mine schedule using longhole bulk mining.

This will allow for the deferral of additional capital beyond Year 4 and will further extend the mine life and increase overall metal production. Further, cut and fill mining will also allow for more waste material to remain underground, reducing the hauling cost associated if the material was first brought and stored on surface.

25.1.4 ORE PRE-CONCENTRATION

The mineralization of the LFZ consists of dense, narrow copper-rich stringer sulphides hosted within lighter weight un-mineralized chlorite schist. The initial phase of bench scale and mini-pilot processing, developed with the assistance of the Research & Development Corporation of Newfoundland and Labrador (RDC), has revealed that physical separation of the denser mineralization from the lighter rock using Dense Media Separation (DMS) is possible. Bench scale and pilot testing indicates that technically the DMS process could increase the grade of copper in the LFZ by removing 30 % to 40 % of the lighter waste host rock with copper recoveries averaging 95 %. In terms of grade improvement, the mini-pilot testing using run of mine material from the LFZ grading 1.39 % copper returned a pre-concentrate grade of 2.27 %copper (an upgrade ratio of 1.63). This technology could be used to extend the reserve base of the operation by upgrading lower grade resources adjacent to existing reserves.

25.1.5 MINERALIZED ZONES OPEN IN MULTIPLE DIRECTIONS

The Ming Mine orebodies remain open in all directions and have been proven to return significant copper and gold intersections with ongoing diamond drill delineation and exploration programs. By expanding on these programs the company is confident that new resources may be added in both the MMS and LFZ. Recent surface exploration drilling completed in 2017 has extended the MNZ and LFZ 550 m down plunge.

25.1.6 TMF REQUIREMENTS ASSESSMENT

Further study of the LOM tailings requirements is recommended to assess the future storage requirements (considering the need for tailings for paste backfill, ARD potential for LFZ tailings, etc.) with respect to potential storage options and their associated costs. This assessment should include a full life cycle analysis of the tailings management options that includes the potentially significant costs associated with environmental assessment and permitting, as well as closure and long-term monitoring requirements.

25.1.7 NUGGET POND HYDROMETALLURGICAL PLANT

The Nugget Pond mill site has a 500-tonne per day gold hydrometallurgical plant located next to the copper concentrator that is not being utilized in this study. With any expansion of Rambler's gold resources or participation in another copper or gold play near to the Nugget Pond milling facility, the idle hydrometallurgical plant could take advantage of any deposit outside the Ming Mine area and operate independently. With the addition of an independent grinding circuit at the copper concentrator, the facility would have the ability to process both copper and gold ores simultaneously.

25.2 RISKS

25.2.1 PROJECT FINANCING

As with all resource development projects there is an inherent risk that the project will not be able to raise the necessary capital to fund any new construction. While Rambler is operating under and generating cash flow from the current phase, there is no guarantee that additional capital funding can be raised for further expansion.

25.2.2 PRECIOUS AND BASE METAL COMMODITY PRICING

This project is exposed to commodity pricing on the world markets, and in fact shows its greatest sensitivity to copper pricing. Tight control on capital and operating spending will alleviate some of the sensitivity to copper pricing, but there does exist a risk that under an extended period of depressed copper markets the LFZ would be marginal to uneconomical. To combat this commodity price risk exposure, the company has the ability to switch between copper production and gold production at its Nugget Pond mill and has exposure to gold resources through interests in other companies in the region.

25.3 CONCLUSIONS

25.3.1 *GEOLOGICAL AND RESOURCE MODELLING*

The conclusions for the geology and resource on the Property are summarized below.

- The Property is 100% owned and controlled by Rambler.
- The Property is analogous to a volcanogenic massive sulphide deposit similar to Buchans, Newfoundland; and Bathurst, New Brunswick.
- Both the hanging wall and mineralized sequences are cut by significant volumes of gabbroic sills and dykes.
- The Ming Massive Sulphide (MMS) consists of three mineral types:
  - massive pyrite ore, which is less than 70% pyrite, with chalcopyrite and minor amounts of galena, sphalerite, and silicate minerals;
  - banded ore consisting of alternating bands of pyrite and chalcopyrite-quartz-actinolite-biotite;
  - massive chalcopyrite-pyrrhotite ore occurring as lenses and layers with up to 80% chalcopyrite.
- The LFZ consists of nebulous zones of disseminated and stringer chalcopyrite-pyrrhotite cutting altered felsic and lesser mafic volcanic rocks.
- Rambler has a strong understanding of the regional and local geology to support the interpretation of the mineralized zones on the Property.
- Mineralization is currently defined in eight zones of various thicknesses over a strike length of the deposit (1806, 1807, MSZ, MNZ, LFZ, , Pillar Remnants).
- Drilling and sampling procedures, sample preparation, and assay protocols conducted by the previous operators were not used in the resource estimate.
- Drilling and sampling procedures, sample preparation and assay protocols conducted by Rambler were generally conducted in agreement with best practices and current standards. Verification of the drillhole collars, surveys, assays, core and drillhole logs indicates Rambler data is reliable.
- The mineral models have been constructed in conformance to industry standard practices.
- The specific gravity value used to determine that tonnage was derived from a larger dataset than used in previous estimates.

25.3.2 *METALLURGY AND MINERAL PROCESSING*

The conclusions for the metallurgy and mineral processing on the Property are summarized below.

- The proposed reserve material could be processed in Rambler's existing conventional flotation concentrator at Nugget Pond, with future upgrades for tailings transfer to and water reclaim from expanded tailings management areas.
- Based on operating experience at Nugget Pond, the MMS and LFZ mineral types are both amenable to conventional flotation to produce a copper-gold concentrate either separately or as a blended feed.
- Typical metallurgical recoveries from the LFZ/MMS blended feed based on operating data from Nugget Pond in 2016 and 2017 have been 96.0% Cu, 65.4% Au, and 66.2% Ag.

25.3.3 MINING

The LFZ reserves were designed on resources achieving a Net Smelter Revenue (NSR) of US$72 or higher. which includes mining, ore haulage to the mill, general and administration, milling, port operations, and royalties.

Both internal and external dilution was applied to all of the longhole stopes. A recovery factor was added to determine how much of the dilution would be sent for milling. The mill feed of the low-grade and dyke material was estimated at 50% and 20% respectively. The balance would be separated out by controlled longhole drilling and blasting and scoop-muck visual inspection/allocation.

The majority of the LFZ ore will come from longhole bulk mining. Paste backfill augmented with waste rock will be required in Year 2020. Prior to that, mill feed from the LFZ will be mined from ore development and post pillar cut and fill mining, where unconsolidated rock fill will be used as backfill.

The current underground mobile equipment fleet, with the exception of the haulage fleet, will support the steady state production of 1,250 mtpd.

Preliminary laboratory testing confirms that it is possible to use the Old Rambler Consolidated Tailings (ORCT) pond material to produce paste backfill.

The unconfined compressive strength (UCS) obtained in laboratory is sufficient for the rock mechanical requirement (400 kPa).

Based on laboratory results, actual information, and various assumptions, a preliminary paste plant and paste distribution network was elaborated. A capital cost and an operating cost were calculated based on this concept.

25.3.4 ENVIRONMENT

RMM has operated, and continues to operate these sites in accordance with the required Federal and Provincial Acts, Regulations, and Guidelines, and maintains an Environmental Management System which includes a number of environmental protection and response plans (e.g., Waste Management, Contingency, MMER Emergency Response, and others), environmental monitoring programs, and other environmental protection measures.

Based on the increase in mineral resources, and as part of RMM’s ongoing operational reviews and planning studies, it has been determined that a number of operational and infrastructure changes are required over the LOM. The key Project change that will require further environmental assessment and permitting is the need for further tailings storage capacity to accommodate LOM tailings production. Other, less significant, changes to buildings, infrastructure, and operational protocols may require some environmental assessment or permitting, however these requirements are expected to be relatively minor.

The phased approach to tailings expansion will likely be required for EA and permitting.

— Expansion to include Camp Pond as a new Tailings Impoundment with the effluent being treated within the existing TMF. Camp Pond has been shown to have no fish presence and therefore it is anticipated that the EA and permitting requirements are relatively straightforward. The process to obtain the necessary EA Release, approvals, and permits commenced in mid-2017 and is ongoing.

— Expansion to include Horseshoe Pond and The Steady as a new Tailings Impoundment and Polishing Pond, respectively. The regulatory timeline for this Phase will be substantially longer (three to four years) as these two waterbodies are known to be productive fish habitat.

Other relatively minor changes to RMM's Project have been presented to the NLDMAE Divisions and NLDNR, and approvals for these changes have either been obtained, or are in progress, and are expected in 2018.

Rambler's Financial Assurance currently place with NLDNR for the existing and approved Rehabilitation and Closure Plan has been updated to reflect the modifications in the Updated 2017 Rehabilitation and Closure Plan, dated December 5, 2017. Additional updates will be required as the TMF expansion proceeds, and if any other substantive changes to the Project are proposed.

25.3.5 ECONOMICS

— The overall economic results indicate that the Project will have positive economic returns and generate approximately $157.1 million net after-tax cash flow ($195.0 million before-tax) over the Project's 20-year mine life.

— Total capital requirements for the Project have been estimated at approximately $120.1 million, with approximately $50.7 million required within the first five years of the Project. These are inclusive of contingency.

— Total operating expenses over the life of the mine are estimated to be approximately $577.9 million.

— At the base case metal prices, the Project's post-tax net present value is estimated at approximately $98.0 million at a discount rate of 5%.

26 REFERENCES

26.1 GEOLOGY

- Burton, D.M., 1982: Geological Report: 1807 Ore Zone, Ming Mine. Internal report prepared for Consolidated Rambler Mines Ltd.
- Burton, D.M., 1982: A Review of the Ming Footwall Zone: Mineral Reserves and Potential. Internal Report Consolidated Rambler Mines Limited.
- Coats, H., 1990, geology and Mineral Deposits of the Rambler Property, In: Metallogenic framework of base and precious metal deposits, Field Trip Guidebook for the 8th IAGOD Symposium. Geological Society of Canada, Open file 2156 p.184-193.
- Darling. G., McKeen, T., Pheeney, P., Weick, R.J., 2012; Ming Mine Project, Preliminary Economic Assessment Report, Newfoundland and Labrador, Canada, Project No. 169511572, Stantec.
- Hibbard, J., 1983: Geology of the Baie Verte Peninsula, Newfoundland Memoir 2, Mineral Development Division, Department of Mines and Energy, Government of Newfoundland and Labrador.
- Kean, B. F., Evans, D. T. W., and Jenner, G. A., (1995): Geology and mineralization of the Lushs Bight Group, Newfoundland Department of Mines and Energy, Report 95-2, 204 p.
- Pilote, J.-L., Piercey, S.J., and Mercier-Langevin, P., 2015, Volcanic architecture and alteration assemblages of the Ming Cu-Au-(Zn-Ag) VMS deposit, Baie Verte, Newfoundland: Implications for Au-enrichment processes and exploration, In: Targeted Geoscience Initiative 4: Contributions to the Understanding of Volcanogenic Massive Sulphide Deposit Genesis and Exploration Methods Development, (ed.) J.M. Peter and P. Mercier-Langevin; Geological Survey of Canada, Open File 7853, p. 197–210.
- Sangster, D.F. and Thorpe, R.I. 1975: Sulphur, lead isotopes prove useful tools in current GSC research on ore deposition, Northern Miner, vol. 61, Number 37, p. B22- B23.
- Szybinski, Z. A., and Jenner, G. A., (1989): Paleotectonic settings of the Ordovician volcanic rocks in the northwestern Dunnage Zone, Newfoundland. Geological Association of Canada – Mineralogical Association of Canada, Program with Abstracts, vol. 13, p. A40.
- Thurlow, J. Geoffrey, P. Geo., Barrett, Steve, Graves, R.M., P. Geo., Mercer, Peter, and Churchill, Rod, P. Geo.: Assessment, Impost and JCEAP Report on 2005 Diamond Drilling and Borehole Transient Electromagnetic Surveys on Mining Leases 141L and 188L; Claim Licenses 8834M (5th and 6th Year) and 10773M (2st Year), Rambler-Ming Property, Baie Verte Peninsula, Newfoundland, NTS 12H16.
- Tuach, J. and Kennedy, J.J., 1978: The Geologic setting of the Ming and other sulphide deposits, Consolidated Rambler Mines, northeast Newfoundland, in Economic Geology, Vol. 73, pp. 192-206
- Williams, H. Colman-Sadd, S.P. and Swinden, H.S. (1988): Tectonic stratigraphic subdivisions of central Newfoundland. In Current Research Part B. Geological Survey of Canada, No. 6 pp. 142-166.
- Williams, H., (1979): Appalachian Orogen in Canada. Canadian Journal of Earth Sciences, Tuzo Wilson Volume, vol. 16, p. 792-807.

Websites

— http://www.worldweatheronline.com/Baie-Verte-weather-averages/Newfoundland-And-Labrador/CA.aspx

— http://www.empr.gov.bc.ca/Mining/Geoscience/MineralDepositProfiles/ListbyDepositGroup/Pages/GMarineVolcanicAssociation.aspx#G06

26.2 METALLURGY

— AMTEL Ltd., "Deportment of Gold in Rambler Rougher Scavenger Tails", Report 10/19, May 13, 2010.

— Met-Solve Laboratories, "Gravity Test Work on Samples Received March 5, 2010" Project MIS1237, April 7, 2010.

— SGS Mineral Services, "An Investigation by QEMSCANTM into the Mineralogical Characteristics of Three Ore Zones from the Baie Verte Peninsula Project", November 8, 2007.

— SGS Canada Inc., "An Investigation into the Grindability Characteristics of Two Samples from the Rambler Project", Project 12348-001 Revision 3, May 20, 2010.

— SGS Canada Inc., "An Investigation into the Recovery of Base Metals from Ore Samples of the Ming Deposit", November 12, 2007.

— Thibault & Associates Inc., "Concentrator Process Development Phase IV Flotation Bench Scale Locked Cycle Test Program", December 19, 2008.

— Thibault & Associates Inc., "Nugget Pond Concentrator Feasibility and Design – Flotation and Gold Recovery Test Program", June 24, 2011.

— Thibault & Associates Inc., "Ming Footwall Gravity Separation Circuit Phase 1: Bench Scale and Pilot Scale Characterization", April 13, 2012.

— Thibault & Associates Inc., "Recovery of Copper from Rambler Footwall Zone Ores - Bench Scale Process Characterization and Economic Assessment", September 16, 2014.

— Thibault & Associates Inc., Ming Mine Footwall Development Dense Media Separation Demonstration Program REV02, December 1, 2015.

— Bench Scale Flotation Reagent and Grind Size Test Program, August 24, 2017 by Thibault & Associates Inc.

— Thibault & Associates Inc. report, Assessment of 2016 DMS Demonstration Plant Trial at Nugget Pond, January 20, 2017.

26.3 MINING

— Ming Copper-Gold Project NI43-101 Technical Report, 29 September 2010 (Rambler, 2010).

— Darling. G., McKeen, T., Pheeney, P., Weick, R.J., 2012; Ming Mine Project, Preliminary Economic Assessment Report, Newfoundland and Labrador, Canada, Project No. 169511572, Stantec.

— Pakalnis & Associates Mining Engineers, Report on Geotechnical Assessment Lower Footwall Zone to Rambler Metals and Mining Canada Ltd., June 26, 2015 File No. RM-03/15 (Pakalnis 2015).

— Pakalnis & Associates Mining Engineers, Internal Report to Rambler Metals and Mining, Scenario Post Pillar Rambler, July 9, 2015.

26.4 ENVIRONMENT

— Rambler Metals and Mining Canada Ltd., 2010, Registration Pursuant to Part X of the Environmental Protection Act for Ming Copper-Gold Mine, Baie Verte, Newfoundland and Labrador, report prepared by Rambler Metals and Mining Canada Ltd.

— Ming Copper-Gold Mine Rehabilitation and Closure plan, Baie Verte, Newfoundland and Labrador December 16, 2010, Stantec Consulting Ltd.

— Ming Copper-Gold Mine Development Plan, Baie Verte, Newfoundland and Labrador, October 5, 2017, Rambler Metals and Mining Canada Ltd.

— Rambler Metals and Mining Canada Ltd., December 2017, Environmental Assessment Registration for Tailings Management Facility Expansion, Ming Copper-Gold Mine, Baie Verte, Newfoundland and Labrador, report prepared by Rambler Metals and Mining Canada Ltd.

— Ming Copper-Gold Mine Rehabilitation and Closure Plan, Baie Verte, Newfoundland and Labrador December 13, 2017, Rambler Metals and Mining Canada Ltd.

27 CERTIFICATES OF QUALIFIED PERSONS

Todd McCracken, P.Geo.

I, Todd McCracken, P.Geo., of Sudbury, Ontario do hereby certify:

- I am a Manager – Mining with WSP Canada Inc. with a business address at 93 Cedar Street, Suite 300, Sudbury, Ontario P3E 1A7.
- This certificate applies to the technical report entitled *Ming Copper-Gold Mine Technical Report Update* (the 'Technical Report').
- I am a graduate of the University of Waterloo (B.Sc. Honours, 1992). I am a member in good standing of Professional Engineers and Geoscientists of Newfoundland and Labrador (License #06763). My relevant experience includes 27 years of experience in exploration and operations, including several years working in volcanic massive sulphide deposits. I am a "Qualified Person" for the purposes of National Instrument 43-101 (the "Instrument").
- My most recent personal inspection of the Property was November 22 to 26, 2014, inclusive, and again from January 12 to 17, 2015, inclusive.
- I am responsible for Sections 1.1, 1.2, 1.3, 1.8, 1.9, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 18.1, 18.3, 23, 24, portions of 25 and 26.1 of the Technical Report.
- I am independent of Rambler Metals & Mining Canada Limited as defined by Section 1.5 of the Instrument.
- I have prior involvement with the Property that is the subject of the Technical Report.
- I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared in compliance with the Instrument.
- As of the date of this certificate, to the best of my knowledge, information, and belief, the sections of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 23rd day of April, 2018 at Sudbury, Ontario.

Original document signed and stamped by Todd McCracken, P.Geo.

Todd McCracken, P.Geo.
Manager - Mining
WSP Canada Inc.

Aubrey Sargeant, P.Eng.

I, Aubrey Sargeant, P.Eng., of Sudbury, Ontario do hereby certify:

- I am a Principal Mining Engineer with WSP Canada Inc. with a business address at 93 Cedar Street, Suite 300, Sudbury, Ontario P3E 1A7.
- This certificate applies to the technical report entitled *Ming Copper-Gold Mine Technical Report Update* (the 'Technical Report').
- I am a graduate of Queen's University, M.Sc. Mining Engineering, 2008. I am a member in good standing of Professional Engineers Ontario and License # 100134207. My relevant experience includes 20 years of experience in engineering and operations, including work in open pit and underground mining for deposits of gold, palladium, nickel and copper] I am a "Qualified Person" for the purposes of National Instrument 43-101 (the "Instrument").
- I have not visited the Property.
- I am responsible for Sections 15, 16 and contributed to portions of sections 1, 21, 25 and 26.3 of the Technical Report.
- I am independent of Rambler Metals & Mining Canada Limited as defined by Section 1.5 of the Instrument.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared in compliance with the Instrument.
- As of the date of this certificate, to the best of my knowledge, information, and belief, the sections of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 23rd day of April, 2018 at Sudbury, Ontario.

Original document signed and stamped by Aubrey Sargeant, P.Eng."

Aubrey Sargeant, P.Eng.
Principal Mining Engineer
WSP Canada Inc.

Joanne Robinson, P.Eng.

I, Joanne Robinson, P.Eng., of Toronto, Ontario do hereby certify:

- I am a Principal Mining Engineer with WSP Canada Inc. with a business address at 2300 Yonge Street, Toronto, Ontario M4P 1EA.
- This certificate applies to the technical report entitled *Ming Copper-Gold Mine Technical Report Update* (the "Technical Report").
- I am a graduate of Queen's University, Bachelor of Science, Mining Engineering, 1997. I am a member in good standing of the Association of Professional Engineers of Ontario (PEO), License Number 100049603 and Professional Engineers of Newfoundland and Labrador (PEGNL), License Number 05208. My relevant experience includes 21 years of experience in with respect to mining engineering in operations and consulting. I am a "Qualified Person" for the purposes of National Instrument 43-101 (the "Instrument").
- I have not visited the Property.
- I am responsible for Sections 1.7, 19, 22, and portions of Section 21 of the Technical Report.
- I am independent of Rambler Metals & Mining Canada Limited, as defined by Section 1.5 of the Instrument.
- I have prior no involvement with the Property that is the subject of the Technical Report.
- I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared in compliance with the Instrument.
- As of the date of this certificate, to the best of my knowledge, information, and belief, the sections of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 23rd day of April, 2018 at Toronto, Ontario.

Original document signed and stamped
by Joanne Robinson, P.Eng.

Joanne Robinson, P.Eng.
Principal Mining Engineer
WSP Canada Inc.

J. Dean Thibault, P.Eng.

I, J. Dean Thibault, of Fredericton, New Brunswick do hereby certify:

— I am a Senior Process Chemical Engineer and Principal of Thibault & Associates Inc. with a business address at 330 Alison Blvd., Fredericton, New Brunswick E3C 0A9.

— This certificate applies to the technical report entitled *Ming Copper-Gold Mine Technical Report Update* (the 'Technical Report').

— I am a graduate of the University of New Brunswick, Chemical Engineering, 1981. I am a member in good standing of Professional Engineers and Geoscientists of Newfoundland (Registration Number 05739). My relevant experience includes 37 years of experience in process flowsheet development and metallurgical / chemical plant design, including base metals precious metals, speciality metals and production of inorganic chemicals for chemical, electronics and battery end use. I am a "Qualified Person" for the purposes of National Instrument 43-101 (the "Instrument").

— My most recent personal inspection of the Nugget Pond Concentrator Property was March 2017 and have been on site at the mine site and concentrator site on various occasions since 2010.

— I am responsible for process design, plant operating assessment and process operating and capital cost assessment which includes Sections 1.4, 1.0,13.0, 17.0, parts of Section 21.2 and 21.2 (pertaining to processing of the feedstock), and 26.2 of the Technical Report as defined herein.

— I am independent of Rambler Metals & Mining Canada Limited as defined by Section 1.5 of the Instrument.

— I have prior involvement with the Property that is the subject of the Technical Report.

— I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared in compliance with the Instrument.

— As of the date of this certificate, to the best of my knowledge, information, and belief, the sections of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 23rd day of April, 2018 at Fredericton, New Brunswick.

"Original document signed and stamped by J. Dean Thibault, P.Eng."

J. Dean Thibault, P.Eng.
Principal / Senior Process Chemical Engineer
Thibault & Associates Inc.

James Powell, P.Eng.

- I am a Senior Project Engineer at GEMTEC Consulting Engineers and Scientists Limited, with a business address at 10 Maverick Place, Octagon Industrial Park, Paradise, NL, A1L 0J1.
- This certificate applies to the technical report entitled *Ming Copper-Gold Mine Technical Report Update* (the 'Technical Report').
- I am a graduate of the University of New Brunswick in Fredericton, NB with a B.Sc. Eng. in Civil Engineering in 1998, and from McGill University of Montreal, QC with an M. Eng. in Mining Engineering in 2005. I am in good standing as a member of the Professional Engineers and Geoscientists, Newfoundland and Labrador (#03986). I have practiced in civil, environmental, geotechnical, and mining engineering continuously since my graduation in 1998. My relevant experience includes technical and project management in a wide range of industrial and mining projects including mine exploration, development, operations, and closure in gold, copper, nickel, and iron ore. I am a 'Qualified Person' for the purposes of National Instrument 43-101 (the 'Instrument').
- My most recent personal inspection of the Property was September 12 to 14, 2017, inclusive, and I have visited the site numerous times since 2009.
- I am responsible for Sections 18.2.4 and 20 of the Technical Report.
- I am independent of Rambler Metals & Mining Canada Limited as defined by Section 1.5 of the Instrument.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared in compliance with the Instrument.
- As of the date of this certificate, to the best of my knowledge, information, and belief, the sections of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 23rd day of April, 2018 at Paradise, Newfoundland and Labrador, Canada.

Original document signed and stamped
by James Powell, M.Eng., P.Eng.

James Powell, M.Eng., P.Eng.
Senior Project Engineer, Vice President Mining
GEMTEC Limited