Report to:

PACIFIC BOOKER MINERALS INC.

Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report

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Report to:

Pacific Booker Minerals Inc.

MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT

March 2009

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GLOSSARY

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^3
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	dBa
Decibel	dB
Degree	°
Degrees Celsius	°C
Diameter	ø
Dollar (American)	US$
Dollar (Canadian)	Cdn$
Dry metric ton	dmt
Foot	ft
Gallon	gal
Gallons per minute (US)	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	"
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
Kilometres per hour	km/h
Kilopascal	kPa
Kilotonne	kt
Kilovolt	kV
Kilovolt-ampere	kVA
Kilovolts	kV
Kilowatt	kW
Kilowatt hour	kWh
Kilowatt hours per tonne (metric ton)	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
Metric ton (tonne)	t
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
Specific gravity	SG
Square centimetre	cm^2
Square foot	ft^2
Square inch	in^2
Square kilometre	km^2
Square metre	m^2
Thousand tonnes	kt
Three Dimensional	3D
Three Dimensional Model	3DM
Tonne (1,000 kg)	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
Year (annum)	a

Abbreviations and Acronyms

Abrasion resistant	AR
Acid base accounting	ABA
Allnorth Consultants Ltd.	Allnorth
Ammonium Nitrate Fuel Oil	ANFO
Ammonium nitrate	AN
Analytical Laboratories Ltd.	Acme
BC Ministry of Energy, Mines, and Petroleum Resources	BC MEMPR
Beacon Hill Consultants Ltd.	Beacon Hill
Biotite feldspar porphyry	BFP

Bond Work Index	BWI
British Columbia	BC
British Columbia Environmental Assessment Act	BCEAA
British Columbia Environmental Assessment Office	BCEAO
Canadian Council of Minister of Environment	CCME
Canadian Dam Association	CDA
Canadian Environmental Assessment Act	CEAA
Canadian Forest Products Ltd.	Canfor
Capital Cost Estimate	CAPEX
Chrisita Enterprises Ltd	Chrisita
Closed circuit television	CCTV
Conservation Data Centre	CDC
Construction Management	CM
Distributed Control System	DCS
Electricity Supply Agreement	ESA
Electromagnetic	EM
Energy and Metals Consensus Forecasts	EMCF
Engineering, Procurement and Construction Management	EPCM
Engineering, Procurement and Construction	EPC
Environmental Assessment Certificate	EAC
Environmental effects monitoring program	EEMP
Environmental Management Plan	EMP
Factor of Safety	FOS
Fixed exchange rates	FXR
Forest Service Roads	FSRs
Free carrier	FCA
Free on Board	FOB
GeoSim Services Inc.	GeoSim
Health and Safety Management Plan	HSMP
Health, Safety and Environmental	HSE
Heating, ventilation, and air conditioning	HVAC
High pressure grinding rolls	HPGR
Input/Output	I/O
International Congress of Large Dams	ICOLD
International Metallurgical and Environmental Inc.	IME
Kaehne Consulting Ltd	Kaehne
Keller Geoservices Ltd.	KGL
Klohn Crippen Berger Ltd.	KCBL
Knight Piésold Consulting	KP
Lake Babine Nation	LBN
Life-of-mine	LOM
London Metal Exchange	LME
Material takeoffs	MTO
Maximum credible earthquake	MCE
Metal Leaching/Acid Rock Drainage	ML/ARD
Metal Mining Effluent Regulations	MMER

Morrison Copper/Gold Project	the Project
National Instrument 43-101	NI 43-101
Nilsson Mining Services	NMS
Non-acid generating	NAG
Noranda Exploration Company	Noranda
Operator Interface Stations	OIS
Pacific Booker Minerals Inc.	PBM
Personal computer Local/Wide Area Network	PC LAN/WAN
Piping and Instrumentation Diagrams	P&ID
Primary Contractor	the Contractor
Probable maximum flood	PMF
Process design criteria	PDC
Process Research Associates Ltd.	PRA
Project Information Centre	e-PIC
Project Management System	PMS
Project Management Team	PMT
Project Procedures Manual	PPM
Qualified persons	QPs
Quality assurance / quality control	QA/QC
Request for Proposal	RFP
Rescan Environmental	Rescan
Resource Inventory Steering Committee	RISC
Rock quality designation	RQD
Rocklabs Ltd.	Rocklabs
Rotating biological contactor	RBC
Run-of-mine	ROM
SAG Power Index	SPI
Semi-autogenous grinding	SAG
Sewage Treatment Plan	STP
SGS Canada Inc.	SGS
Site Mixed Emulsion	SME
Snowden Mining Industry Consultants (PTY) Ltd.	Snowden
Standards deviations	SD
Tailings storage facility	TSF
Three-dimensional	3D
Traditional ecological knowledge	TEK
Traffic and Logistics	T&L
Two-dimensional	2D
Valued ecosystem components	VECs
Wardrop Engineering Inc.	Wardrop
Work breakdown structure	WBS
Workplace Hazardous Materials Information Systems	WHMIS

1.0 SUMMARY

Pacific Booker Minerals Inc.'s (PBM) proposed Morrison Copper/Gold Project (the Project) is located 65 km northeast of Smithers and 35 km north of the village of Granisle in north-central British Columbia (BC). The Project is on the east side of Morrison Lake on Crown land and falls within the traditional territory of the Lake Babine Nation. Access to the Project site is by road with barge access across Babine Lake, which is 50 km south of the site. The Project is approximately 35 km north of the former Bell and Granisle copper/gold mines.

The Morrison mine will be a 30,000 t/d open pit operation with ore processed in a conventional milling plant and the copper/gold concentrate transported to the Port of Stewart for shipment to offshore smelters. Molybdenum concentrate will be trucked from the mine to a refinery location to be confirmed. The mine will produce approximately 224 Mt of tailings and 170 Mt of waste rock.

Two alternatives have been investigated to supply power to the Project. Both originate at the existing BC Hydro Babine Substation located on the west side of Babine Lake in the vicinity of the Granisle Township.

The Morrison deposit was discovered in 1963 by the Norpex Group of Noranda Exploration Company who completed 95 diamond drill holes over a 10 year period that broadly defined the deposit to an approximate depth of 150 m. PBM optioned the property in late 1997 and has completed 96 exploration core holes on the Morrison deposit totalling 26,202 m. The property is owned 100% by PBM. Additional drill test programs for metallurgical samples and geotechnical data have also been carried out.

In September 2006, PBM commissioned a team of engineering consultants to complete the component studies of this Technical Report for the Project. The following consultants were commissioned to complete the component studies for this Technical Report:

- Wardrop Engineering Inc. (Wardrop) – processing, mining, infrastructure, and financial analysis
- GeoSim Services Inc. (GeoSim) – mineral resource estimate
- Nilsson Mining Services (NMS) – mining
- Klohn Crippen Berger Ltd. (KCBL) – tailings handling, water management, and geotechnical design
- Rescan Environmental (Rescan) – environmental
- Kaehne Consulting Ltd. (Kaehne) – electrical power supply

- Chrisita Enterprises Ltd. (Chrisita) – haul route study
- Allnorth Consultants Ltd. (Allnorth) – haul route options analysis
- Butterfield Mineral Consultants Ltd. – markets and contracts.

The mineable reserves, using a 0.2% Cu mining grade cut-off, are estimated to be 224 million tonnes.

Wardrop made use of all metallurgical testwork results developed by the previous operator of the property (Noranda), and additional documentation provided by PBM and its consultants. The information available from the earlier work (1970 to 2002) was reviewed and reinforced by supplementary data developed from year 2002 to 2008. SGS Canada Inc. (SGS) was contracted by PBM to develop comminution and flotation studies to be used as the basis for mill process design.

SGS conducted the flotation test and determined that a saleable copper concentrate could be produced using conventional comminution and flotation process. The flotation circuit includes rougher/scavenger mechanical cells followed by regrinding and two cleaning stages. The first cleaner cells will be mechanical and stages two will be column cell.

The processing plant design is based on a 30,000 t/d mill capacity. Samples from the diamond drill cores from exploration work have been used for analysis and extensive metallurgical tests. The previous information developed by Beacon Hill Consultants (preliminary Assessment) in 2004, Noranda, IME, PRA, SGS Canada (grinding and flotation test results, 2005, 2006, and 2007) and the more recent results from high pressure grinding rolls (HPGR) pilot testing conducted by Polysius in Germany, who were contracted by PBM, were used to develop the process plant design for this project.

The recent flotation tests at SGS confirmed the work reported in the previous studies and confirmed that a copper concentrate grading 25.1% to 26.5% Cu, 9.00 g/t Au, and 75.00 g/t Ag can be produced. An overall Cu recovery of 84.0% was achieved using a conventional crushing, grinding, and flotation process.

While not all ore samples tested contained significant amounts of molybdenum, when present, it recovered well into a bulk cleaner concentrate. Limited molybdenum flotation testing on bulk cleaner concentrate demonstrated that a Mo concentrate in excess of 50% Mo could be achieved with a reasonably high stage recovery.

A trade-off study to evaluate potential economic and technical benefits of using HPGR in place of conventional SAG milling was completed and showed a significant savings in power and consumable costs. HPGR pilot tests results confirmed that HPGR is suitable for the Morrison material. The other benefit of applying HPGR in the comminution circuit is high mechanical availability. The favourable results obtained from this study confirmed the benefit of incorporating HPGR into the Morrison comminution circuit.

Wardrop used the SGS and Polysius test results for Morrison process design. The reports produced by SGS and Polysius are included as appendices in the Wardrop report to PBM entitled "Morrison Copper/Gold Project Feasibility Study Volume 1 – Process Plant, Mining, and Infrastructure" dated February 2009.

KCBL has completed the design of a cyclone sand tailings dam, which will be sufficient for the duration of mine life. It is sited upstream of the proposed mill site. Locations for waste dumps have been selected to be compatible with plans for surface water management, which include a seepage recovery dam and pond downstream of the main dam structure.

The general information of the Project is summarized below:

- Mine Life..21 years
- Milling Rate ....30,000 t/d
- Strip Ratio ....0.82 t waste/1.0 t ore
- Tonnage Milled..224 Mt
- Total Copper Concentrate Production (dry)......2,345,188 t
- Pre-production Capital ....Cdn$516,684,042
- Average Operating Cost ....Cdn$8.15/t milled.

A pre-tax economic model has been developed from the estimated costs and the open pit production schedule. The base case has an IRR of 20.05% and an NPV of Cdn$495.9 M at an 8% discount rate for the 21-year mine life. The payback of the initial capital is within 4.2 years.

2.0 INTRODUCTION

This National Instrument 43-101 (NI 43-101) compliant report has been prepared by Wardrop based on work by the following independent consultants:

- SGS
- Polysius
- GeoSim
- NMS
- KCBL
- Rescan
- Kaehne
- Chrisita
- Allnorth
- Butterfield

Hassan Ghaffari (P.Eng.) and Peter Wells (SAIMM (Fellow)) visited the site on behalf of Wardrop on September 25, 2006.

A summary of the qualified persons (QPs) responsible for each section of this report is detailed in Table 2.1. Certificates of QPs are included in Section 22.0.

Table 2.1 Summary of QPs

Report Section	Company	QP
1.0 – Summary	Wardrop	Hassan Ghaffari
2.0 – Introduction	Wardrop	Hassan Ghaffari
3.0 – Reliance on Other Experts	Wardrop	Hassan Ghaffari
4.0 – Property Description and Location	GeoSim	Ron Simpson
5.0 – Accessibility, Climate, Local Resources, Infrastructure and Physiography	GeoSim	Ron Simpson
6.0 – History	GeoSim	Ron Simpson
7.0 – Geological Setting	GeoSim	Ron Simpson
8.0 – Deposit Types	GeoSim	Ron Simpson
9.0 – Mineralization	GeoSim	Ron Simpson
10.0 – Exploration	GeoSim	Ron Simpson
11.0 – Drilling	GeoSim	Ron Simpson

table continues…

Report Section	Company	QP
12.0 – Sampling Method	GeoSim	Ron Simpson
13.0 – Sample Preparation, Analysis and Security	GeoSim	Ron Simpson
14.0 – Data Verification	GeoSim	Ron Simpson
15.0 – Adjacent Properties	GeoSim	Ron Simpson
16.0 – Mineral Processing and Metallurgical Testing	Wardrop	Hassan Ghaffari
17.0 – Mineral Resource & Mineral Reserve Estimation	GeoSim	Ron Simpson
18.0 – Additional Requirements for Development and Production Properties		
18.1: Mining Operations	Wardrop/ NMS	Paul R. Franklin/ John Nilsson
18.2: Process Plant	Wardrop	Hassan Ghaffari
18.3: On-site Infrastructure	Wardrop	Peter Wells
18.5: Water Management Plan	KCBL	Harvey McLeod
18.6: Waste Management Plan	KCBL	Harvey McLeod
18.7: Geotechnical Design	KCBL	Terence Jibiki
18.8: Project Execution Plan	Wardrop	Peter Wells
18.11: Environmental	Rescan	Rolf Schmitt
18.12: Taxes	PBM	N/A
18.13: Capital Cost Estimate	All	P. Wells/H. McLeod/ P.R. Franklin/H. Ghaffari
18.14: Operating Cost Estimate	All	H. Ghaffari/H. McLeod/ P.R Franklin
18.15: Financial Analysis	Wardrop	M. Vicentijevic
18.15.4: Markets and Contracts	Butterfield	N/A
19.0 – Interpretations and Conclusions	N/A	N/A
20.0 – Recommendations	N/A	N/A
21.0 – References	N/A	N/A

3.0 RELIANCE ON OTHER EXPERTS

Technical data provided by PBM for use by Wardrop in this report is the result of work conducted, supervised, and/or verified by PBM professional staff or their consultants. Wardrop provides no guarantees or warranties with respect to the reliability or accuracy of information provided by third-parties.

As outlined in Section 2.0, this Technical Report has been completed by independent consulting companies. Certificates of QPs are included in Section 22.0. The author of this Technical Report disclaims responsibility for reliance on information provided by the following experts who are not Qualified Persons:

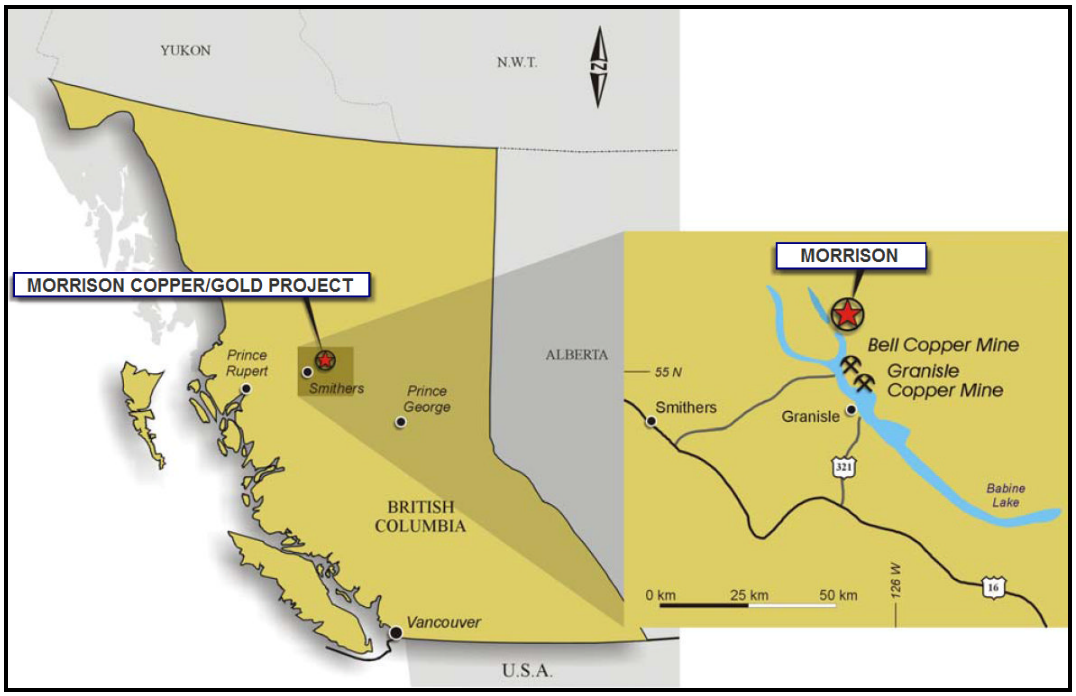
- Butterfield has been relied on for advice on matters relating to market and contracts. Specifically, Butterfield's report, entitled *Market and Contracts – Pacific Booker Minerals* dated February 27, 2009, has been relied on.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 LOCATION

The Morrison Copper/Gold Project is located in the Babine Lake Region of central BC, approximately 65 km northeast of the town of Smithers and 35 km north of the village of Granisle (Figure 4.1). Coordinates for the Project are 55°11'24"N latitude and 126°19'7"W longitude and the NTS map sheet that covers the area is 93M01/W. UTM coordinates are 6119215N, 670691E, Zone 9.

Figure 4.1 Location Map



4.2 MINERAL RIGHTS

PBM's land position consists of 45 contiguous claims totalling 12,027 ha, as listed in Table 4.1 and shown in Figure 4.2. This ground position includes the Morrison Property (20 units in 1 claim – ERIN 1) and the Hearne Hill Property (378 units in 27 claims). All claims are located within the Omineca Mining Division.

A former owner of the Hearne 1 and 2 claims commenced legal proceedings against PBM asserting that an option agreement on the two claims was no longer in effect. The court case was settled in October 2008 in favour of PBM. Under the terms of the settlement, PBM retains surface rights to the Hearne 1 and 2 claims but no longer has the mineral rights.

On September 8, 2006, PBM made a final cash payment to Falconbridge Limited (formerly Noranda) for the Morrison Property. The Morrison Property is not subject to any net smelter returns.

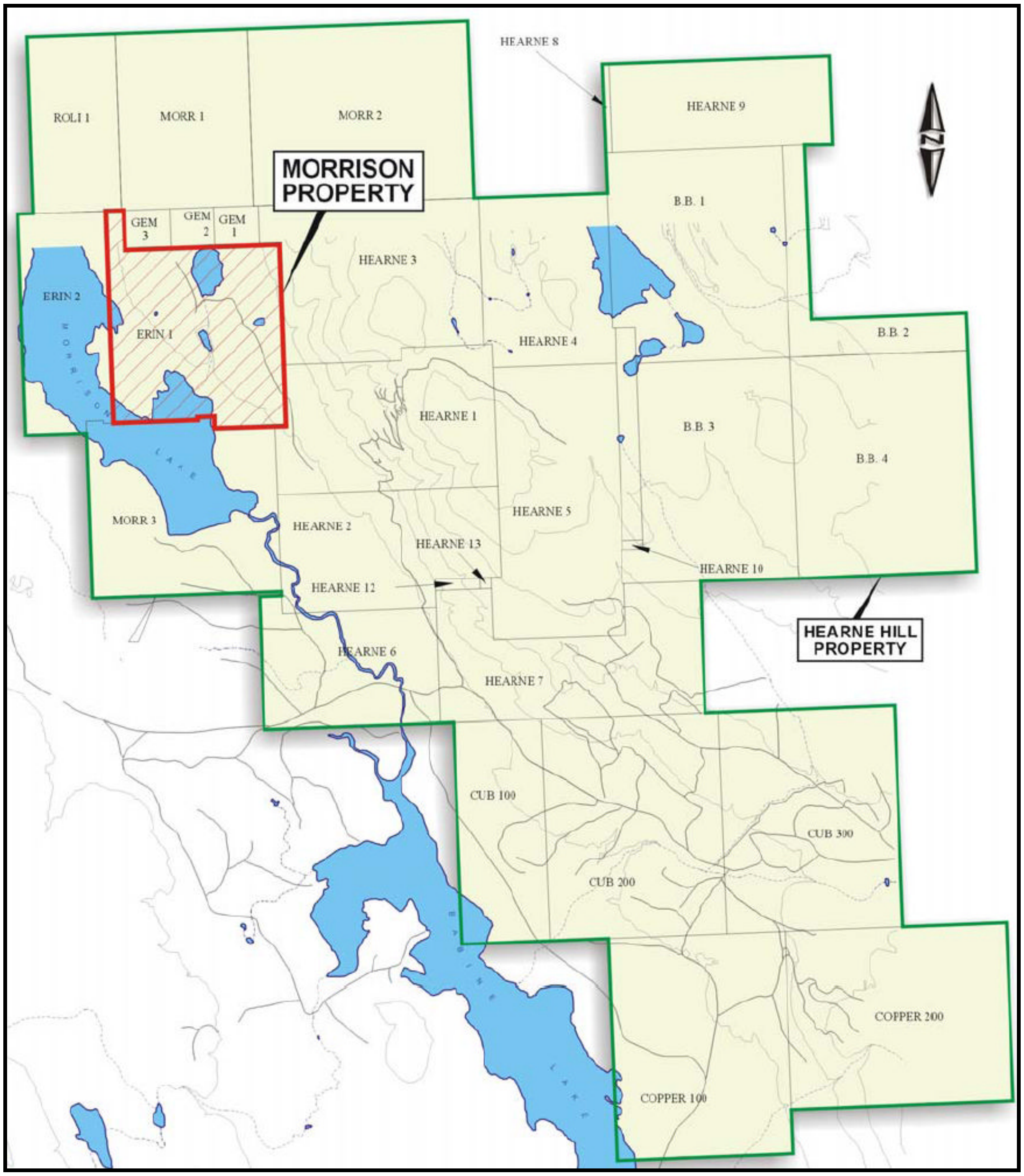
Table 4.1 Morrison Mineral Claims

Tenure #	Claim Name/ Property	Issue Date	Good To Date	Area (ha)
341509	CUB 200	13-Oct-95	15-Sep-16	500
341510	CUB 300	13-Oct-95	15-Sep-16	500
341511	COPPER 200	13-Oct-95	15-Sep-16	500
341512	COPPER 100	13-Oct-95	15-Sep-16	500
341513	CUB 100	13-Oct-95	15-Sep-16	250
341551	B.B. 1	19-Oct-95	15-Sep-16	500
341552	B.B. 2	24-Oct-95	15-Sep-16	500
341553	B.B. 3	19-Oct-95	15-Sep-16	500
341554	B.B. 4	24-Oct-95	15-Sep-16	500
347037	HEARNE 3	20-Jun-96	15-Sep-16	500
347038	HEARNE 4	20-Jun-96	15-Sep-16	300
347039	HEARNE 5	18-Jun-96	15-Sep-16	450
347040	HEARNE 6	20-Jun-96	15-Sep-16	300
347041	HEARNE 7	20-Jun-96	15-Sep-16	450
347042	HEARNE 8	19-Jun-96	15-Sep-16	225
347043	HEARNE 9	19-Jun-96	15-Sep-16	375
347046	HEARNE 10	20-Jun-96	15-Sep-16	25
347047	HEARNE 11	20-Jun-96	15-Sep-16	25
348735	HEARNE 12	25-Jul-96	15-Sep-16	25
348736	HEARNE 13	25-Jul-96	15-Sep-16	25
353315	GEM 1	22-Jan-97	15-Sep-16	25
353316	GEM 2	22-Jan-97	15-Sep-16	25
353317	GEM 3	22-Jan-97	15-Sep-16	25
366985	MORR 1	10-Nov-98	15-Sep-16	300
366986	MORR 2	16-Nov-98	15-Sep-16	500
366987	MORR 3	12-Nov-98	15-Sep-16	500
383070	ERIN 1	21-Nov-00	15-Sep-16	500
383071	ERIN 2	20-Nov-00	15-Sep-16	250
390461	ROLI 1	11-Oct-01	15-Sep-16	200
415198	RM 1	20-Oct-04	15-Sep-16	25
415199	RM 2	20-Oct-04	15-Sep-16	25

table continues…

Tenure #	Claim Name/ Property	Issue Date	Good To Date	Area (ha)
415200	RM 3	21-Oct-04	15-Sep-16	25
415201	RM 4	21-Oct-04	15-Sep-16	25
415202	RM 5	21-Oct-04	15-Sep-16	25
415210	RM 6	21-Oct-04	15-Sep-16	25
415211	RM 7	27-Oct-04	15-Sep-16	25
415212	RM 8	27-Oct-04	15-Sep-16	25
415213	RM 9	27-Oct-04	15-Sep-16	25
520533	PIONEER 1	28-Sep-05	15-Sep-16	405.85
520538	PIONEER 2	28-Sep-05	15-Sep-16	442.76
520540	PIONEER 3	28-Sep-05	15-Sep-16	387.21
520541	PIONEER 4	28-Sep-05	15-Sep-16	461.05
520542	PIONEER 5	28-Sep-05	15-Sep-16	442.47
520543	PIONEER 6	28-Sep-05	15-Sep-16	239.66
521491	PIONEER 7	25-Oct-05	15-Sep-16	147.64

Figure 4.2 Claim Location Map



4.3 PERMITS AND ENVIRONMENTAL LIABILITIES

Exploration work on mineral properties in BC requires the filing of *A Notice of Work and Reclamation* with the Ministry of Energy and Mines. The issuance of a permit facilitating such work may involve the posting of a reclamation bond. Permits for the 2005 and 2006 exploration work programs were obtained with no undue delays. Reclamation bonds totalling $118,600 have been posted by PBM.

Environmental base line studies within the property area have been ongoing since 2001. These include hydrological measurements on tributary creeks, water quality sampling from creeks and drill holes, wildlife observations, fisheries background studies, and acid rock drainage investigations. In 2006, PBM retained Rescan to consolidate prior studies and to review outstanding requirements to complete the Project Terms of Reference requirements coordinated by the BC Environmental Assessment Office (BCEAO). In 2007 and 2008, the following remaining studies were completed:

- archaeological impact assessment
- soil mapping for reclamation planning
- metal leaching and acid rock drainage prediction and mitigation design
- traditional use and traditional knowledge
- groundwater assessment and modelling
- aquatic biology.

Monitoring of water quality and meteorological conditions will continue. Additional studies may be required along portions of the proposed transportation and power line access corridors. The scope of environmental studies is communicated to the BCEAO Project Working Group and Lake Babine Nation for their input. Collaboration with agencies, such as Fisheries and Oceans Canada on fish habitat assessments, is occurring. Preparation of the Environmental Assessment Certificate Application will follow completion of environmental field assessments.

Geosim is not aware of any specific environmental liabilities to which the various mineral claims are subject. The Morrison Property is situated in an area where mining-related activities have been underway for more than 40 years.

4.3.1 *Environmental Assessment Certificate Application*

The Morrison Copper/Gold Project is classified as a major mine in BC and subject to review under the Environmental Assessment Act. The BCEAO issued the Morrison Project Section 10 Order to PBM on September 30, 2003 confirming review under the Act. Under the terms of a joint provincial–federal agreement, the BCEAO and Canadian Environmental Assessment Agencies (CEAA) will harmonize their respective consultation and review requirements for the Project.

Following the Section 10 Order, early project definition and pre-application activities commenced. A multi-stakeholder Project Working Group was formed in May 2006 and is overseeing the review and finalization of a Project Terms of Reference for the Environmental Assessment Certificate (EAC) Application, as well as providing guidance on consultations with the Lake Babine Nation and public on input on input to the Terms of Reference and confirmation of environmental work plans. Approval of the Project Terms of Reference and issuance of the Section 11 Order by the

BCEAO, specifying formal consultation requirements with agencies, First Nations, and public during preparation, submission, and review of the EAC Application are anticipated in the first quarter of 2009.

Development of the EAC Application will occur in early 2009 following completion of the environmental fieldwork and impact assessment, concurrent with completion of the Project Feasibility Study. Once the completed Application is screened by the BCEAO and accepted as conforming to the Project Terms of Reference, formal review will be initiated and must be completed in 180 days. At the conclusion of the 180 day review period, the BCEAO submits an Assessment Report with recommendations to Ministers who will determine whether to issue the EAC within 45 days. It is PBM's goal to be in receipt of an EAC in the latter half of 2009.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCE, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 ACCESS, LOCAL RESOURCES, AND INFRASTRUCTURE

Access to the property is via a well-maintained network of provincial highways and privately operated logging roads. From the village of Topley on Highway 16, access to the property is gained by following provincial Highway 118 for 46 km north to Michelle Bay. A barge, operated by Babine Barge Ltd. for Canadian Forest Products Ltd. (Canfor) and other commercial users, is then taken to Nose Bay on the eastern side of Babine Lake (an approximately 15-minute trip). From Nose Bay, a network of main haulage logging roads provides access to the east side of Babine Lake. The Morrison Property is located approximately 48 km northwest of the barge landing. Figure 5.1 is a Landsat image of the area showing major access roads in the area.

Electrical power for the Project will be supplied by BC Hydro from the Babine Substation located on the west side of Babine Lake in the vicinity of the village of Granisle. BC Hydro has completed a System Survey Study (SNC Lavelin) to investigate load interconnection options and identify facilities required. A transformer upgrade will be required at the Babine Substation in order to provide 30-35 MW power at 138 kV.

Power from BC Hydro will be delivered to the Morrison mine site via existing and new transmission lines. PBM will extend the line from the Bell Mine site, located on Newman Peninsula. The 138 kV service, which was extended to the Bell Mine in 1971, is now energized at 25 kV but has been tested to confirm that it can be re-energized to its design voltage. Appropriate arrangements will be negotiated with Xstrata (formerly Falconbridge) and BC Hydro.

BC Hydro has indicated that 2 MW of power at 25 kV is available immediately without any upgrades to their facilities. PBM intends to construct the new power transmission line and a temporary substation early in the pre-production period to make this power available during construction. The power will be converted from 25 kV to 138 kV to provide sufficient power for production. In addition to the power supplied by BC Hydro, diesel fuel fired electrical generator sets will also be considered to provide:

- some construction power during the pre-production period
- emergency/backup power during production.

An opportunity will also be considered to generate as much as 500 kW of power using a turbine on the reclaim water pipeline. This opportunity exists as the tailings storage facility is in excess of 150 m above the plant site.

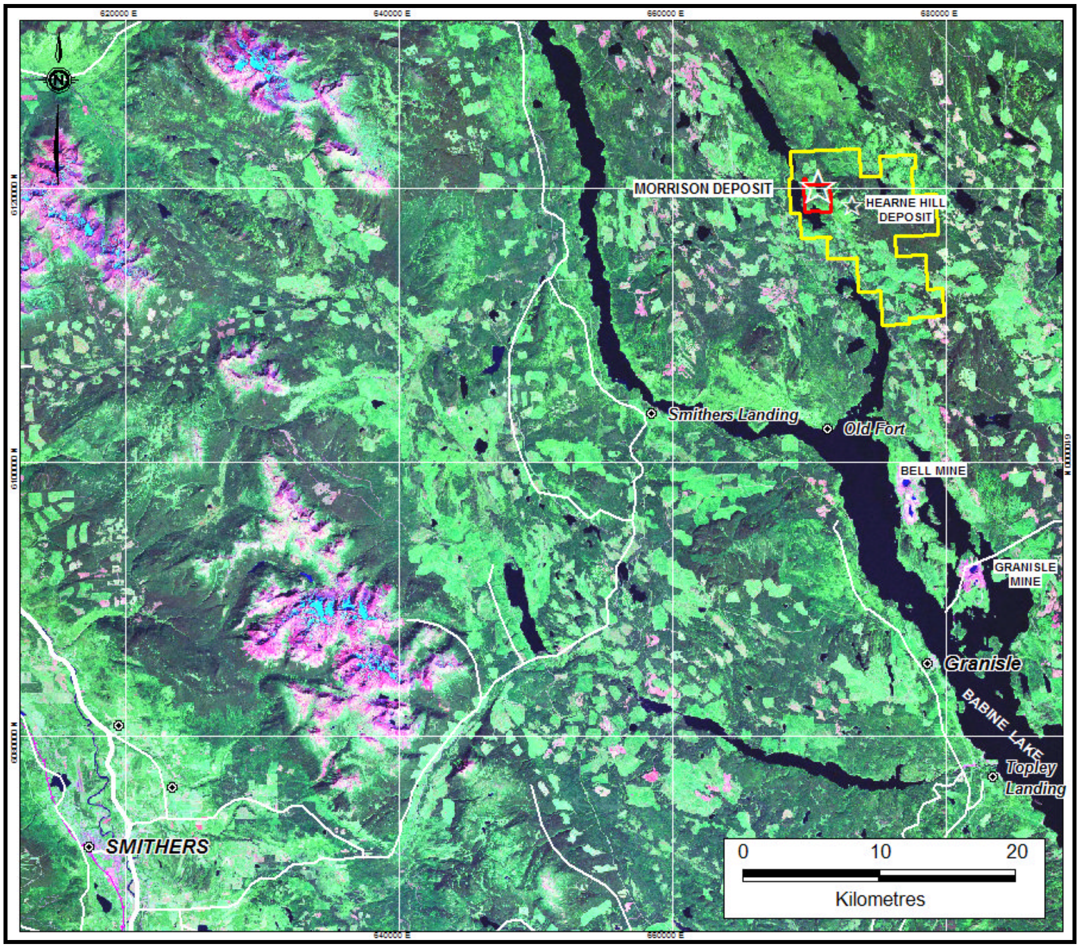
The nearby centres of Prince George, Burns Lake, Houston, and Smithers (populations of 83,000, 2,100, 3,200, and 5,200, respectively) have provided all the necessary supplies and services to operate past exploration programs. All of these communities have a strong mining history. Prince George is the regional centre with a mineral resource sector economic base.

5.2 PHYSIOGRAPHY

The Babine Lake region forms part of the rolling uplands of the Nechako Plateau within the Intermontane Belt of central BC. Block faulting has dissected the region into a basin and range morphology consisting of northwesterly-trending ridges and valleys. The major depressions are filled with long, narrow, and deep lakes, the largest of which is Babine Lake. Morrison Lake lies to the northwest of Hatchery Arm of Babine Lake and occupies the same valley. Elevations in the property area range from 733 m on the shore of Morrison Lake, to 1380 m on Hearne Hill. The eroded scarp of the Morrison Fault forms the eastern flank of the Morrison graben. All ground in the area is below the tree line and forested with variable proportions of spruce, pine, aspen, and poplar. Willow bushes commonly are the predominant understory plant.

Climatically, the area experiences distinct seasonal changes. Winters are the most extreme season, starting in late November and extending until March or April, with a typical snow pack reaching depths of 1.0 to 1.6 m. Temperatures during this period are commonly below freezing and can fall as low as -30°C for short periods of time. Such winter conditions do not limit the length of the operating season; however, the transportation of heavy materials is limited on highways and logging roads during the spring thaw (March - April), when axle limits on large trucks can be reduced to 70% or even 50% of legal limits.

Figure 5.1 Landsat Image (circa 2000)



6.0 HISTORY

The Morrison Property was discovered and initially explored in the early 1960s during the initial rush of porphyry copper exploration in the Babine Lake region. Regional stream sediment sampling in 1962 by the Norex Group of Noranda led to the discovery of the Morrison deposit in 1963. Critical early work on the discovery was carried out by L. Saunders, R. Woolverton, and D.A. Lowrie (Woolverton, 1964).

Noranda reports that in 1963, while following up on anomalous copper stream sediment results collected in 1962, copper-bearing biotite feldspar porphyry (BFP) as float and outcrop were found in a stream that flows over the copper zone of the Morrison deposit. Trenching of the thin overburden uncovered large areas by of relatively unweathered chalcopyrite-bearing bedrock on both sides of the stream (650 m by 250 m on the west side and 250 m by 250 m on the east side), where a copper soil geochemical anomaly had been defined.

Further delineation of the deposit took place during the period 1963 to 1973 and included soil geochemical, electromagnetic (EM), magnetic, and IP surveys together with trenching, geological mapping, alteration studies and 13,890 m of diamond drilling. The drilling, which utilized the magnetic surveys as a guide in early programs, consisted of 95 diamond drill holes, most inclined at -45° and oriented east or west. The first 65 holes were AEX (27 mm) diameter. The remaining 30 were BQ (36.5 mm) diameter. By 1968, diamond drilling had defined two zones immediately northwest and southeast of a small central pond. The position of these zones corresponds closely to the strong copper geochemical and magnetic anomalies previously outlined during Noranda's earlier surface exploration.

Geological mapping in 1963 and 1967 indicated the possibility that the two zones might be off-set segments of a single faulted deposit. Hydrothermal alteration studies initiated in 1967 showed that the deposit had well-defined biotite-chlorite zoning and that biotitization was very closely related to copper grades. Although data were sparse, biotitization in the large, poorly tested area between the two known zones appeared to be widespread and strong, indicating that this area had the potential to be mineralized. Drilling in 1970 to test this central area was successful in defining mineralization and better establishing the limits of the fault offset portions of the copper zone. This increased the known lateral extent of the deposit significantly.

Following the 1973 drill program, Noranda did no further field work at Morrison. In 1988, Noranda investigated the gold content of the deposit by assaying 477 composite samples. Noranda completed preliminary pit design and operating studies in 1988 and 1990. The purpose of the studies was to establish whether Morrison could supply feed to the Bell Mine; however, Noranda concluded that, at that time, such an operation would not be economic.

According to the documents provided by PBM, no further work was done on the Morrison Property until Booker Gold Exploration (now Pacific Booker Minerals Inc.) optioned the property and initiated exploration programs in late 1997 with a till geochemical survey.

Between 1998 and 2003, PBM completed surface backhoe trenching and 82 diamond drill holes totalling 25,245 m within the limits of the Morrison deposit previously drilled by Noranda. In 2005, four additional exploration holes (957 m) were completed and four large-diameter PQ (76 mm) holes (700 m deep) were drilled for metallurgical samples twinning older holes. Seven geotechnical holes (1,464 m) were completed in 2006 and assayed the following year. Between 2006 and 2008, 35 condemnation/geotechnical holes (1,175 m) were completed in outlying areas that were regarded as potential plant, waste, and tailings sites. These holes were logged but not assayed as no visible copper mineralization was encountered. Twenty-two holes were drilled specifically for water monitoring in 2007-2008. Core from one of these holes was sampled and assayed as it was located in the proposed pit area.

6.1 HISTORIC RESOURCE ESTIMATES

The earliest published resource estimate for the Morrison deposit is presented by Carson and Jambor (1976) in CIM, Special Volume 15, as part of their geological studies on the Morrison Project. The resource is stated in their technical paper as "geological reserves" of approximately 86 Mt averaging 0.42% Cu, calculated at a cut-off grade of 0.30% Cu. This resource evaluation was based on 95 diamond drill holes. There is no description on the evaluation method, resource/reserve classification scheme, and as to whether a preliminary pit design and economic study were undertaken to define this resource as a geological reserve.

A resource model of the Morrison deposit based on the 95 Noranda diamond drill holes was developed in 1992 (Ogryzlo et al., 1995). This estimate included the addition of gold assays from pulp composites from the old Noranda drilling. The mineralized zones were defined into specific geological domains based on geological controls and grade distribution within the deposit, and an inverse distance block model at various copper cut-off grades was developed to generate preliminary resource estimates. The indicated and inferred resources were calculated at 190 Mt grading 0.40% Cu and 0.21 g/t Au to a depth of 300 m at a cut-off grade of 0.30% Cu. An open pit resource based on a 0.75:1 waste to ore strip ratio was estimated at 58 Mt at 0.41% Cu and 0.21 g/t Au. The classification scheme for these resource estimates is not defined, but it probably conformed to the methods applied for resource and reserve estimations at the Bell Mine.

In 2002, Ed Kimura completed a manual polygonal resource estimate based on geological interpretation and modelling of the Morrison deposit on 14 cross-sections (Kimura, 2002). In a separate procedure, the sectional geological models were converted into three-dimensional wire frames by SNC Lavalin; this model was, in turn, developed into a 12 m by 12 m block model with geostatistically-generated block grades. Preliminary open pit configurations were developed from the geostatistical block model by Snowden Mining Industry Consultants (Pty) Ltd. (Snowden).

The preliminary pit designs and resource estimates were based on metal prices of US$0.70/lb Cu and US$324/oz Au and estimated recoveries of 85% and 65%, respectively. The results at a 0.3% Cu cut-off grade are shown in Table 6.1.

Table 6.1 2002 Polygonal Resource Estimate by Kimura

	Ultimate Pit			Optimized Pit		
Classification	**Tonnes**	**% Cu**	**g/t Au**	**Tonnes**	**% Cu**	**g/t Au**
Measured	43,700,000	0.46	0.22	8,100,000	0.53	0.27
Indicated	18,400,000	0.46	0.22	4,300,000	0.54	0.24
Meas. + Ind.	**62,100,000**	**0.46**	**0.22**	**12,400,000**	**0.53**	**0.26**
Inferred	8,900,000	0.52	0.21	2,800,000	0.65	0.22

In 2003, Snowden completed a resource estimate and preliminary pit optimization study of the deposit. Their kriged resource estimate reported at a cut-off grade of 0.3% Cu and is shown in Table 6.2.

Table 6.2 Snowden Kriged Mineral Resource Estimate

Category	Tonnes (Mt)	Cu%	Au g/t
Measured	80.3	0.44	0.20
Indicated	35.0	0.43	0.19
Meas. + Ind.	**115.3**	**0.44**	**0.20**
Inferred	49.8	0.44	0.20

Snowden’s preliminary pit optimization used metal prices of US$0.85/lb copper and US$325/oz gold and respective recoveries of 88% and 65%. Results of the ‘most likely’ case were 79.3 Mt grading 0.42% Cu and 0.2 g/t Au with a strip ratio of 0.54.

In 2004, Beacon Hill Consultants (1988) Ltd. (Beacon Hill) completed a Preliminary Assessment on the Morrison and Hearne Hill deposits. The resource estimate reported at a cut-off grade of 0.3% Cu and is shown in Table 6.3.

Table 6.3 Beacon Hill 2004 Kriged Mineral Resource Estimate

Category	Tonnes (Mt)	Cu %	Au g/t
Measured	55.6	0.465	0.26
Indicated	30.0	0.428	0.26
Meas. + Ind.	**85.6**	**0.452**	**0.257**
Inferred	1.2	0.36	0.26

Beacon Hill's pit optimization used metal prices of US$0.90/lb Cu and US$350/oz gold and recoveries of 88% Cu and 70% Au. A two-phase pit was recommended with the total ore extracted amounting to 86.9 Mt grading 0.45%Cu and 0.257 g/t Au with an ultimate strip ratio of 1.44. The waste portion included potential low-grade stockpile material amounting to 28.15 Mt with a grade of 0.278% Cu and 0.123 g/t Au.

Beacon Hill concluded that there is potential for a viable open pit mine and that a 25,000 t/d production rate was the most economically attractive option at the time.

In April 2007, an updated mineral resource was completed by GeoSim. At a 0.3% copper equivalent copper cut-off, the Morrison deposit was estimated to contain a measured and indicated resource of 206.9 Mt averaging 0.39% Cu, 0.2 g/t Au, and 0.005% Mo. An additional 56.5 Mt grading 0.4% Cu, 0.21 g/t Au, and 0.005% Mo was classified as inferred.

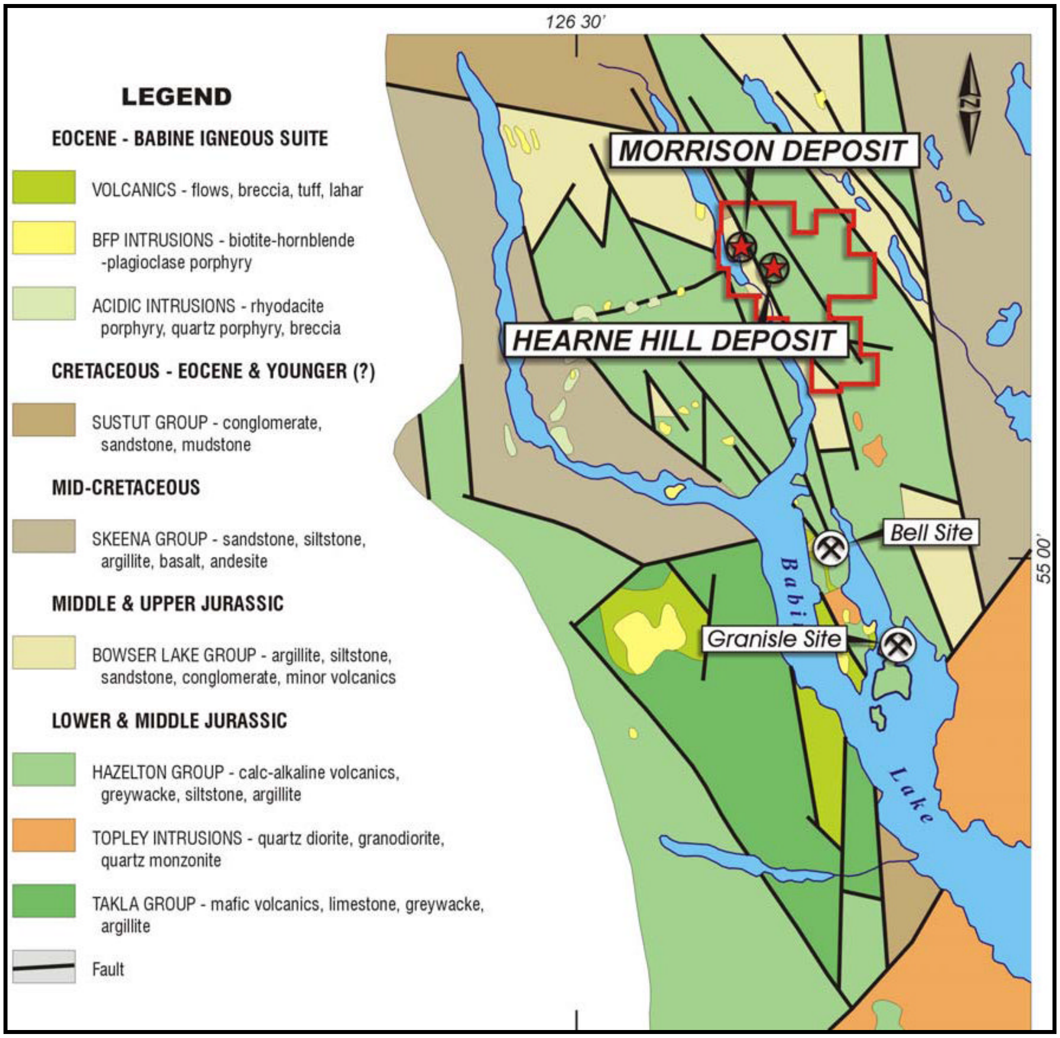
7.0 GEOLOGICAL SETTING

7.1 REGIONAL GEOLOGY

The Morrison deposit is situated on the northern edge of the Skeena Arch in a region underlain by volcanic, clastic, and epiclastic rocks ranging in age from the Lower Jurassic to Lower Cretaceous, including the Takla Group, Hazelton Group, Bowser Lake Group, Skeena Group, and Sustut Group (Carter, 1976). The rock units are disrupted by a series of dominantly north to northwesterly-trending faults into uplifted blocks, downfaulted grabens, and tilted fault blocks. This has resulted in older lithologic units being juxtaposed and locally truncated against younger rock units (Figure 7.1).

Intrusive rocks in the area include the Early Jurassic diorite and granodiorite Topley Intrusions, Eocene rhyolite and rhyodacite intrusions, and most importantly from an economic viewpoint, the Eocene Babine Igneous Suite which consists of quartz, hornblende, biotite, and plagioclase phyric intrusions (Carson and Jambor,1976).

Figure 7.1 Regional Geology



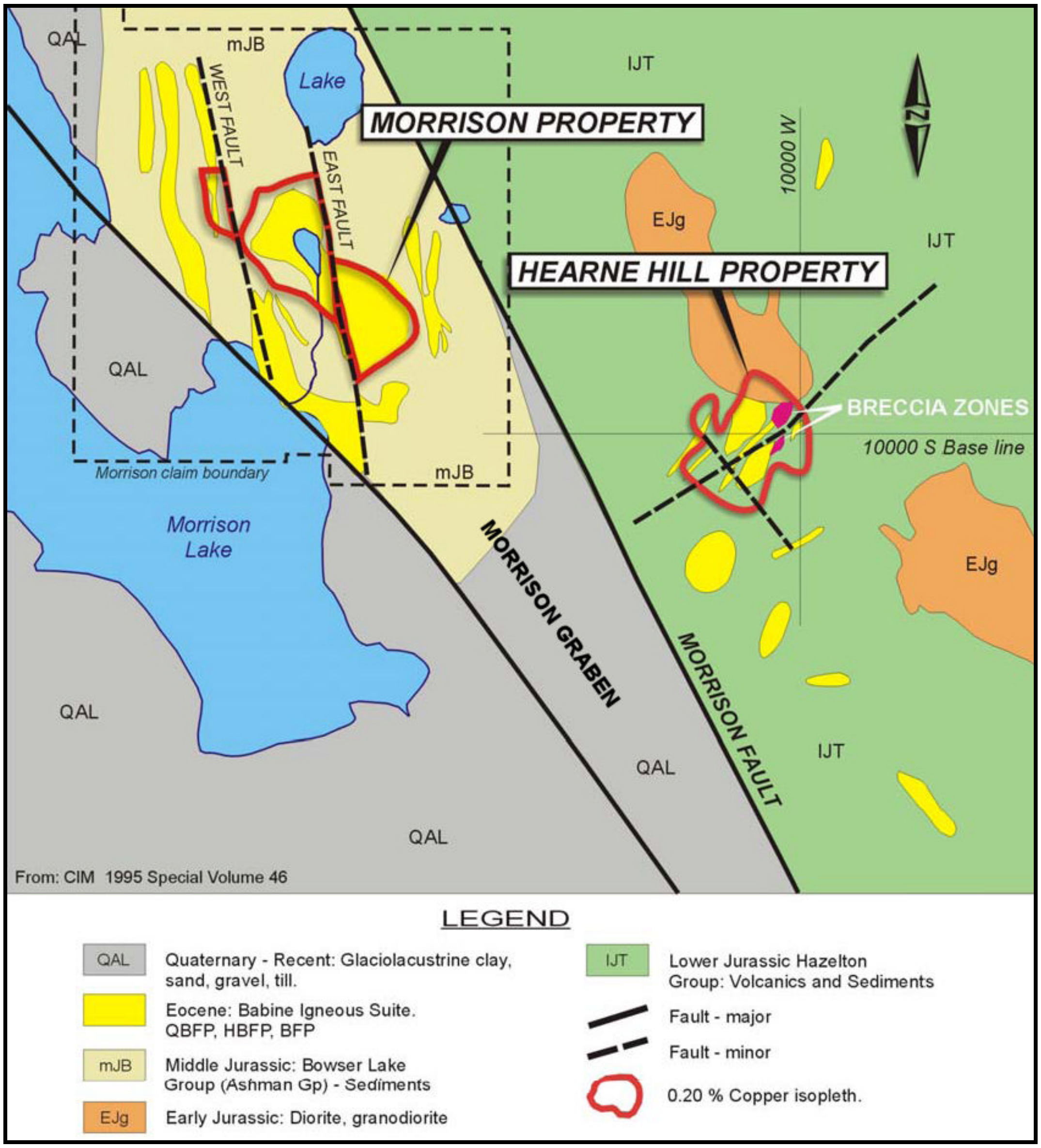
7.2 Local and Property Geology

The following was extracted from a report prepared by E.T. Kimura, P.Geo., Consulting Geologist, dated 4 February, 2003.

The dominant geological feature on the Morrison Property is the Morrison Graben that transects the property in a north-northwesterly trend (see Figure 7.1). The 1.5 to 2.0 km wide graben is spatially host to the siltstone, sandstone, and greywacke sedimentary sequence of the Upper Jurassic Ashman Formation on the northern half of the property, and younger sandstone, shale, and siltstone units of Lower Cretaceous Skeena Group to the south. Much of this southerly part of the graben is overlain by glacial overburden. These lithologic sequences have been down-faulted into the graben structure relative to the older volcanic and sedimentary rock units of Lower to Middle Jurassic Telkwa Formation, Saddle Hill Volcanics, and Smithers

Formation that flank the Morrison Graben to the east and west. All of the above rock units are locally intruded by Eocene-age Babine Intrusions that occur as small stocks, plugs, and dyke-like bodies of biotite feldspar porphyry, quartz diorite, and granodiorite. More importantly on the Morrison Property, the copper-gold porphyry mineralization is developed in a BFP plug and related dyke-like bodies that intrude the siltstone/sandstone unit of the Ashman Formation.

Figure 7.2 Property Geology



Source: Ogryzlo et al., 1995.

7.3 Ashman Formation

The Ashman Formation consists primarily of siltstone, sandstone, greywacke, and minor conglomerate sequences. These were initially recognized in an area 10 km southeast of the Morrison Property. Fossil identification at this locality indicated that these rock units are of Upper Jurassic age.

The Ashman Formation on the Morrison Property is represented as a down-faulted sequence of siltstone, sandstone, silty argillite, minor conglomerate, and greywacke into the Morrison Graben. Medium to dark grey, very fine to fine grained siltstone is the most abundant rock type. The siltstone in and around the Morrison deposit as recovered in drill core is commonly biotitized and locally chloritized. This type of alteration generally imparts a dark greyish green to almost black colouration to the siltstone. The siltstone locally appears to be hornfelsed into an almost cherty-textured rock. The sandstone component of the Ashman Formation is occasionally silicified, and the rock unit then has a fine sugary texture.

7.4 Babine Intrusions

A BFP plug of the Eocene-age Babine Intrusions intrudes the older siltstone and greywacke sequence of the Ashman Formation. The near-vertical plug has been faulted and offset with dextral movement along the two principal north-trending East and West Faults and related subparallel subsidiary faults. Application of palinspastic reconstruction of the intrusive body suggests that the original plug was a 600 to 700 m size irregularly-elongated to semi-circular-shaped body that bifurcates northward and southward into several 40 to 100 m wide dyke-like offshoots and smaller fingers. Surface trenching and diamond drilling have defined a number of 1.0 to 10.0 m-wide BFP dykes that occur around the peripheral margin of the main BFP plug. These dykes and elongated bodies crudely conform to the dominant northerly structural trend. The BFP at Morrison Property is typically a fine to medium grained crowded biotite-hornblende-feldspar porphyry of quartz diorite composition. There are abundant 1.0 to 5.0 mm-size plagioclase phenocrysts that impart a distinctive speckled texture. The porphyry is commonly potassically altered with weak to strong development of secondary biotite in the form of fine to medium-sized grains and also as fine matted clots. Locally, the biotitization is developed in the BFP as a very dark pervasive overprint.

7.5 Skeena Group

The extension of the Morrison Graben immediately south of the Morrison deposit is occupied by down-faulted quartzo-feldspathic sandstone, dark grey siltstone, and dark grey to black carbonaceous mudstone of the Lower Cretaceous Skeena Group. This interpretation is from MacIntyre et al. (1997). None of these rock units have been encountered in Morrison drill core or observed as surface exposures on the Morrison Property.

7.6 MAJOR STRUCTURAL FEATURES

The Morrison Graben is the dominant structural feature on the Morrison Property. Geological evidence indicates that the development of this north-northwesterly structure is late-Eocene or younger as rock units such as the Babine Intrusions have been truncated and offset by the bounding faults of the graben. The fault that bounds the eastern margin of the graben is correlated with the Morrison Fault. Ogryzlo et al. (1995) presented a geologic concept whereby the Morrison Fault dextrally disrupted the Morrison/Hearne Hill copper-gold porphyry system into two displaced bodies, 2.0 km apart, with the Morrison deposit representing the downward extension of the higher level Hearne Hill deposit.

Structural movement during development of the Morrison Graben possibly triggered the development of sub parallel and subsidiary faults such as the East and West Faults. These faults have displaced the Morrison deposit with dextral en echelon-oriented offsets. These dextral offsets have been accentuated to some degree by a family of subsidiary faults that are sub parallel and related to the East and West Faults.

8.0 DEPOSIT TYPES

The Morrison deposit is classified as a calc-alkaline copper-gold porphyry with an alkalic trace element signature (Ogryzlo et al., 1995), which may reflect a mixed alkaline/calc-alkaline parentage for the Babine Igneous Suite. The geologic settings of the host rock relationships, structural development, and the general style of the hydrothermal alteration and mineralization at Morrison are similar to other porphyry deposits in the northern Babine Lake area.

9.0 MINERALIZATION

Hydrothermal alteration at Morrison is similar to that at other Babine porphyry copper deposits (Carson and Jambor, 1974). Alteration is concentrically zoned with a central biotite (potassic) alteration core surrounded by a chlorite-carbonate zone. A third alteration facies, clay-carbonate alteration, is considered retrograde and associated with major faults and shears and subsidiary fracture zones. No well developed phyllic zone has been identified.

Sulphide mineralization at Morrison shows strong spatial relationships with the underlying intrusive (BFP) plug and associated alteration zones. The central copper-rich core is hosted mainly within a potassically altered BFP plug with intercalations of older siltstone. This plug was initially intruded into the siltstone unit as a near-vertical subcircular intrusion approximately 700 m in diameter. It was subsequently disrupted by the East and West Faults and now forms an elongated body extending some 1,500 m in the northwest direction.

Chalcopyrite is the primary copper-bearing mineral and is distributed as fine grained disseminations in the BFP and siltstone, as fracture coatings or as stockworks of quartz veinlets in which the chalcopyrite occurs as coarse grains (1-3 mm) within veinlets that range from 1.0 mm to approximately 15 mm in width. Minor bornite occurs within the higher grade copper zones as disseminations and associated with the quartz-sulphide stockwork style of mineralization.

Polished-section studies have also shown that, in addition to chalcopyrite and pyrite, magnetite and minor bornite are present in the low-grade core of the deposit. Magnetite is a finely disseminated original constituent of the BFP and siltstones, and is most abundant in the western segment of the copper zone. Many magnetite grains are partly altered to hematite, which seems to be most abundant at the outer 0.2% Cu boundary. No iron oxides have been observed in the pyrite halo.

Diamond drilling, geological mapping, and detailed polished-sections studies performed by Caron and Jambor (1976) indicate that pyrite and chalcopyrite have a well-defined zonal relationship. Although pyrite predominates in the pyrite halo, the 0.2% copper isopleth precisely marks a change in pyrite-to-chalcopyrite ratios; chalcopyrite consistently exceeds pyrite in samples only from the inside of this boundary. Although the absolute abundance of pyrite decreases toward the centre of the Morrison deposit, disseminated grains of pyrite persist throughout the copper zone and in the low-grade core.

Molybdenum is present in smaller and somewhat spatially restricted amounts, particularly in the southeast portion of the deposit. Rare arsenopyrite and sphalerite have been noted locally in carbonate-cemented brecciated veins within and near the faults and in smaller parallel shears.

A pyrite halo is developed in the chlorite-carbonate altered wall rock surrounding the copper zone. The pyrite mineralization characteristically occurs as thin (0.1 to 5.0 cm) fracture-fillings and quartz-pyrite-minor chalcopyrite stringers in the form of stockwork within the halo. There is a crude zonation to the pyrite development with coarse (0.5 to 5.0 mm) disseminated crystals within the inner parts of the halo where pyrite content ranges from 5 to 15% by volume. Pyrite in the outer zone is predominantly developed as a stockwork and averages 1 to 2% by volume accompanied by weak copper mineralization (<0.1%). The pyrite halo is developed as a more extensive zone around the eastern and southeastern segment of the Morrison deposit. Drilling and geophysical surveys indicate that the halo at this position attains widths up to 500 m with up to 15% pyrite for the inner margin and decreasing abruptly to 1 to 2% in the outer two thirds of the halo. The pyrite halo is more restricted at the western and northwestern segments of the deposit where pyrite abundances decrease more gradually to the 3 to 5% range. The siltstone host rock at this location is intruded by large northerly-trending BFP and rhyodacite dykes.

10.0 EXPLORATION

Exploration work by Noranda prior to 1997 is described in Section 6.0. Assay data from the old Noranda drilling was not used in recent resource estimations nor is it used in the present study.

Three phases of exploration were coordinated and conducted on the Morrison Property during the period from January 1998 to July 2002 by PBM. The programs consisted primarily of diamond drilling (see Section 11.0), backhoe trenching, geochemical till sampling, and geophysics.

During the Phase I program (Fall 1997) a total of 273 C-horizon till samples were collected on a 100 m grid pattern and analyzed by Acme Analytical Laboratories Ltd. (Acme) for 32-element ICP plus a separate gold analysis. A significant copper anomaly was defined over the Morrison deposit area with a prominent 500 m southerly-trending dispersion train. No other anomalies indicative of potential outlying mineralized zones were identified.

The backhoe trenching program consisted of re-excavating the old Noranda trenches and parts of existing access roads. Exposures were mapped and chip samples were collected, initially at 5.0 m intervals, and at a later date at 10 m intervals when it was determined that mineralization is generally quite consistent over these lengths. All samples were analyzed by Acme for 30-element ICP analyses plus gold by fire assay. The results generally confirmed the geological interpretation for the limits of the mineralization and the information was applied for planning and designing the diamond drill programs.

In the Phase II program, several old trenches were extended along the western and northwestern periphery of the Central and Northwest Zones to the west, with the objective of defining the transitional contact between the copper-gold mineralized zone and pyrite halo. The old Noranda Road that peripherally skirts the west and southwest side of the Morrison deposit was also excavated. Geological mapping of the trench exposures confirmed the occurrence of numerous BFP dykes in siltstone within the pyrite halo. Many of these predominantly northerly-trending dyke-like bodies are weakly potassic-altered and mineralized with disseminated pyrite, quartz-pyrite veinlets, and weak copper mineralization.

Ground magnetic and IP geophysical surveys were completed during the period 12 to 21 October 2000 as part of the Phase II program. The surveys were located at the northwest sector of the property with the objective of defining the contact between copper-gold zone and the pyrite halo. The surveys consisted of 11 lines at 100 m spacing totalling 11 line km. The work was contracted to Peter E. Walcott and

Associates Ltd. Interpretation of the results indicated potential northerly extensions to the Central and Northwest Zones.

11.0 DRILLING

Table 11.1 presents the summary of core drilling carried out by PBM on the Morrison Project between 1998 and 2008. A total of 8,399 intervals were initially assayed for Cu and Au representing 25,299 m of core. Later assaying of pulps/rejects for molybdenum brought the total number of Mo analyses to 6,057 representing 18,341 m of core. In 2007, an additional 48 intervals from MW07-07A drilled in the Central Zone were analyzed as well as 471 intervals from 7 of the 2006 geotechnical holes completed in 2006.

Table 11.1 Drilling Summary 1998-2008

Year	Core Size	Holes Drilled	Total Metres	Type	Series
1998	NTW	3	949.8	Exploration	MO-98-01 to 03
1999	NTW	1	454.5	Exploration	MO-99-04
2000	NTW	19	5,322.30	Exploration	MO-00-05 to 23
2001	NTW	40	10,518.50	Exploration	MO-01-24 to 62
2002	NTW	20	5,578.20	Exploration	MO-02-63 to 82
2003	NTW	9	2,421.10	Exploration	MO-03-83 to 90
2005	NTW	4	957	Exploration	MO-05-91 to 94
2005	PQ	4	700	Metallurgical Sampling	MET-01 to 04
2006	HQ3	7	1,463.80	Geotechnical (assayed in 2007)	9000-1 to 9560-1
2006	HQ3	16	639.38	Condemnation/Geotechnical (not assayed)	DH06-01 to -17 (no DH06-05)
2006	ODEX	1	4.3	Water monitoring hole	GW1
2007	ODEX+HQ3	16	498.79	Water monitoring holes	MW07-01A,B to -08A, B
2007	ODEX+HQ3	15	435.2	Geotechnical	DH07-1A, B to -5A, B and DH07-6 to -10
2008	ODEX+HQ3	3	45.22	Condemnation/Geotechnical (not assayed)	DH08-1A, B and DH08-2
2008	ODEX+HQ3	1	55.17	Plant site condemnation/ water monitoring	DH08-03
2008	ODEX+HQ3	6	390.78	Water monitoring holes	MW08-1A, B to -03A, B
Total		**165**	**30,434.04**		

Reported core recovery during these drill programs has been excellent, averaging approximately 97%.

11.1 Collar Surveying

Drill hole collar positions for all of the PBM diamond drill holes were surveyed by A.D.W. Surveying and Mapping Ltd. of Calgary, Alberta (formerly A.D.S. Engineering Ltd. at Smithers, BC). Their most recent survey was carried out from April 3 to 10, 2006.

Due to discrepancies between the collar elevations and topography noted in previous technical reports (Simpson, 2007 and Beacon Hill, 1988) the holes were re-surveyed in 2007 by Allnorth. The survey was completed using a LEICA RTK GPS base station and rover combination. Results showed reasonable correlation with the topographic base map.

Holes drilled in 2007 for condemnation and geotechnical information were located by hand-held GPS.

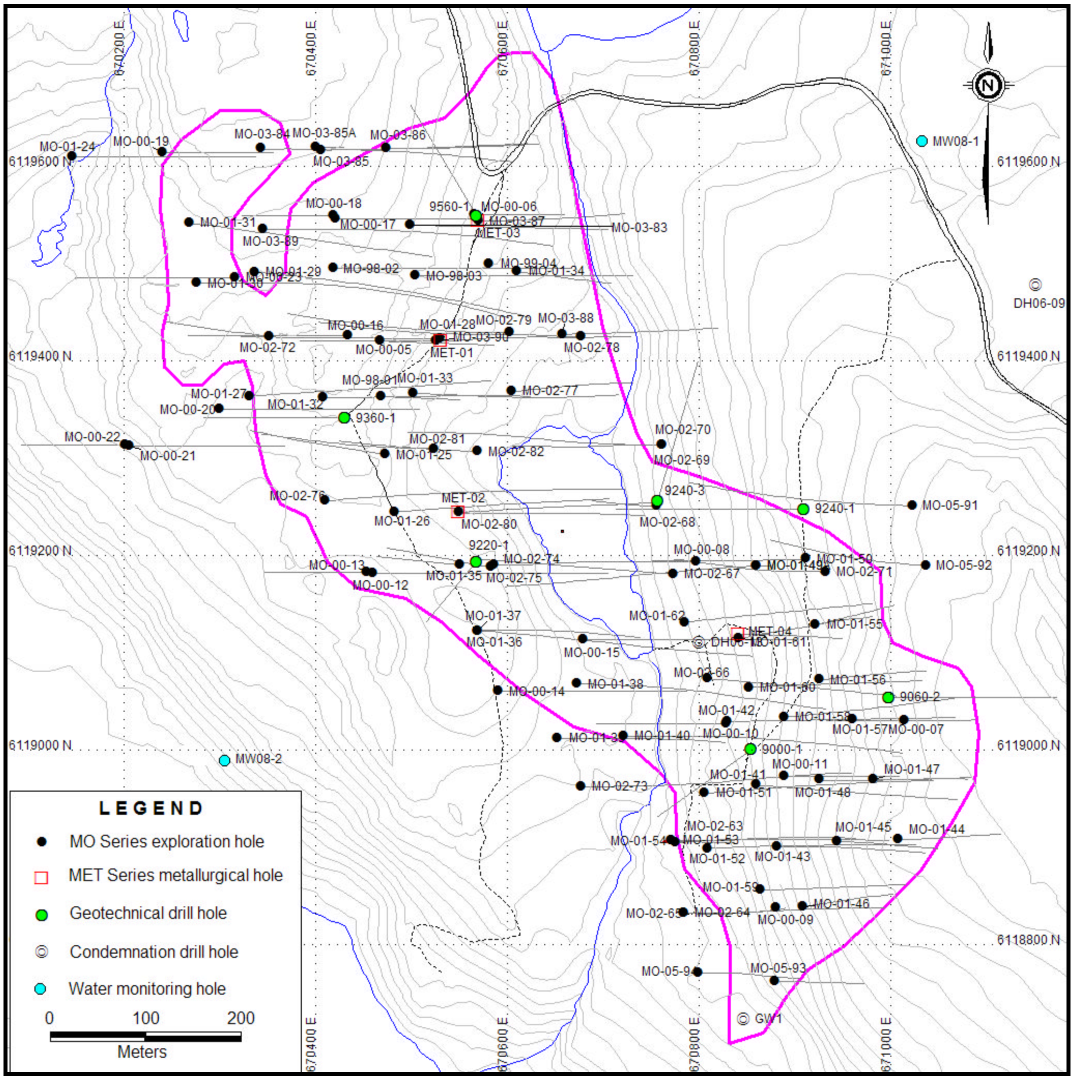
Collar locations in the deposit area are illustrated in Figure 11.1.

11.2 Downhole Surveying

Down-hole surveys for the first 23 holes were restricted to only standard acid tests for inclination. The next 26 holes were surveyed with a Tropari instrument. A single-shot Sperry-Sun instrument was used for the subsequent holes. The surveys were measured routinely at 15 m below collar, and then at every 100 m interval down-the-hole.

The down-hole readings from Tropari and Sperry-Sun surveys were frequently quite erratic and often indicated unrealistic hole deviations. For most instances, the first readings 15 m below collar are inapplicable readings as they often indicated 5° to 7° deviation from collar azimuth. These erratic readings are probably related to the instruments being too close to the drill rig and casing. Many readings for a number of holes were very erratic, and these are probably attributed to magnetism in the rock at the depth of measurement. In order to rationalize the problem, all the survey readings have been re-evaluated as to their reliability by checking the degree of deviation of each reading against the more normal deviation. All spurious readings have been deleted from the database, and this often included the entire down-hole survey for an individual hole. The average down-the-hole inclinations for 45° to 60° inclined holes flatten by 0° to 2° over 350 m with a maximum of 4°. Kimura (2003) recommend probing a few holes with other methods such as Lite-log that are unaffected by magnetism in the rock.

Figure 11.1 Drill Hole Plan



12.0 SAMPLING METHOD AND APPROACH

12.1 DRILL CORE

Diamond drill core was delivered to the PBM core logging facility by the drillers at the end of each shift. The core was initially examined by a technician who completes the geotechnical log according to recognized geotechnical logging standards. Geotechnical data was collected for each 3.05 m (10 ft) drill run, and this includes recording core recovery, rock quality designation (RQD), rock hardness, and fracture frequency for several fracture orientations relative to the core axis. Originally PBM's field procedure included photographing the core once the geotechnical logging was completed. This was standard procedure for the first four holes completed by PBM but the practice was not continued. The procedure was reinstated in the spring of 2001 starting with hole MO-01-28. As a result, photographs were not available for holes MO-00-05 to MO-01-27. All data was compiled into a file folder for each drill hole.

Geotechnical logging was followed by detailed geological logging performed by PBM's contract geological staff. Each 3.05 m drill run was logged for lithology, structure, alteration, and mineralization. Graphic logs of lithology, structure, and vein types were also completed. The core logging was completed using a standardized geological legend. This legend has evolved from the geological fieldwork of various geologists who have worked on the Project.

Finally, samples were also collected at the 3.05 m intervals corresponding to each drill run. Shorter intervals were occasionally sampled at the beginning and end of each hole depending on the start of bedrock and where the hole was stopped, respectively. Unique samples numbers were assigned by a sampling technician who records the sample intervals and sample numbers on a separate drill hole sampling record. The technician also stapled a sample tag to the beginning of each sample interval in the core box. The sampling record sheet allowed the regular insertion of quality assurance/quality control (QA/QC) materials into the sample stream to be accurately recorded.

With the exception of holes M0-98-01 to MO-00-11, which were manually split, all drill core was sawn in half. One half was bagged and tagged for submission to the primary assay laboratory and the second half was kept as a permanent record of the lithology in the core storage area at the PBM camp. After sawing and bagging the individual samples, they were placed in rice bags driven to Burns Lake or Houston and shipped via Bandstra Transportation to the primary assay lab.

All core handling and sampling procedures were supervised by PBM's contract geological staff.

12.2 TRENCH SAMPLES

All surface trenching was performed by a backhoe which re-excavated the earlier Noranda bulldozer trenches and roads. PBM reports that after re-establishing the trenches, the bedrock exposure was cleaned by mucking with shovels and, in some cases, cleaned with water from a hand fire pump. The exposures were then mapped by PBM's contract geological staff. Samples were taken along the trenches by collecting continuous chips with a hammer and moil. Sample lengths ranged from 1.0 m to 22.0 m in length, with the majority being 5.0 to 10.0 m in length.

Trench data was not used in the present block model estimate but geologic information was used for lithologic modelling.

13.0 SAMPLE PREPARATION, ANALYSIS, AND SECURITY

13.1 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

PBM implemented a full quality control program at Morrison in September 2000 starting with hole MO-00-17 and continuing for all subsequent holes and programs. This included regular insertion of standard blanks and duplicates into the sample stream and submission of 10% of all core samples to a second lab for check assay.

For materials inserted into the sample stream, a sample sheet was filled out for each drill hole specifying where and which material was to be used. For every 40 samples, a total of 7 samples were used for quality control including 3 standards, 2 duplicates, and 2 blanks. One of these materials was inserted every 6 samples and the spacing between materials of the same type was 18 samples.

The sample batches were packed in rice bags, secured, and transported by PBM personnel to Houston or Burns Lake, at which point Bandstra Transportation delivered the samples to Acme laboratory in Vancouver.

13.1.1 STANDARDS

The PBM standards were prepared by CDN Resource Laboratories Ltd. in Delta, BC. These standards were prepared from selected Morrison core reject material of similar grade that were combined to make an approximate 25 to 30 kg composite sample. The following preparation procedure was followed:

- Drill core rejects from Morrison samples of similar copper and gold grade were selected to make up a 25 to 30 kg composite sample.
- Composite sample was dried.
- Material was crushed and pulverized to –200 mesh.
- The –200 mesh fraction was mechanically mixed for 4 days to homogenize the material.
- Four sets of eight separate splits were taken from the homogenized material, and the sets were sent to four different laboratories for round-robin analysis. Laboratories selected were: Assayers Canada, ALS Chemex, Bondar Clegg, and IPL Laboratories.
- Standards were bagged in approximately 100 g packages to represent a prepared pulp standard.

Four Morrison site standards with varying copper and gold grades were prepared (Table 13.1) along with a blank standard from barren Morrison drill core rejects (2001-A). Three sets of certified reference standards were also purchased from Rocklabs Ltd. (Rocklabs), primarily for gold. These were packaged in 30 g plastic sachets so the laboratories were only able to assay the material once as there was insufficient material to perform a duplicate assay.

Table 13.1 Morrison Project Certified Reference Materials

Standard	Origin	Cu Value (%)	Au Value (g/t)	Used on Holes	Insertion Rate
PBM	Site Material	0.449 +/- 0.0128	0.264+/- 0.025	MO-00-17 to MO-02-82	1 every 20
DRM3	Rocklabs	0.360 +/- 0.010	1.38	MO-00-20 to MO-01-52	1 every 35
OX8	Rocklabs	-	0.186 +/- 0.018	MO-00-20 to MO-01-52	1 every 35
OX9	Rocklabs	-	0.465 +/- 0.029	MO-00-21 to MO-01-53	1 every 35
S3	Rocklabs	-	0.939 +/- 0.054	MO-00-20 to MO-01-49	1 every 35
2001-A (blank)	Site Material	0.018 +/- 0.003	0.018 +/- 0.005	MO-01-55 to MO-05-94	1 every 20
2001-B	Site Material	0.156 +/- 0.009	0.053 +/- 0.011	MO-01-55 to MO-05-94	1 every 35
2001-C	Site Material	0.303 +/- 0.011	0.198 +/- 0.019	MO-01-56 to MO-05-94	1 every 35
2001-D	Site Material	0.636 +/- 0.018	0.192 +/- 0.007	MO-01-56 to MO-05-94	1 every 35

For standards, the accepted range should be the accepted value plus or minus two standard deviations (SD) and less than 5% of the results from the submitted standard material should fall outside these limits. The results of analyses on Rocklabs standards (Table 13.2) show that the mean values from the Acme analyses are all slightly higher than the recommended values suggesting a slight bias; however, the mean Acme values do fall within two SD of the recommended value and are therefore acceptable.

Table 13.2 Results of Rocklabs Standards Analyses at Acme

Standard	No. of Analyses	Recommended Au Value ±2 SD	Mean Acme Au Value (g/t)	% Diff.	Recommended Cu Value ±2 SD	Mean Acme Cu Value (%)	% Diff.
DRM3	25	1.38	1.44	4.3	0.360 +/- 0.010	0.37	2.7
OX8	23	0.186 +/- 0.018	0.193	3.8	-	-	
OX9	25	0.465 +/- 0.029	0.476	1.9	-	-	
S3	25	0.939 +/- 0.054	0.965	2.8	-	-	

Results from the Morrison standards prepared from site material show a slight negative overall bias for both Cu and Au (Figure 13.1 to Figure 13.5). Otherwise the laboratory performance is judged to be acceptable as very few values exceed two SD from the accepted mean value.

Figure 13.1 Sample Sequence Chart – Site Standard (Cu)

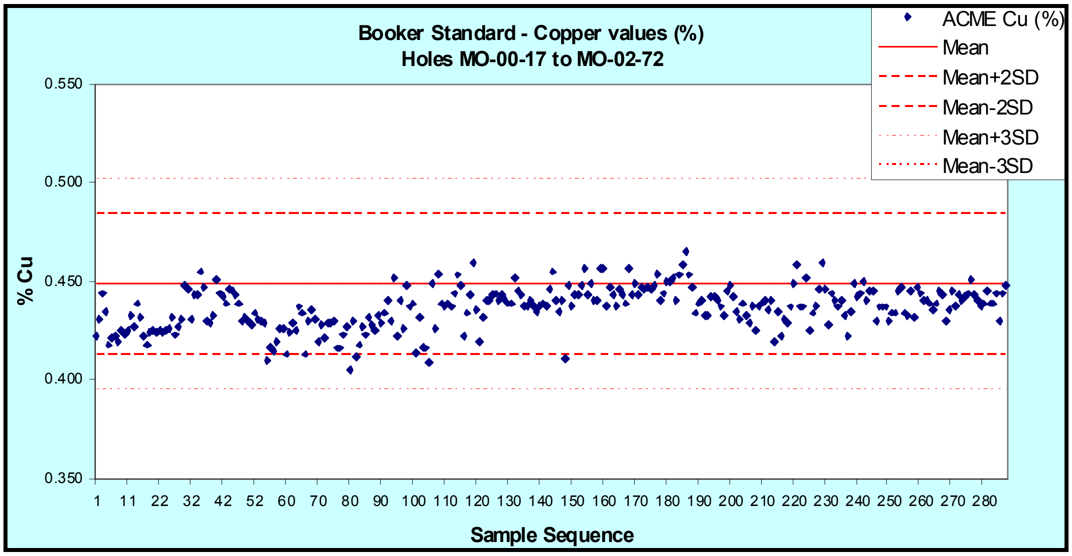


Figure 13.2 Sample Sequence Chart – Site Standard (Au)

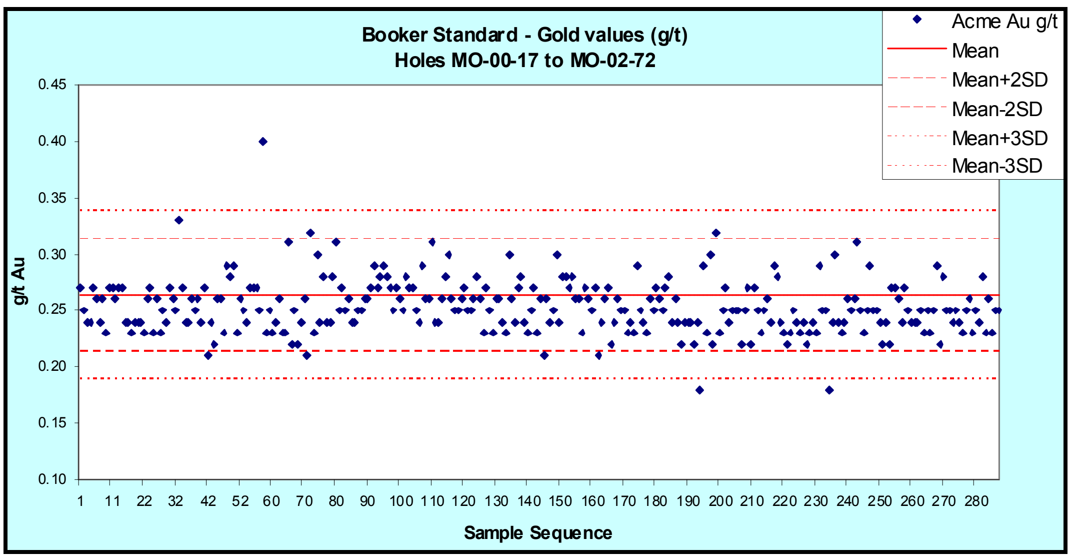


Figure 13.3 Sample Sequence Charts – 2005 Drilling Standard 2001-B

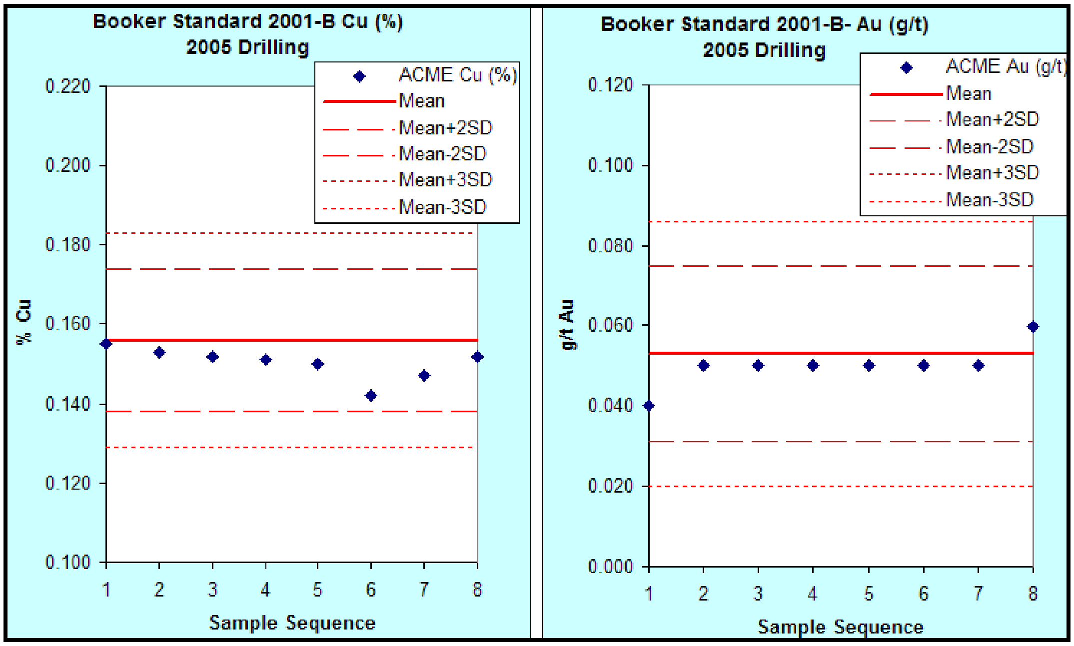


Figure 13.4 Sample Sequence Charts – 2005 Drilling Standard 2001-C

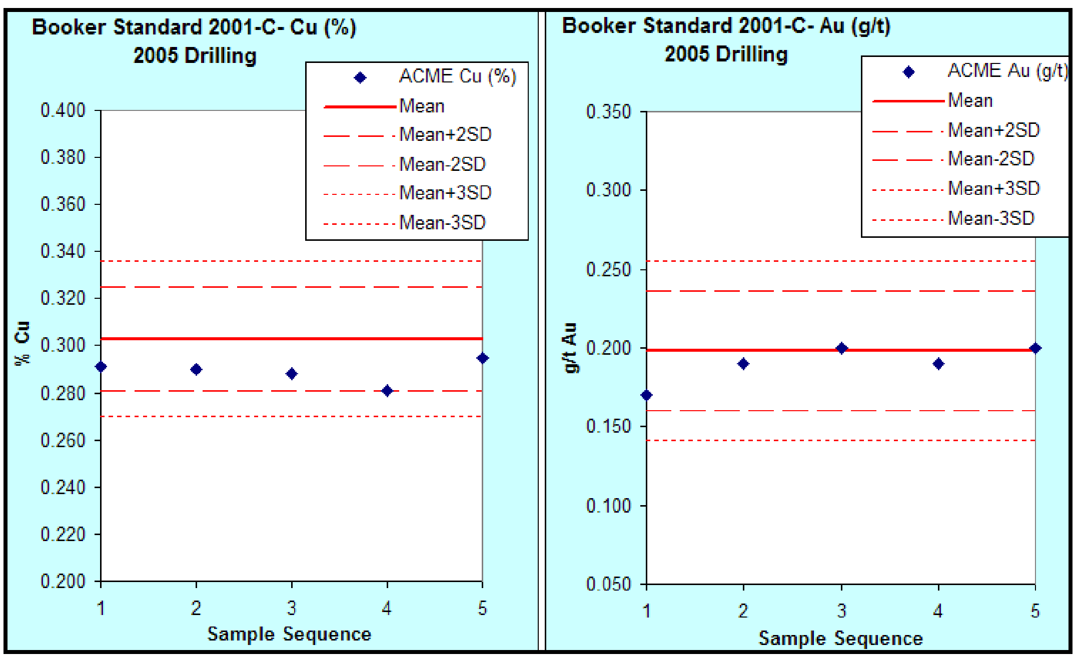
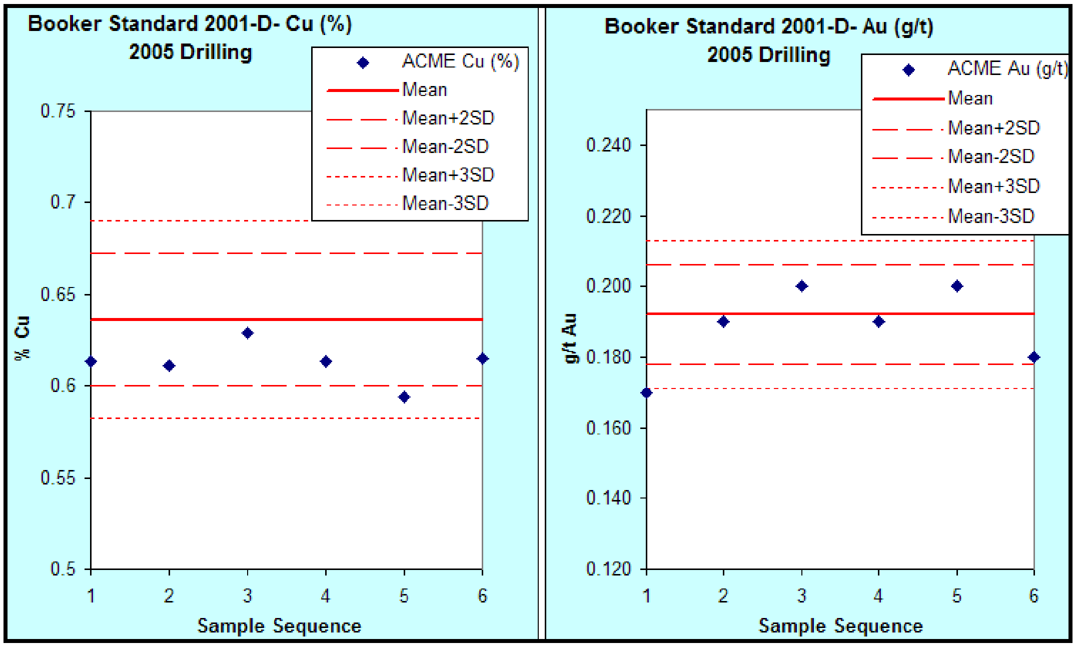


Figure 13.5 Sample Sequence Charts – 2005 Drilling Standard 2001-D



13.1.2 DUPLICATES

Duplicates have been regularly prepared, once every 20 samples, starting with hole MO-98-03. The first half of the core was submitted as the original sample with a second bag being submitted to the laboratory empty but with the tag from the next sample number in the sequence. At the lab, after the original sample had been jaw crushed, the sample material was riffle split with half of the material being retained as the original sample and the second half being used as the duplicate. The results are displayed as scatterplot charts in Figure 13.6 and Figure 13.7.

Figure 13.6 Duplicate Assays – Cu

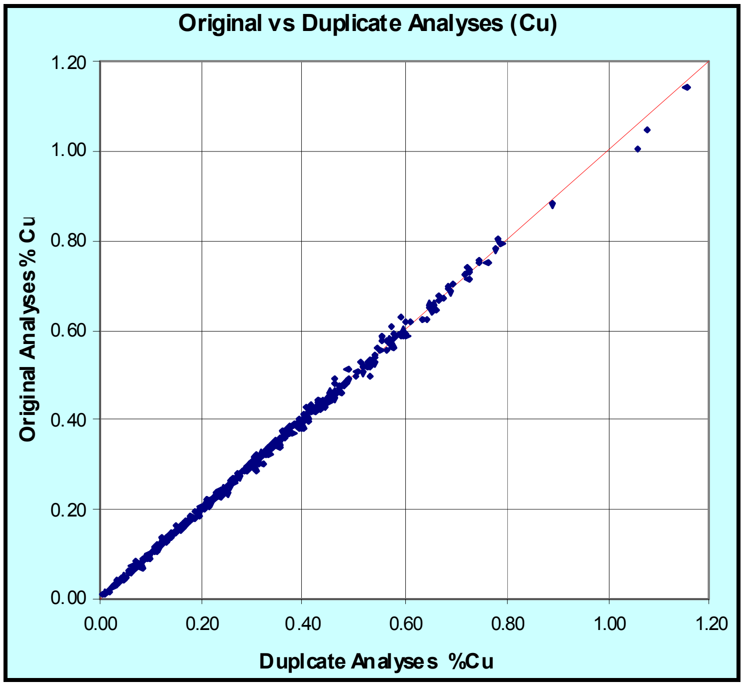
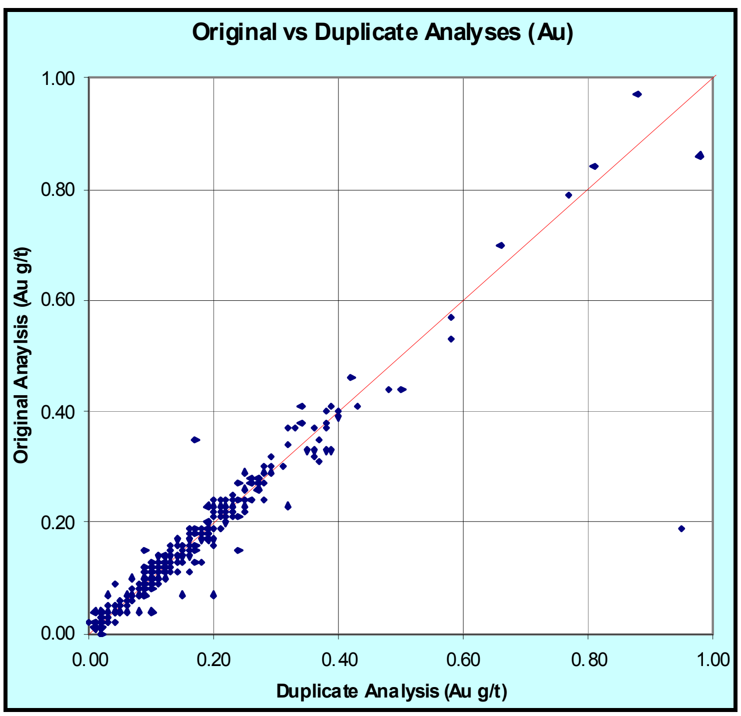


Figure 13.7 Duplicate Assays – Au



13.1.3 CHECK ASSAYS

In 2001, 174 pulps from the 1998 and 2000 series of holes were sent to Bondar Clegg for check assays. Pulp samples from holes MO-01-24 to MO-01-62, comprised of 307 pulp samples and 34 reject samples were sent to ALS Chemex for rechecks. A total of 34 reject samples from the same series were also re-checked at ALS Chemex with similar results. Scatterplots of the data (Figure 13.8 to Figure 13.11) show generally good correlation with Acme showing a slight low bias for Cu compared to the other laboratories which matches the trend shown in the standard charts.

Figure 13.8 Pulp Check Assays for Cu – Acme vs. Bondar Clegg

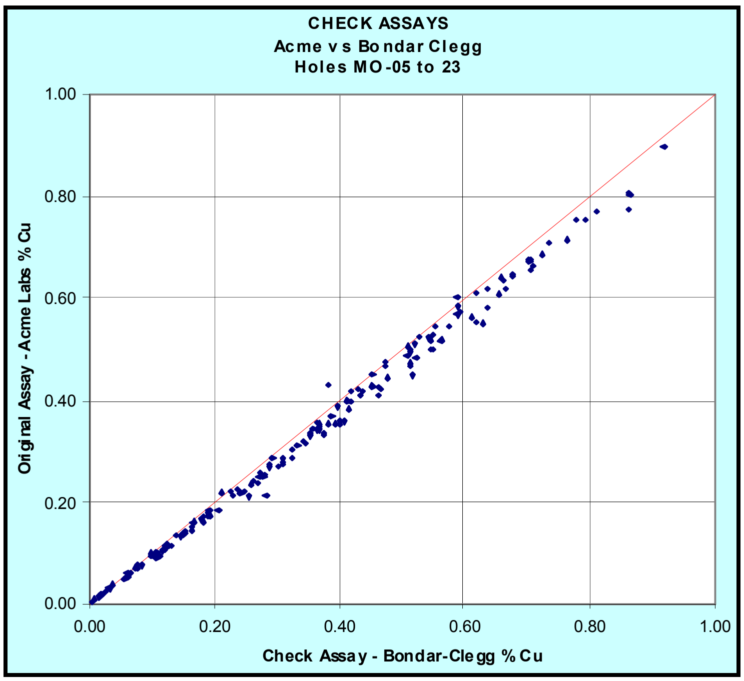


Figure 13.9 Pulp Check Assays for Au – Acme vs. Bondar Clegg

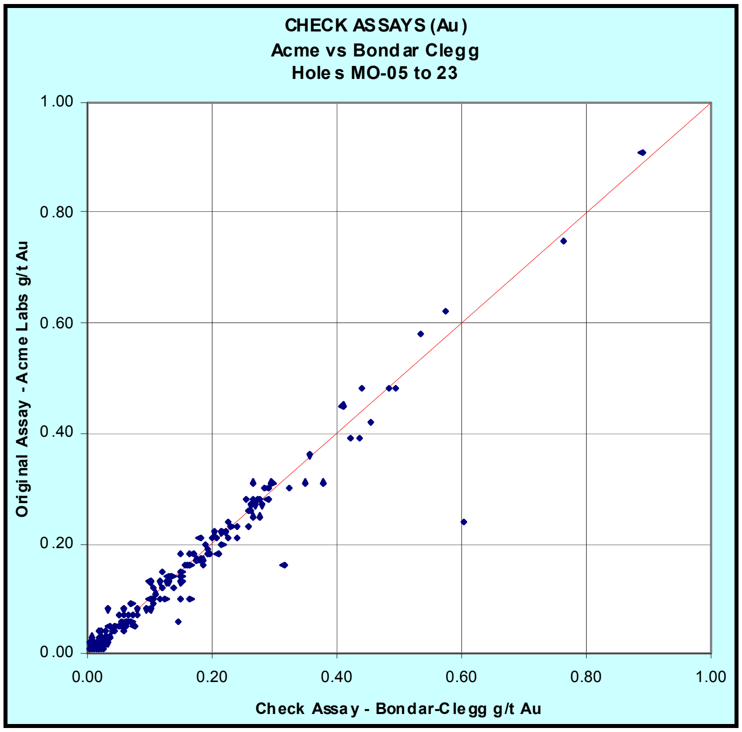


Figure 13.10 Pulp Check Assays for Cu – Acme vs. ALS-Chemex

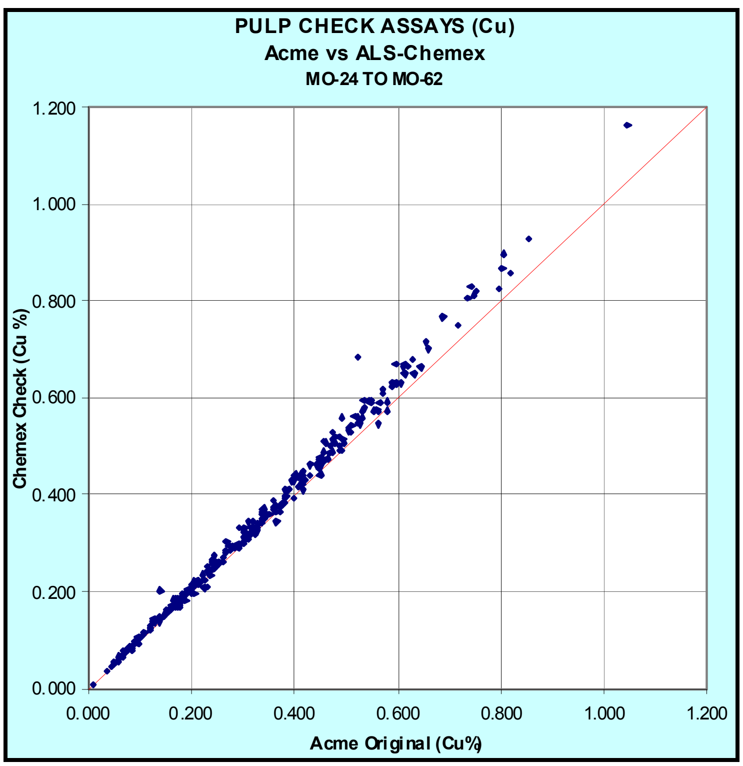
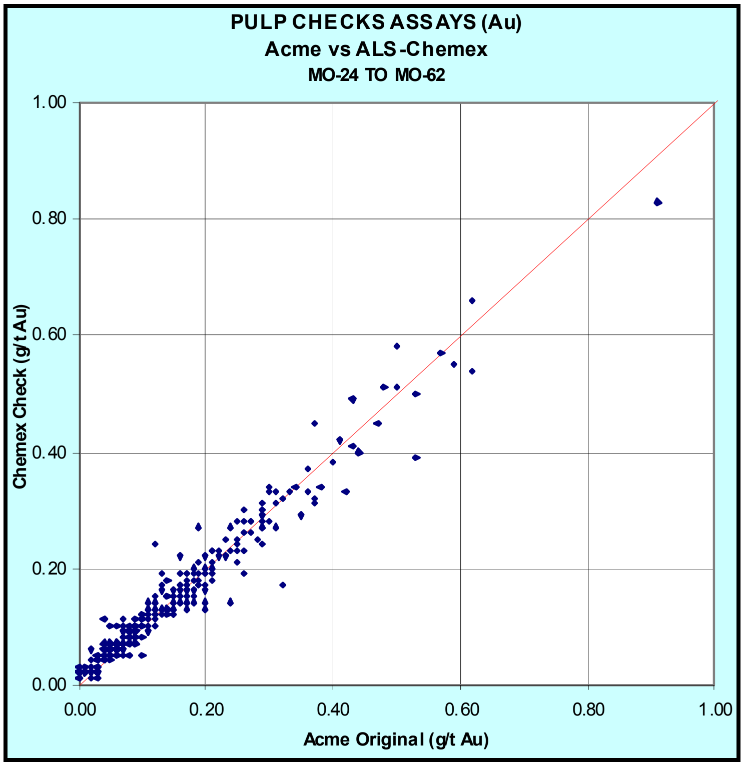


Figure 13.11 Pulp Check Assays for Au – Acme vs. ALS-Chemex



13.2 LABORATORY PROCEDURES

Acme is the primary assay laboratory for the Morrison Project. Except for four drill holes in the Phase I program, all the sample preparation, analyses, and assaying for copper and gold have been performed by Acme. ALS Chemex performed majority of the check assaying of the pulp samples. Core samples from the first 15 drill holes were analyzed by 35-element ICP method with a separate fire assay for gold. Thereafter, all core samples from drill hole 16 to 94 were initially assayed for only copper and gold.

In 2006 and 2007, all available pulps from drilling within the mineralized zones were re-assayed for molybdenum at Acme. Where pulps were unavailable, coarse reject samples were analyzed.

14.0 DATA VERIFICATION

GeoSim accepts that the data provided by PBM are valid and accurate for the purposes of this study, based upon inspection and validation by qualified, independent consultants (Snowden, 2003) in addition to review in previous independent studies performed on behalf of PBM (SNC, 2002 and Kimura, 2003).

All geological, geotechnical, and assay data for the Morrison Project has been entered into an MS Access database using Gemcom software. A feature of this software is a data verification subroutine. This allows the user to verify that all entries conform to the specified entry types for a given field (real number, whole number, string, etc.) and checks to ensure that interval data is defined properly (no undefined intervals, no overlapping intervals).

This data verification subroutine was run on a regular basis after periods of data entry. If errors were detected, the original drill logs were reviewed and appropriate corrections were made. It should be noted that if an entry conformed to the definition for that field but was in error, that this subroutine would not detect the error.

In September 2002, PBM's database was audited for errors by Keller Geoservices Ltd. (KGL). KGL examined 6.5% of the total database, examining all tables and fields and making direct comparisons to original records. KGL determined that the database had an overall error rate of 10.6%, which is significantly higher than the acceptable rate for mineral resource estimation purposes.

Many of the errors identified by KGL are related to improper entry of interval data, resulting in errors where the database and the original record exhibit an error of 0.01 m. Excluding these errors resulted in an overall error rate of approximately 2.5%, although the error rate for the alteration coding in the database indicated an error rate of 9.3%.

15.0 ADJACENT PROPERTIES

The Morrison deposit lies in a well known, historically significant porphyry copper district that hosts more than a dozen deposits and occurrences, all spatially related to the Eocene Babine Intrusions (Carter et al., 1995). The most significant of these are Noranda's past-producing Bell and Granisle mines, which lie 25 and 30 km southeast of the Morrison deposit, respectively. PBM's Hearne Hill deposit lies 2.0 km southeast of Morrison. The Hearne Hill Property has been extensively explored, and a comparatively small but high grade copper-gold resource in two breccia pipes within a larger porphyry system has been defined.

The mineral resources and reserves for the Bell and Granisle mines, as reported by Carter et al. (1995), are shown in Table 15.1.

Table 15.1 Reported Resources and Reserves for Adjacent Properties

Property	Mineral Resource			Reserve (Mined)		
	Mt	Cu (%)	Au (g/t)	Mt	Cu (%)	Au (g/t)
Bell	296	0.46	0.20	77.2	0.47	0.26
Granisle	119	0.41	0.15	52.7	0.47	0.20

15.1 HEARNE HILL DEPOSIT

The following was extracted from a report prepared by E.T. Kimura (P.Geo.), Consulting Geologist, dated 1 January 2002.

The Hearne Hill Property lies adjacent to Morrison in the Babine Lake area of central BC. An exploration program was completed during the period from May 1993 to October 1997. The main objective for the project was to determine if additional high grade copper-gold breccia pipes deposit could be discovered.

The exploration programs were successful in discovering and defining a second well-mineralized copper-gold breccia pipe within the larger lower grade copper porphyry system. This breccia pipe, referred to as the Peter Bland Zone, was discovered after the uncovering of well-mineralized float boulders in trenches upslope from the Chapman Zone, and which, in turn, directed the follow-up diamond drilling in the general area northeast and upslope from the float train. Preliminary resource estimates were reported at a 0.40% Cu cut-off grade by geostatistical methods for the Peter Bland Zone and the adjacent and previously-known Chapman Zone as shown in Table 15.2. These estimates are not considered reliable and do not conform to NI 43-101 requirements.

Table 15.2 Hearne Hill Historic Resource

Classification	Zone	Tonnes	% Cu	g/t Au
Indicated	Peter Bland	2,342,000	0.660	0.217
	Chapman	474,000	1.074	0.256
Total Indicated		**2,816,000**	**0.730**	**0.224**
Inferred	Peter Bland	226,000	0.568	0.245
	Chapman	22,000	0.682	0.160
Total Inferred		**248,000**	**0.578**	**0.237**

Note: Resources listed above do not meet the requirements of NI 43-101 regulations and are shown for information purposes only.

The resources are based on geochemical methods of analyses for the core samples. By incorporating 622 re-analyses of gold content by fire assay method into the database, the resources for the combined two zones were calculated at the 0.40% Cu cut-off grade as 2,880,000 tonnes at 0.723% Cu and 0.233 g/t Au in the indicated classification, and 355,000 tonnes at 0.537% Cu and 0.210 g/t Au in the inferred classification. A significant component of the exploration programs consisted of drilling 142 holes totalling 33,493 m. A large proportion of this drilling was focused on defining the two breccia zones and exploring geochemical anomalies as potential breccia pipe targets. Additional drilling was allocated to exploring the larger porphyry system, the results of which have effectively confirmed submarginal copper and gold grades for the stockwork type of mineralization.

16.0 MINERAL PROCESSING AND METALLURGICAL TESTING

A detailed description of the mineral processing and metallurgical testing is contained in the report entitled “Morrison Copper/Gold Project Feasibility Study, Volume 1 – Process Plant, Mining, and Infrastructure” dated February 2009.

16.1 METALLURGICAL TESTING

16.1.1 INTRODUCTION

Metallurgical tests were conducted by various laboratories and showed that conventional froth flotation is the optimum process for the recovery of copper/gold/silver. The average metal recoveries are 84.0% for copper and 59.0% for gold and 56.0% for silver. Concentrate grade varies with head grade and ore type with an average of 26.5% Cu for the first five years of operation. The impurity element contents in the concentrate were below the penalty levels imposed by smelters.

While not all ore samples tested contained significant amounts of molybdenum, when present, it recovered well into a bulk cleaner concentrate. Limited molybdenum flotation testing on bulk cleaner concentrate demonstrated that Mo concentrates in excess of 50% Mo could be achieved with reasonably high stage recovery.

Table 16.1 presents a chronological summary of the test work reports reviewed in order to derive the process design criteria (PDC) required for the Morrison process facilities. The table includes previous reports, as well as review reports, issued since 2002.

Table 16.1 Chronological Summary of Test Work Reports

Author	Date	Report Title
SNC-Lavalin Engineering	21 June 2002	Technical Report on the Morrison Porphyry Copper-Gold Project
International Metallurgical and Environmental Inc.	17 June 2002	Laboratory Flotation Tests of Drill Core Samples from the Morrison Lake Property
Beacon Hill Consultants (1988) Ltd.	01 Aug 2004	Morrison/Hearne Hill Project Preliminary Assessment
Process Research Associates Ltd.	10 Oct 2005	Flotation Optimization and Variability Testing on Composites from the Morrison Project
SGS Lakefield Research Ltd.	Aug 2007	Ore Grindability Characterization and Feasibility Grinding Circuit Design for the Morrison Project
SGS Lakefield Research Ltd.	23 Oct 2007	The Recovery of Copper, Gold and Molybdenum from Ore from the Morrison Copper Project
SGS Lakefield Research Ltd.	06 Dec 2007	Morrison Project Flotation Testwork Report
Polysius Research Center	06 Dec 2007	High-Pressure Grinding Test on Copper/Gold/Molybdenum Ore from the Morrison Project
SGS Lakefield Research Ltd.	17 Jan 2008	The Flotation Response of HPGR-prepared versus Conventionally Crushed Flotation Feed from Morrison Deposit

For this project, Wardrop utilized SGS completed test work (2006, 2007) and the previous work done by Process Research Associates Ltd. (PRA) in 2005, International Metallurgical and Environmental Inc. (IME) in 2002, and Noranda in 1970.

Noranda submitted three Morrison ore samples to its milling facilities in Quebec for initial flotation test work in 1970 and 1971.

IME completed a series of laboratory flotation tests on two composite samples (approximately 39 kg) prepared from samples of drill core submitted by PBM from the Morrison deposit.

In March 2005, PRA was engaged by Beacon Hill on behalf of PBM to undertake metallurgical testing including locked cycle tests to form part of the basis for a prefeasibility study. Fresh samples from a limited drill program were assayed and grouped into three specific types, and various composites. The test program included sample characterization, grindability, and flotation test work followed by environmental and tailings characterization testing.

In November 2006, PBM appointed SGS to conduct grinding and flotation test work followed by a circuit design. The objective of the project was to conduct a series of grinding and flotation tests that would provide metallurgical targets and lead to circuit design in support of a feasibility study. The SGS program involved feed and product samples characterization, mineralogy, comminution, and flotation test works followed by grinding and flotation circuit design.

The most recent phase of testing at SGS was on 1.7 t of sample material (82 drill core samples) to confirm the initial results and bring the project up to a feasibility level, a report on tailings characterization was issued by SGS separately.

After discussions with all high-pressure grinding rolls (HPGR) suppliers, Polysius was contracted by PBM to conduct test work on high pressure comminution. The 1.7 t of Morrison material were shipped to Polysius test facilities in Beckum, Germany. After completion of the test work, a trade-off study to evaluate the application of HPGR as an alternative technology to the conventional semi-autogenous grinding (SAG) milling technology was prepared by Wardrop. The favourable results obtained from this study confirmed the incorporation of HPGR into the Morrison comminution circuit.

A comparison study was conducted by SGS to evaluate the impact of high pressure comminution in flotation recovery.

Wardrop used all of the test results as a basis for developing the Morrison process flowsheet and completing the process plant and onsite facilities feasibility study.

16.1.2 NORANDA METALLURGICAL TESTING

The following information is taken from Mearns (1971) and Godbehere (1971).

Noranda submitted several samples of Morrison mineralization to its milling facilities in Noranda, Quebec for initial flotation test work. In September of 1970, two samples of crushed drill core identified as A and B and weighing 60 lb and 54 lb, respectively, were submitted and then, in February of 1971, a third sample identified as C and weighing 355 lb was submitted. Brief summaries of the testing are given below. Detailed results can be found in Mearns (1971) and Godbehere (1971).

The flotation circuit used for all tests consisted of rougher/scavenger flotation followed by two stages of cleaning. Regrinding of the rougher concentrate was found to be necessary to produce higher grade concentrates (>25% Cu).

Samples A and B had assayed head grades of 0.68% and 0.51% copper respectively. Composites consisting of a 50/50 mixture of samples A and B were subjected to a series of grinding and flotation tests. A grind time of 18 minutes was found to be optimum; producing 84.4% -200 mesh material. The work index for this grind was 18.0. Depending on the reagents used, copper recoveries of 89.4 to 92.6% were attained.

Sample C had an assayed head grade of 0.52% copper and 0.011 oz/t (0.377 g/t). In this series of tests a grind time of 15 minutes producing 75% -200 mesh material was found to be optimum (work index = 17.2). Flotation tests on this material returned copper recoveries of 87.6%.

16.1.3 PBM Metallurgical Testing

IME Test Work

In May of 2002, PBM submitted approximately 28 kg of drill core rejects to IME of Kelowna, BC for flotation tests. The material represented mineralized BFP and was comprised of three contiguous sample lengths. The average head grade was 0.58% copper and 0.23 g/t gold.

Results indicate that 88.4% of the copper can be recovered to a flotation cleaner concentrate with grades of up to 27.6% Cu. Recovery of copper to the rougher concentrate was 96.4%. Results for gold show recoveries of over 50% to the final concentrate with grades in the range of 7.4 to 10.2 g/t. Rougher concentrate recoveries for gold were over 63%.

In late June 2002, PBM submitted further material to IME for test work, sending approximately 20 kg each of mineralized siltstone and mineralized clay carbonate altered BFP for analysis. IME completed the test work on this material and concluded that copper and gold recoveries should range between 88 to 90% for copper and 50 to 70% for gold, based on the test work completed to date. These metallurgical recovery levels are similar to the recoveries achieved at the nearby Bell Mine.

PRA Test Work

In 2005, PRA completed a metallurgical test work program to establish a metallurgical database for the Morrison project (Tan, 2005). Samples used for the study were collected from four large diameter PQ core holes drilled in 2005.

Test results showed that energy consumptions for the communition of the samples were intermediate or mildly intermediate. Low-energy impact work indices range from 6.7 to 8.5 kWh/t, Bond rod mill work indices from 12.6 to 15.5 kWh/t at a discharge particle size of 14 mesh, and Bond ball mill indices from 15.4 to 17.4 kWh/t at a closing screen size of 150 µm.

Baseline viability rougher flotation on the individual composites at P_{80} ~150 µm yielded recoveries between 63 and 90% for gold, and from 70 to 93% for copper, on the samples with head grades of 0.1 to 0.4 g/t Au and 0.3 to 0.6% Cu.

The PRA tests showed that some of the gold is closely associated with pyrite and detailed mineralogical examination was recommended. Other recommendations included further locked cycle tests to optimize flotation performance and a pilot plant scale test to collect more data for design and feasibility studies.

SGS TEST WORK

SGS conducted grinding test work on 1.7 tonnes of PBM Morrison sample material (82 drill core samples) in 2007. Table 16.2 shows the results obtained.

Table 16.2 Morrison Ore Grindability Test Summary – SGS

	Crusher Index	SAG Power Index (minutes)	Bond Work Index (kWh/t)
Average	13.7	105.2	16.4
Standard Deviation	10.2	36.1	2.8
Relative Standard Deviation (%)	75	34	17
Minimum	58.5	36.5	10.8
Maximum	1.5	207.9	23.5

The study suggested circuit to produce and average 1359 t/h at P_{80} of 150 µm consisting of a single SAG mill, single ball mill, and a cone crusher for the pebbles. The test work reflects that the ore is relatively medium hard from perspective of semi-autogenous milling with a SAG Power Index (SPI) of 105 minutes. From the perspective of ball milling, the samples were characterized as relatively hard with an average of 16.4 kWh/t. In addition, some of the samples shown indicated to be very hard, in excess of 20 kWh/t.

SGS FLOTATION TESTING

Several test work programs were conducted using locked cycle testing of the PBM samples. The most comprehensive program was that conducted by SGS and reported in December 2007. The initial flotation test work was conducted by PRA and reported in October 2005. Comparison test works was completed by SGS on HPGR-prepared and conventionally crushed flotation feed samples. The results obtained were reported in December 2007. The results obtained are discussed below.

The most recent flotation test work on 82 Morrison samples were conducted by SGS during 2007. The work was part of the feasibility study for grinding, flotation, and circuit design and involved sample preparation/ characterization, mineralogy, comminution studies, flotation test work, grinding, and flotation circuit design. A representative sample of the material had head grades of 0.45% Cu, 0.21 g/t Au, 1.40 g/t Ag, 0.006% Mo, 3.53% Fe, and 0.89% S. Five composites were used to perform ore characterization tests, including batch flotation test development and confirmation, full QEMSCAN™ for mineralogical analysis, flotation calibration test work (including flotation locked cycle test and cleaner MinnovEX Flotation Tests), as well as the general comminution test work (including the SPI, ModBond work index tests, Biwa tests, MinnoveEX crusher index for grinding circuit design). A portion of each drill core sample was used to perform variability test work that produced the information needed for grinding and flotation circuit design.

The effect of regrind was tested and the test conditions and results of regrind size on Cu, Mo, Au, and Ag grades and recoveries for all of the cleaner stage minerals show a decreasing grade with increasing regrind size. Both Mo and Au recovery increase with increasing regrind size and the stage recovery of Cu and Ag both decrease with coarser grind size. The poor Mo recovery at finer regrind sizes could be due to insufficient collector in the cleaning stages.

COPPER-MOLYBDENUM SEPARATION

As part of the initial test work conducted by SGS, copper-molybdenum tests were run on high Mo composite and lithology composites.

FLASH FLOTATION AND DE-SLIMING FLOTATION

The flash flotation and desliming tests were conducted at SGS, which included production of a low-sulphur and a high sulphur tailings stream.

The results indicated low combined flash cleaner and second cleaner concentrate grades, which shows that flash flotation is not a potential option for the upstream recovery of Cu, Au, and Mo. The low flash cleaner concentrate grades are likely due to poor liberation at the 685 µm flash flotation grind size.

The test work also involved the hydro cyclone separation of the coarse tailings sands from the combined first cleaner scavenger tail and the rougher tail. Any pyrite reporting to the coarse fraction was recovered through flotation and combined with the cyclone slimes. Table 16.3 shows the comparison of modified ABA results for tests F17 and F21. The NP/AP value above four indicates that the sample is not acid generating. The removal of pyrite from the tailings increased the NP/AP ratio from 6.7 for the combined tailings to 38.1 for the low 'S' tails (cyclone sands). Although both tailings were neutral, in this case, the proposed tailings processing scheme would ensure that the low 'S' tailings generated are never acid generating regardless of the flotation feed pyrite content.

Table 16.3 De-sliming Flotation Summary

Sample ID		Test 17 Combined Tails	Test 21 Low 'S' Tails – Cyclone Sands
NP	t $CaCO_3$/1000t	50.0	47.7
AP	t $CaCO_3$/1000t	7.5	1.25
Net NP	t $CaCO_3$/1000t	42.5	46.4
NP/AP	**Ratio**	**6.7**	**38.1**
S	%	0.26	0.13
S_{2-}	%	0.24	0.04
SO_4	%	<0.4	<0.4
C	%	0.907	0.832
CO_3	%	1.54	2.25

A review of the head assays indicates that the data is relatively consistent and that the metal contents of the different samples vary greatly.

16.1.4 SGS Flotation Test Work Results

A report was submitted by SGS to PBM as part of the requirements for a feasibility study for grinding, flotation, and circuit design on the Morrison Property.

The principle components of the test work involved comminution studies, flotation test work, grinding, and flotation circuit design.

An average Bond ball mill work index of 16.1 kWh/t was observed for the 82 samples tested. This is indicative of medium-hard ore. Various composites were assembled from the 82 samples for development and confirmatory flotation test work. These included two master composites, four lithology composites, and four grade variability composites. The master composites prepared from the 82 variability samples had a head grade, given in Table 16.4.

Table 16.4 Head Assay – Master Composite Sample

Cu (%)	Au (g/t)	Ag (g/t)	Mo (%)	Fe (%)	S (%)
0.45	0.21	1.4	0.006	3.53	0.89

A mineralogical investigation of the Master composite indicated that the major Cu mineral is chalcopyrite with minor amounts of bornite. Analysis of particle liberation shows that Cu-sulphides are generally not well liberated above 1,504 µm and that liberation significantly improves between 150 and 75 µm. Liberation of Cu-sulphides is best in the -38 µm particle size range. Based on this mineralogy, target primary grind size should be much finer than 150 µm, and target regrind size should be in the range of 30 µm. The mineralogy is typical of other porphyry systems tested at SGS, but is considered marginally finer grained.

Flotation testing outlined a conventional flowsheet targeting a primary grind size K_{80} of –130 µm for natural pH rougher flotation using standard collectors PEX and AERO 3302, and MIBC as frother. The rougher concentrate is then reground to a K_{80} of -25 µm and cleaned in two stages at pH 11.5 to 11.8, adjusted with lime to depress pyrite, with small additions of CMC to control floatable non-sulphide gangue. These conditions were used in locked cycle testing using recycled effluent water from lab testing. An average over two master composite locked cycle tests and four grade variability composites resulted in the following metallurgical projections (Table 16.5).

Table 16.5 Average Master Composite Sample Test Results

Product	Mass (%)	Assays				Distribution			
		Cu (%)	Mo (%)	Au (g/t)	Ag * (g/t)	Cu (%)	Mo (%)	Au (%)	Ag * (%)
3rd Cleaner Conc	1.51	25.1	0.28	8.37	65.3	84.4	79.0	59.4	55.6
Combined Tail	98.5	0.071	0.001	0.10	0.67	15.6	21.0	46.3	44.4
Head (calc)	100.0	0.45	0.005	0.21	1.48	100.0	100.0	100.0	100.0

* Based on master composite tests only.

The majority of the samples tested showed a good relationship between Cu head grade and recovery, and Au head grade and recovery. Flotation testing on the lithology composites has lead to the conclusion that composite ZS-QZSE performed much poorer than the other lithology composites. It is recommended that the impact of grind size on Cu recovery be investigated for this lithology.

While not all ore samples tested contained significant amounts of molybdenum, when present, it recovered well into a bulk cleaner concentrate. Limited molybdenum flotation testing on bulk cleaner concentrate demonstrated that Mo concentrates in excess of 50% Mo could be achieved with reasonably high stage recovery.

For more details, see the report by SGS entitled “Morrison Project Flotation Test Work Report as a part of the Feasibility Study Prepared for Pacific Booker Minerals Inc.”, dated December 12, 2007, which can be found in an appendix for the report entitled “Morrison Copper/Gold Project Feasibility Study, Volume 1 – Process Plant, Mining, and Infrastructure” (Wardrop, 2008).

16.1.5 HPGR Test Work and Results

12 The 1.7 t of Morrison ore samples were shipped to the Polysius test facility in Beckum, Germany and tested in September 2007.

A series of pilot scale HPGR tests were carried out to demonstrate the ability of HPGR in processing of the Morrison material. The tests were conducted using stud linings.

In the comminution test series, the influences of the specific pressing force, feed moisture, and different roller wear linings were investigated. The Morrison material showed good response to high pressure comminution.

The high pressure grinding tests showed the following results:

- The material was found to be of low to medium abrasiveness, ATWI index 9-15 g/t.
- The size reduction achieved was better than average for copper ores.
- Increasing pressure had a minimum effect. The maximum specific press force necessary was 3.5 N/mm^2.
- The specific throughput for design purposes was 220 ts/hm^3. Recycling of oversize in a close-circuit operation has no significant effect.
- The net specific energy consumption was 1.7 kWh/t at a specific press force of 3.5 N/mm^2 for dry material, and 2.0 kWh/t for wet material with 4 to 5% moisture content.
- The material did not form competent flakes on pressing and could be screened with relatively high efficiency.
- The Bond work index (BWI) of the sample tested was 17.8 kWh/t before and 16.1 kWh/t after HPGR. Pressing in the HPGR results in a 10% weakening of the material, though the formation of micro-cracks.
- LABMILL tests indicated potential energy saving in the order of 14% at a P_{80} size of 200 µm and 12% at 90 µm from the greater amount of fines created by the HPGR.

The machine was sized and the 24/17 HPGR model was used for the circuit for the interim feasibility study. This machine is capable of processing 30,000 t/d.

For more details on the HPGR, see the report by Polysius entitled “High Pressure Grinding Tests on Copper/Gold/Molybdenum Ore from the Morrison Project, Pacific Booker Minerals at the Polysius Research Centre, December 6, 2007”, which can be found in an appendix for the report entitled “Morrison Copper/Gold Project Feasibility Study, Volume 1 – Process Plant, Mining, and Infrastructure” (Wardrop, 2008).

16.1.6 HPGR vs. SAG Milling – Effect on Flotation Recovery

A comparison study to evaluate the flotation response of HPGR prepared flotation feed versus standard prepared flotation feed was prepared by SGS in October 2007. Table 16.6 shows the head assays for both sub-samples.

Table 16.6 Head Assays – SGS Lakefield Research

Composite	Cu (%)	Mo (%)	Au (g/t)	S (%)
GT Comp	0.78	0.060	0.23	1.13
HPGR – GT Comp	0.79	0.044	0.24	1.26
Average	0.79	0.052	0.24	1.20
Standard Deviation	0.01	0.011	0.01	0.09

The SGS head assay results reported in Table 16.6 also shows that the GT composite is of relatively high Cu and Mo grade compared to the master composite indicated at Table 16.4 (0.45% Cu, 0.006% Mo, 0.21 g/t Au and 0.89% S).

The 2007 SGS report stated that the HPGR-GT Comp had a finer size distribution than the GT Comp, requiring a shorter grind time in a laboratory mill to reach the target flotation feed primary grind size (suggesting a lower BWI). At the target primary grind, both composites had the same size distribution.

Both cleaner and locked cycle tests on both composites gave similar metallurgical results to those observed in previous test work conducted under 11474-001. The comparison study on flotation recovery applying HPGR comminution versus conventional comminution showed that no remarkable improvement for copper recovery can be achieved.

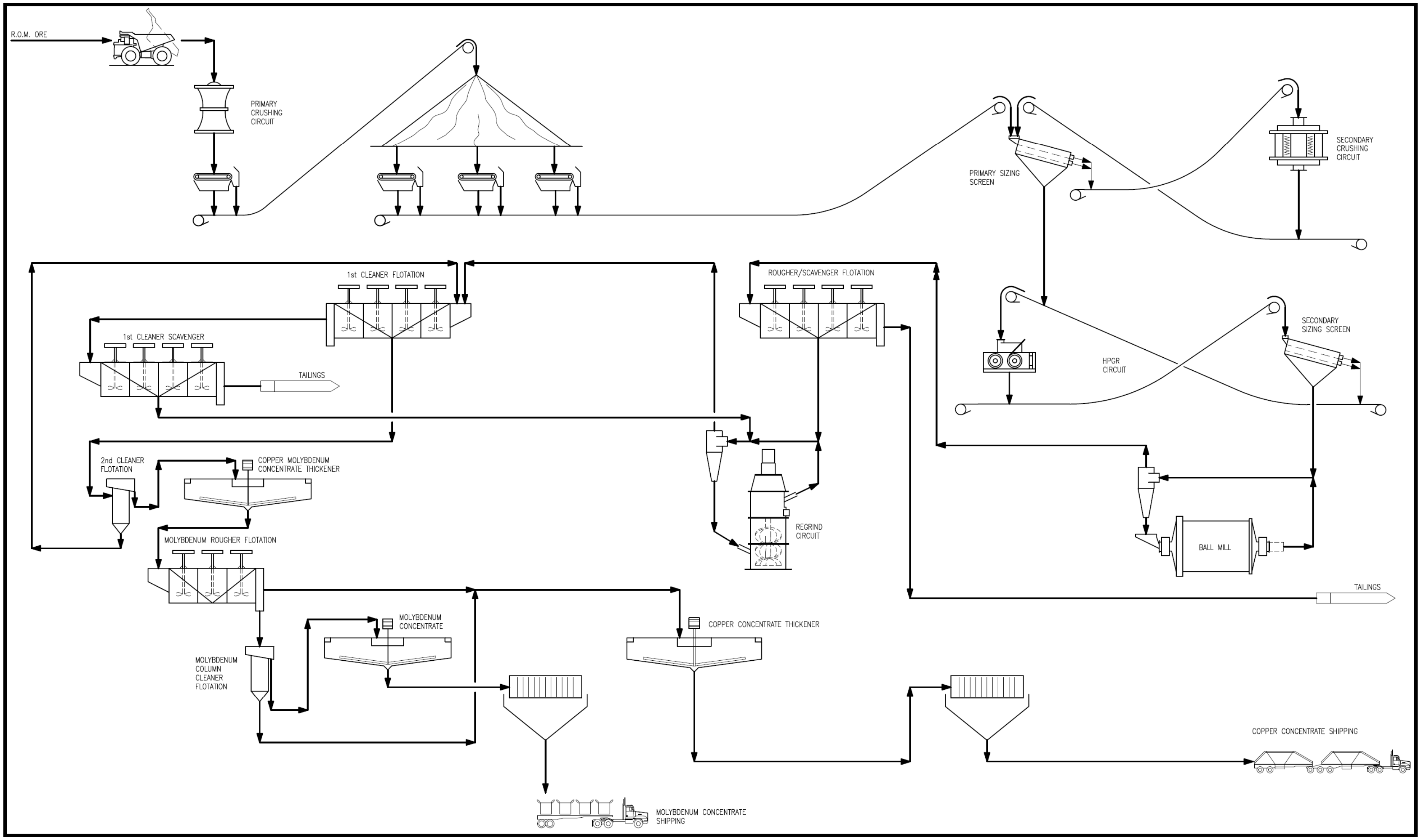
For more details on the HPGR, see the report by SGS entitled “The Flotation Response of HPGR versus Conventionally Crushed Flotation Feed from the Morrison Deposit Prepared for Pacific Booker Minerals Inc.”, dated December 21, 2007, which can be found in an appendix for the report entitled “Morrison Copper/Gold Project Feasibility Study, Volume 1 – Process Plant, Mining, and Infrastructure” (Wardrop, 2008).

16.2 MINERAL PROCESSING

Processing of the ore will be performed on-site using crushing, grinding, and flotation to recover copper and molybdenum concentrates. The crushing, grinding, and flotation test work was conducted by SGS at Lakefield, Ontario during the years of 2006 and 2007. The high pressure grinding pilot testing was conducted by Polysius at Beckum Germany in 2007 with HPGR in place of conventional SAG milling incorporated into the plant design.

A simplified flowsheet is shown in Figure 16.1.

Figure 16.1 Simplified Flowsheet



The flowsheet design is based on 30,000 t/d mill capacity with an overall mill availability of 92%, which allows for scheduled and non-scheduled maintenance. The process facilities will operate 365 d/a, 24 h/d for the whole of the comminution and processing system.

The facilities include the following unit operations.

16.2.1 PRIMARY CRUSHING AND COARSE ORE STORAGE

Run-of-mine (ROM) material from the pit is delivered by 227 t capacity haul trucks that dump directly to the 1,372 mm x 1,905 mm primary gyratory crusher. The gyratory crusher discharge is collected by a 1,830 mm apron feeder under the crusher. The feeder then transfers the crushed ore onto a 1,524 mm conveyor, which in turn discharges onto the crushed ore stockpile. The total live capacity of the stockpile is 30,000 t. A dust collection system is installed to minimize dust emissions.

16.2.2 SECONDARY AND TERTIARY CRUSHING

Three 1,200 mm x 5,500 mm apron feeders withdraw ore from the stockpile onto the 1,372 mm wide x 201,300 mm long primary sizing screens feed conveyor at an average rate of 1,359 tonnes per operating hour. The primary sizing screens are 2,700 mm wide x 8,000 mm long with grate apertures of 75 mm and 45 mm. The oversize material (+45 mm) from the both screens is feed to the cone crusher, powered with 750 kW motor.

The undersize product from the primary sizing screens (-45 mm) is fed to the HPGR surge bin. The material is fed to the HPGR through a belt feeder and then to the secondary sizing screens. The secondary sizing screens are 4,000 mm wide x 8,000 mm long with grate apertures of 20 mm and 6 mm.

The oversize product (+6 mm) from the secondary sizing screens is returned to the HPGR surge bin through series of conveyor belts.

The undersize product (-6 mm) is mixed with water before being fed to the grinding cyclones feed pumpbox. Water is added with the ore to form slurry in the cyclone feed at about 55% solids.

16.2.3 PRIMARY GRINDING

The two 6.1 m x 10.2 m ball mills are powered with 6,700 kW motor. The ball mills are in a closed circuit with a one stage cyclone package.

Aero 3302 and PEX, as the flotation collector reagent, are added to the ball mill pumpbox. Other reagents if required may also be added to the pumpbox.

The pumpbox slurry is pumped to the two sets of 660 mm primary cyclones (5 operating, one stand-by each), with the underflow returning to the ball mill. The primary cyclone overflow, at approximately 35% solids and a pH of about 8, is advanced to the copper flotation circuit for further recovery. The particle size range is 80% less than 150 μm.

16.2.4 COPPER & MOLYBDENUM CONCENTRATION AND REGRINDING

The circuit contains the following stages:

- copper rougher/scavenger flotation
- copper rougher/scavenger and first cleaner/scavenger concentrates regrinding
- copper first and second cleaner flotations
- molybdenum rougher flotation
- molybdenum cleaner flotation.

The primary grinding cyclone overflow (from the grinding section) is directed to the copper rougher flotation. The slurry from the cyclones is fed to the four 200 m^3 mechanical cells. The copper rougher tailings are scavenged using four 200 m^3 mechanical cells prior to discharge to the tailings impoundment. MIBC (a frother) and possibly more reagents are added as required.

The copper rougher/scavenger concentrates are collected in a pumpbox and further reagents and makeup water are added as required. This is then sent to the regrind mills cyclopac. The underflow drops into the regrind mills feed chute and returns for regrinding. Each regrind mill processes about 140 to 150 t/h. Lime is also added to the regrind mill to maintain a pH of about 11.5.

The regrind cyclone overflow, at approximately 25% solids, is directed to the first cleaner flotation cells. The particle size P_{80} is less than 25 μm. The tailing of the first copper cleaner stage is scavenged using conventional mechanical cells with the concentrate being re-circulated to the regrinding mill feed. The tailings product is added to the copper rougher/scavenger tail as final tailings.

The concentrate from the first copper cleaner stage is then advanced to the copper second cleaner flotation. The second cleaner is using a 3.1 m Ø x 10.0 m column cell with concentrate advanced to the molybdenum flotation circuit and tailings recycled to the copper first flotation.

The concentrate from the copper second flotation is fed in an 11 m Ø copper-molybdenum concentrate thickener. The thickened concentrate is fed to the three 5 m^3 mechanical cells. The molybdenum rougher tailings together with the copper-molybdenum and final molybdenum concentrate thickeners overflows are advanced to the copper dewatering circuit. The molybdenum rougher concentrate is further processed to the single cleaner stage circuit (column cell). The final molybdenum cleaner concentrate is predicted to be achieved with a grade of 45 to 50% Mo.

16.2.5 Copper Concentrate Dewatering

The final copper concentrate is thickened in an 11.4 m Ø concentrate thickener with the aid of flocculent. The thickener overflow is recycled to the process water tank for reuse. The underflow, at 60% solids, is pumped to a pressure filter.

The copper concentrate filter cake is expected to have between 8 and 10% moisture. The cake is conveyed to a stockpile. The water discharged from the filter is recycled to the concentrate thickener to recover the fine solids in the water.

16.2.6 Molybdenum Concentrate Dewatering, Drying, Packing & Transport

The final molybdenum concentrate is thickened in a 2.5 m diameter thickener with the aid of flocculant. The thickener underflow at 60% solids is pumped to a filter. The molybdenum concentrate filter cake is expected to have between 10 and 15% moisture. The cake is conveyed to a standard rotary dryer to further reduce the moisture content to less than 5%. The final molybdenum concentrate product discharges into a bin prior to packaging.

An automated bagging machine will package the dried molybdenum concentrate into two-tonne tote bags at a rate of one bag per hour. These bags are weighed and sampled before moving them to a storage area. The molybdenum concentrate production is approximately 0.01% of the mill feed tonnage averaging 8 t/d.

16.2.7 Tailing Disposal and Process Water Supply

Flotation plant tailings are pumped to the tailings dam through two booster pump stations where the tailings are cycloned from April to October. The coarse fraction is fed to a 200 m^3 pyrite flotation cell (optional). The tailings sand is used to build the dam perimeter by the centre-line method, with the fine fraction discharged within the upstream side of the dam. From November through March, the tailings are spigotted at regular intervals along the upstream side of the dam. Process water will be reclaimed from the tailings impoundment by pumps located on a floating barge to the reclaim water holding tank.

Process water within the concentrator is recycled. Make-up process water, as required, is supplied from the fresh water tank. Water for initial start-up and for operations in the first year is provided from the pond located by the compacted till starter dam.

SGS carried out tailings characterization, followed by aging tests of the tailings supernatant water study.

16.2.8 Reagents and Consumables

Reagents are added to the flotation circuit to enhance selective floatability. The reagent addition points are shown in the flowsheet drawings.

The main proposed reagents to be used for the Morrison project are: lime, PEX, Aero 3302, Kerosene, CMC, MIBC, and flocculants. Most reagents will be received in bulk as in palletized bags, drums, or bulk bags.

All reagents will be prepared and stored in a separate, self-contained area within the concentrator building and delivered by individual metering pumps or centrifugal pumps to required addition points. All the reagents will be prepared using fresh water.

The covered and curbed reagent storage and preparation area will be located adjacent to the flotation area. A forklift with a drum handler attachment will be used for reagent handling, while the electric hoist servicing the concentrate load-out and reagent areas will lift the reagents to the respective reagent mixing area located above the mixed reagent storage area. The reagent system will include unloading and storage facilities, mixing tanks, transfer pumps, and feeding equipment.

Test reagents may be used periodically and a dedicated reagent mixing and storage system is included. Any unused test reagent will be returned to the supplier.

Each reagent line and addition point will be labelled according to Workplace Hazardous Materials Information Systems (WHMIS) standards. All operational personnel will receive WHMIS training and additional training in the safe handling and use of the reagents based on the best practice.

Reagents are added to the flotation circuit to enhance selective floatability.

The major consumables for the comminution circuit are balls and liners. HPGR roll wearing was calculated by the vendor during recent high pressure comminution tests.

17.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATE

17.1 DATABASES – GENERAL DESCRIPTION

Data from the 1998–2008 Morrison drilling programs has been compiled in a Microsoft Access database. The data consists of collar locations, downhole surveys, lithologic intervals, alteration intervals, and assay intervals for copper and gold. Geosim found that the assay data from four metallurgical holes had not been previously entered and this was corrected. Seven geotechnical holes completed in 2006 were sampled and analyzed in 2007. The 21 condemnation holes drilled in 2006-2008 were not sampled as no significant copper mineralization was visually identified. One hole drilled in the Central Zone in 2007 for water monitoring purposes was sampled and assayed.

Prior to 2006, molybdenum was not considered to have economic significance and had not been entered into the master database. After examining drill core from the southeast zone, Geosim identified what appeared to be significant molybdenite-bearing intercepts and recommended that further investigation of the molybdenum potential be carried out. As a first step, all available molybdenum analyses were entered into the digital database. This comprised a total of only 1,539 samples which was fewer than 18% of the intervals analyzed for copper and gold. As this number of assays was not deemed sufficient for the purpose of resource estimation, it was decided to re-analyze all available sample pulps or rejects from the recent drill programs for molybdenum. Between December 2006 and March 2007, a total of 5,975 pulps and rejects were assayed for Mo at Acme laboratories using 4-acid digestion followed by ICP-ES analysis.

Data from the older Noranda holes has also been entered in the database but, as stated in previous studies, the quality and reliability of the assays do not meet NI 43-101 standards. Although the assay data was not used in the resource estimate, the geologic data was incorporated into the present lithologic and structural models.

The descriptive statistics for the analyzed intervals within all the domains used in the present resource model are shown in Table 17.1. Frequency distributions of copper, gold, and molybdenum are illustrated in Figure 17.1 to Figure 17.3.

The histogram for copper (Figure 17.1) shows a moderately skewed distribution with no strong bimodality evident. Histograms for Au and Mo show strongly skewed distributions but no bimodal character (Figure 17.2 and Figure 17.3).

Table 17.1 Statistics of Assays Within 0.1% Cu Isopleth

	Cu (%)	Au (g/t)	Au (g/t) *	Mo (%)
n	7,745	7,745	7,745	5,468
Minimum	0.00	0.00	0.00	0.000
Maximum	1.81	15.17	1.50	0.147
Mean	0.36	0.19	0.18	0.005
Median	0.33	0.14	0.14	0.003
SD	0.21	0.33	0.16	0.007
Variance	0.04	0.11	0.03	0.000
Coeff. of Var.	0.576	1.803	0.929	1.498

* capped at 1.5 g/t.

Figure 17.1 Frequency Distribution of Cu

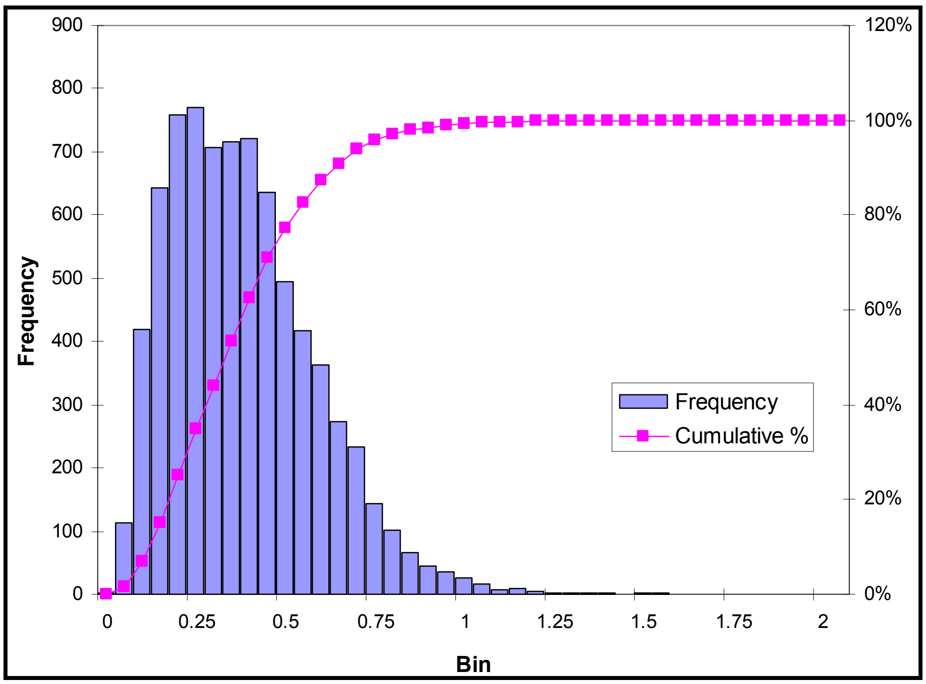


Figure 17.2 Frequency Distribution of Au

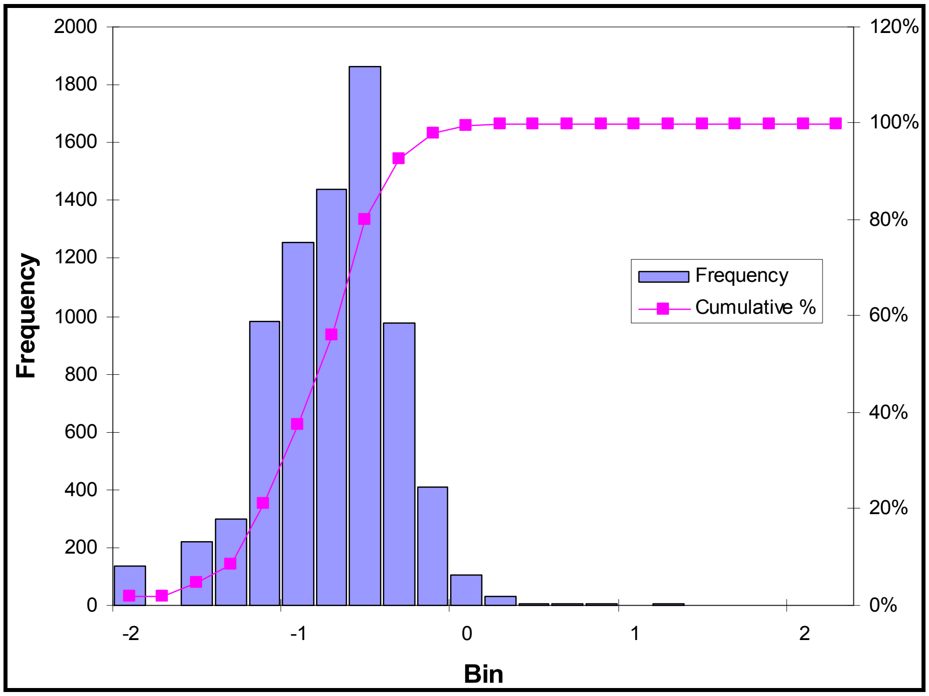
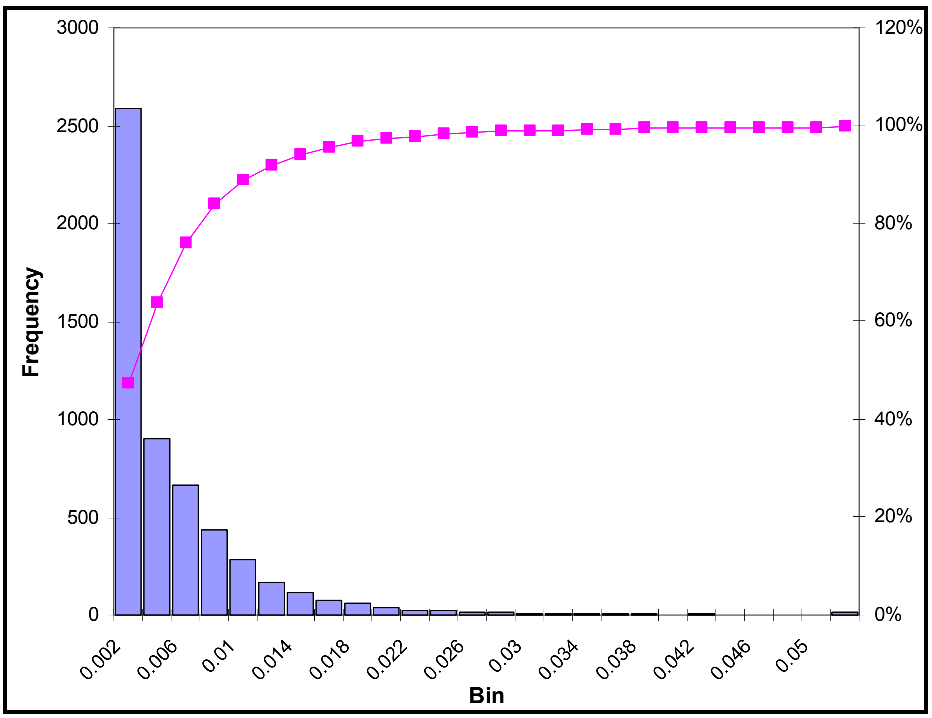


Figure 17.3 Frequency Distribution of Mo



17.2 TOPOGRAPHY

The most recent surface topography of the property was created by Eagle Mapping Ltd. in June, 2007 produced from 1:10,000 scale aerial photography flown in September 2006. The contour interval was 2 m and the datum was NAD83 Zone 9.

The Morrison deposit lies between and on the flanks of two small hills with a small pond between (Figure 11.1). Geosim noted in the previous technical report (Simpson, 2007) that the surveyed drill hole collar elevations at that time matched the topography fairly well in the areas south and east of the pond (±3 m) but elsewhere, they tended to be higher than the topographic base. This difference was as much as 5 to 10 m in the extreme northwest. Although the effect of this discrepancy on the block model resource estimate was regarded as minimal, it represented a loss of potentially mineralized material and should be corrected. In 2007, the holes were re-surveyed by Allnorth and the results were deemed acceptable. The revised hole collars surveys were used in the present resource estimate.

There is significant overburden in areas of the deposit, particularly in the shallow valley occupied by the pond. A bedrock surface model was constructed using profiles drawn on section and this was used as the upper surface of the block model for grade estimation purposes.

17.3 DENSITY

A total of 309 core samples from the 2001 and 2002 drilling programs were measured for specific gravity at Acme laboratories in Vancouver. The statistics for the two major rock units and argillic-sericite altered fault zones are shown in Table 17.2.

Table 17.2 Specific Gravity Statistics

	BFP	Sediments	BFP + Sediments	Fault Zones
Count	159	78	237	72
Minimum	2.57	2.50	2.50	2.27
Maximum	2.81	2.81	2.81	2.86
Mean	2.72	2.71	2.72	2.58
Median	2.73	2.71	2.72	2.61
SD	0.041	0.056	0.047	0.13

The mean and median values between the BFP unit and the sedimentary rocks were almost identical and it was decided to use the overall mean/median value of 2.72/m^3 for both units. The east and west fault zone blocks were assigned a density of 2.6 t/m^3.

17.4 GEOLOGIC MODEL

Lithologic codes were assigned to model blocks in a similar way to previous models which used a nearest neighbour method to determine which blocks between sections were within the intrusive rock (Snowden, 2003). As a first step, blocks within the intrusive (BFP) unit were determined by indicator kriging. This was accomplished by creating 6 m downhole composites within the 3 main lithologies (BFP, sediments, and fault zones). The composite intervals that corresponded with drill hole intercepts of the BFP unit were then assigned a value of 1 and all other composites assigned a 0 value. Semi-variograms of the resulting composite file were then modelled to establish nugget, sill, and range values for use in the kriging runs. Indicator kriging was then used to assign blocks a value between 0 and 1 corresponding to the probability that the majority of a block was within the BFP unit. Blocks with a value of 0.5 or greater were then coded as BFP. All other blocks were coded as sedimentary rocks with the exception of those within the East Fault Zone and a few blocks along the West Fault.

17.5 ZONE CONSTRAINTS

Previous three-dimensional (3D) model domains used for limiting block model estimations were based on a 0.2% Cu grade envelope and mineral resources were reported at a cut-off grade of 0.3% Cu (Snowden, 2003 and Beacon Hill, 2004). For the 2007 resource update, it was decided to expand the grade envelope to a 0.1% Cu cut-off grade. This was considered justified for the following reasons:

- Metal prices have increased significantly since 2004.
- Copper and gold mineralization are not directly correlated.
- Significant molybdenum grades occur in the southeastern portion of the deposit.

Despite this expansion of the constraining grade envelope, the ultimate extends did not change significantly in many areas as there tends to be a sharp decrease in the outer limits of copper mineralization grade between a grade of 0.2 and <0.1%. However, a number of areas previously treated as internal waste (<0.2% Cu) were above the 0.1% Cu cut-off as well as a significant portion to the northwest (Figure 17.4).

The most significant change made in the 3D gradeshell model was the separation of the Central Zone domain into two zones separated by the West Fault (Figure 17.5). A few additional drill holes in the Southeast Zone also resulted in some modification of the grade envelope in that area.

For the purposes of block grade estimation, the four zones were treated as independent domains separated by hard boundaries. A block percent item was calculated for all blocks for each zone. For blocks spanning more than one zone, the final assigned grade was the weighted average of the corresponding zone estimates.

Figure 17.4 Comparison of Block Model Constraints Based on Cu Grade Isopleths

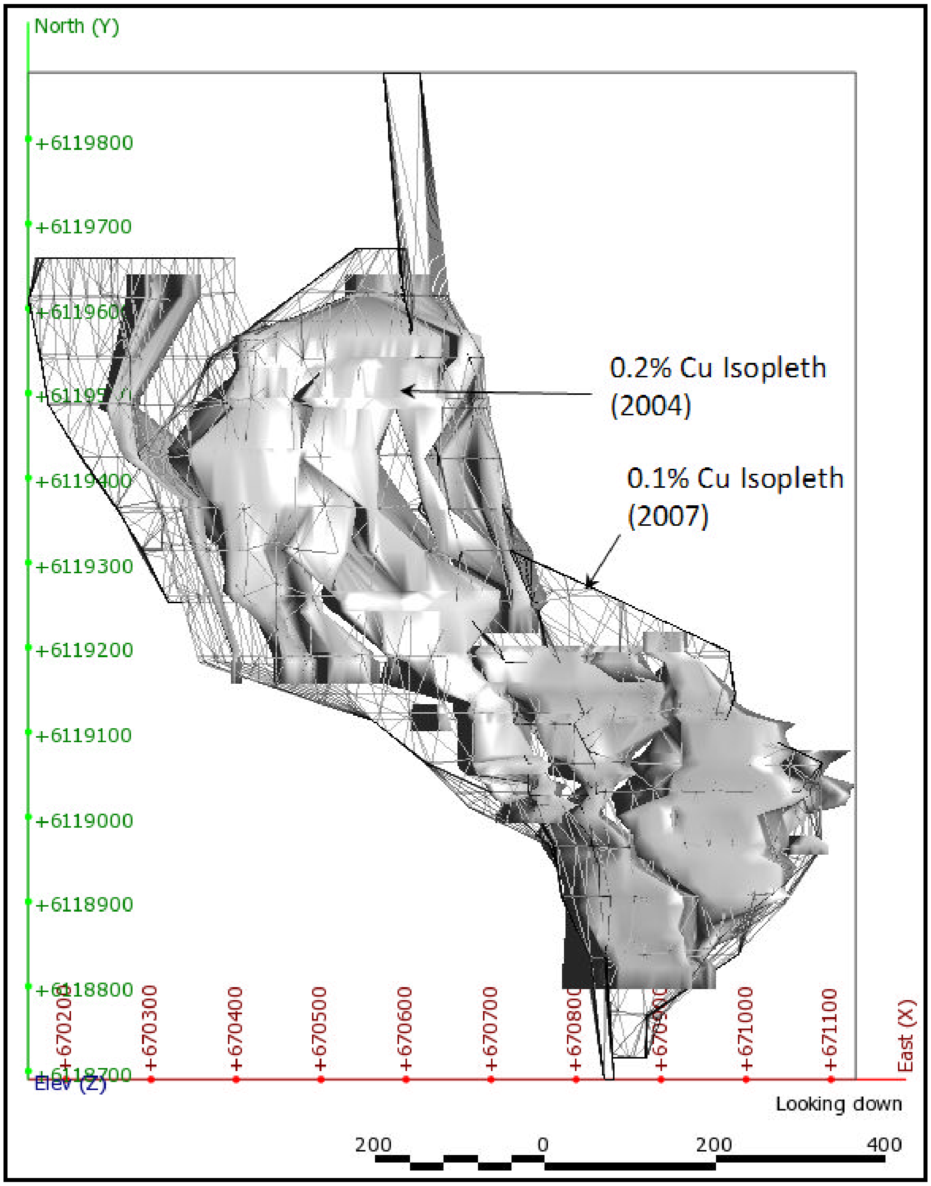
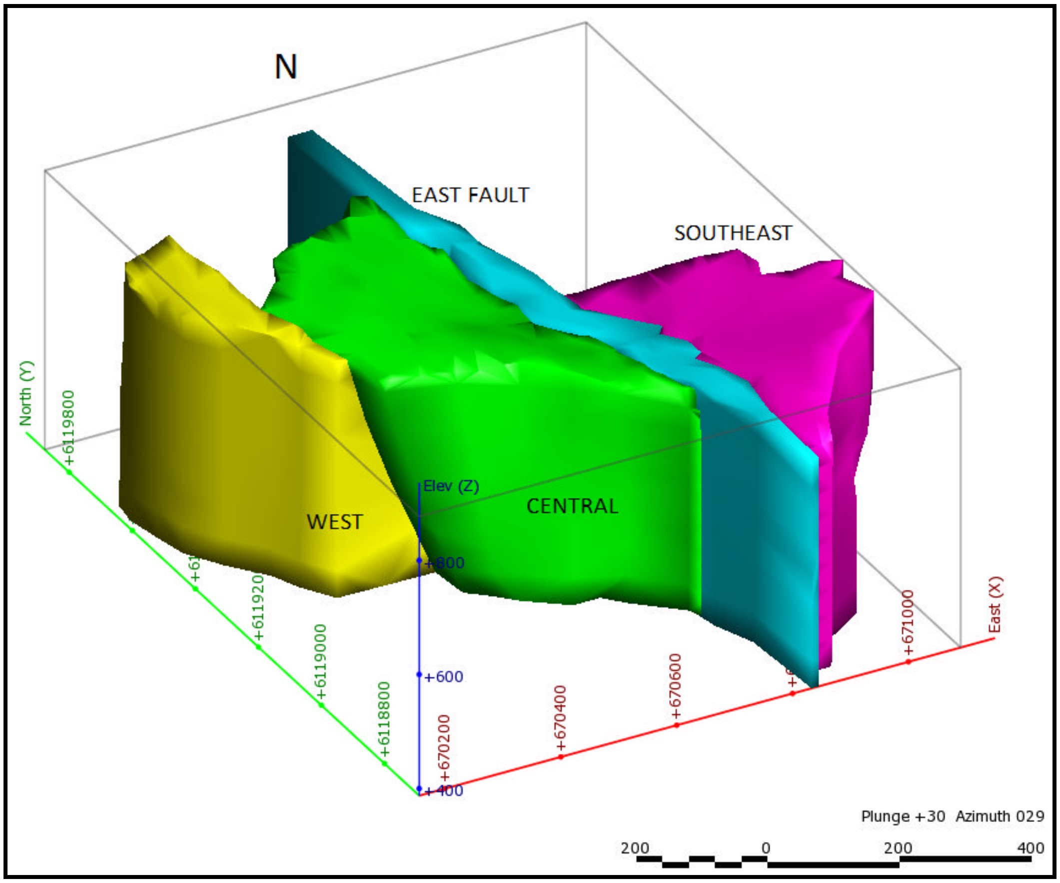


Figure 17.5 Morrison Structural Domains Within 0.1% Cu Isopleth



17.6 EXTREME GRADES

Grade distribution of Cu, Au, and Mo in drill hole data was examined to determine if grade capping or special treatment of high outliers was warranted. It was concluded that capping of copper and molybdenum grades is not warranted as there are no significant outliers evident in the probability plots (Figure 17.6 and Figure 17.7) and the coefficient of variation is fairly low at 0.576.

The log probability plot for Au (Figure 17.8) shows a number of outliers above a clear break around the 1.5 g/t level. This was selected as a top-cut value and assays were capped at 1.5 g/t prior to compositing. This affected a total of 21 samples and reduced the coefficient of variation from 1.8 to 0.93.

Figure 17.6 Log Probability Distribution Plot of Cu Assays

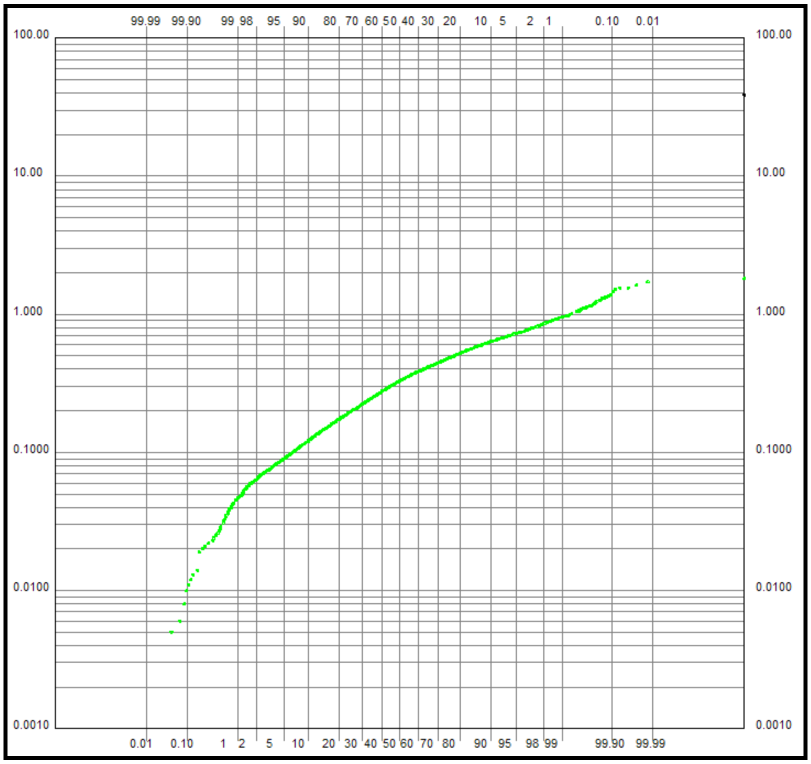


Figure 17.7 Log Probability Distribution Plot of Mo Assays

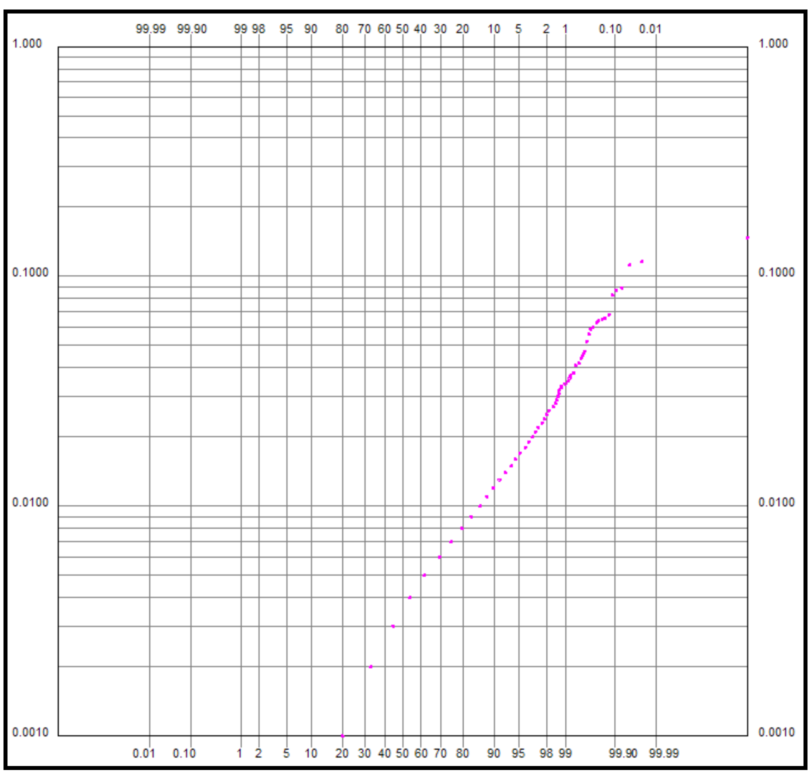
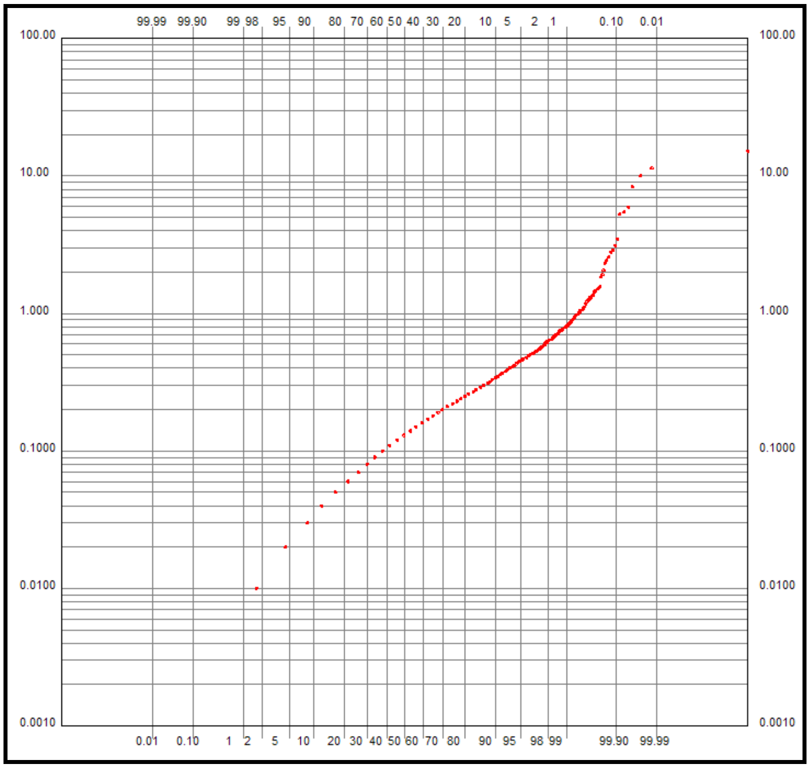


Figure 17.8 Log Probability Distribution Plot of Au Assays



17.7 COMPOSITING

Raw assay intervals were composited on 6 m downhole intervals honouring domain boundaries. Gold assays were capped at 1.5 g/t prior to compositing. The descriptive statistics for the composites are shown in Table 17.3.

Table 17.3 Summary Statistics for All 6 m Composites

	Cu (%)	Au (g/t)	Mo (%)
Count	3,860	3,860	2,666
Minimum	0.004	0.009	0.000
Maximum	1.674	1.336	0.086
Mean	0.360	0.176	0.005
Median	0.336	0.144	0.003
Variance	0.036	0.019	0.00004
SD	0.189	0.137	0.006
Coeff. of Var.	0.524	0.777	1.253

17.8 VARIOGRAM ANALYSIS

Pairwise relative semi-variograms for copper and gold were modelled for the revised Central, East Fault, and Southeast Zone domains using the composited drill hole data (Figure 17.9 to Figure 17.11). Normal variograms were modelled for molybdenum. The Central Zone model was also applied to the smaller West Zone as there were insufficient samples in the latter for any meaningful spatial analysis.

Results for all zone domains are summarized in Table 17.4.

Table 17.4 Semi-variogram Models

Item	Zone	Variogram Model					
		Orientation	co	c1	a1	c2	a2
Cu	West & Central	vertical	0.0575	0.0744	80.1	0.126	211
		00° ->044°			211		211
		00° ->134°			42		118
Au	West & Central	vertical	0.0986	0.099	75.5	0.1816	185
		00° ->040°			185		185
		00° ->130°			29		112
Mo	West & Central	vertical	0	1,193.5	110.8		
		0° ->020°			78.0		
		0° ->290°			49.2		
Cu	East Fault	00° ->164°	0.071	0.0796	41.8	0.1016	187.8
		vertical			41.8		192.5
		00° ->74°			18		68
Au	East Fault	00° ->160°	0.0796	0.098	57.6	0.1686	180.9
		vertical			180.9		180.9
		00° ->70°			21		65
Mo	East Fault	-83°->180	75	637	137.3		
		0° ->350°			79.8		
		7° ->080°			54.3		
Cu	East	vertical	0.039	0.029	41.1	0.1074	200
		00° ->030°			200		200
		00° ->120°			28		118
Au	East	vertical	0.067	0.0552	53.5	0.1019	213
		00° ->045°			213		213
		00° ->135°			46		126
Mo	East	00° ->040°	2,258	984.5	98.9	2,980	275
		80° ->130°			81		225
		-10° ->130°			46		127

Figure 17.9 Semi-variogram Models for Cu by Zone

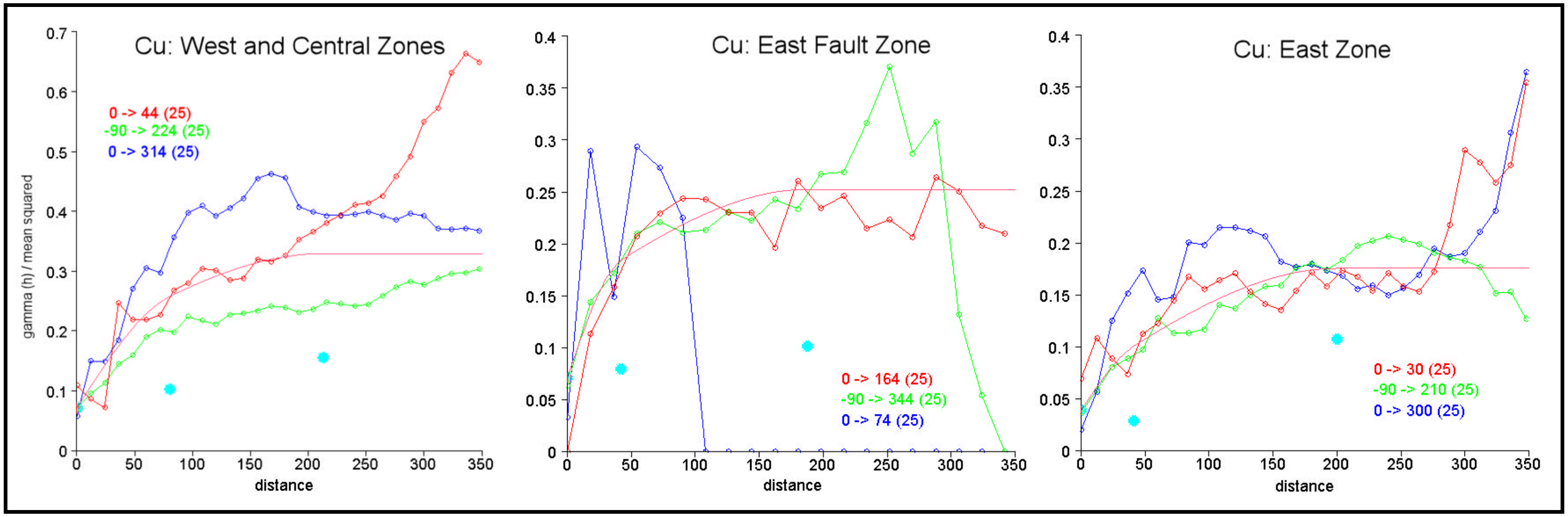


Figure 17.10 Semi-variogram Models for Au by Zone

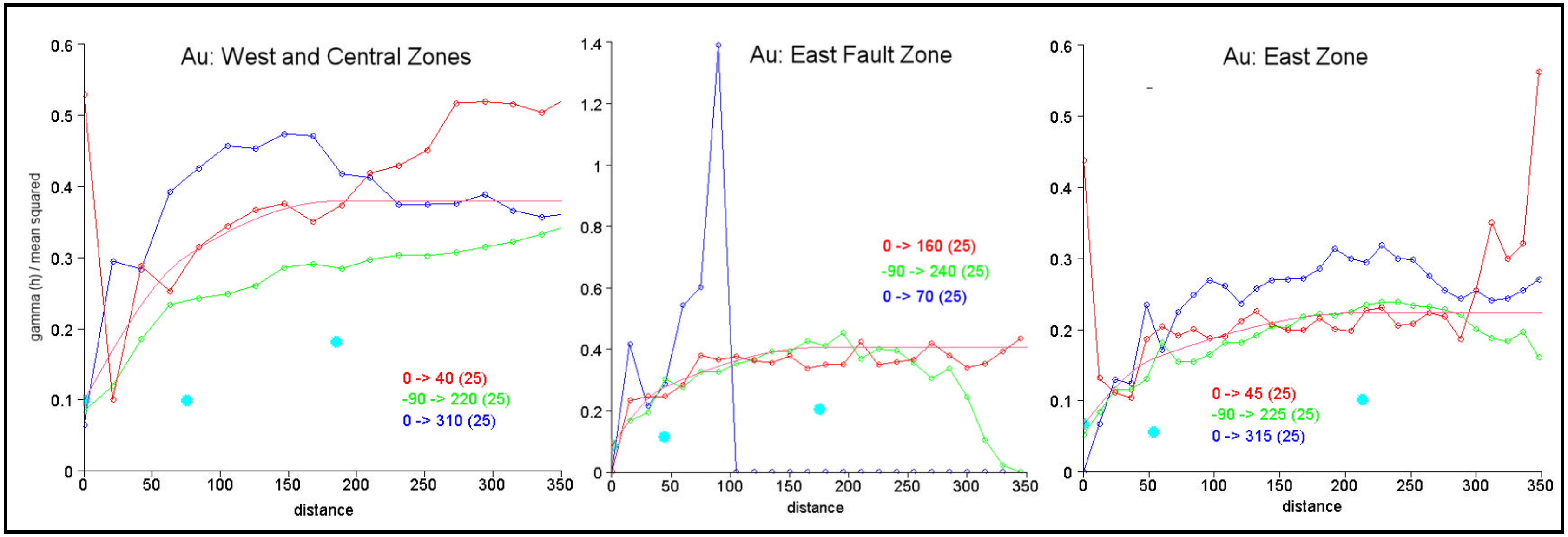
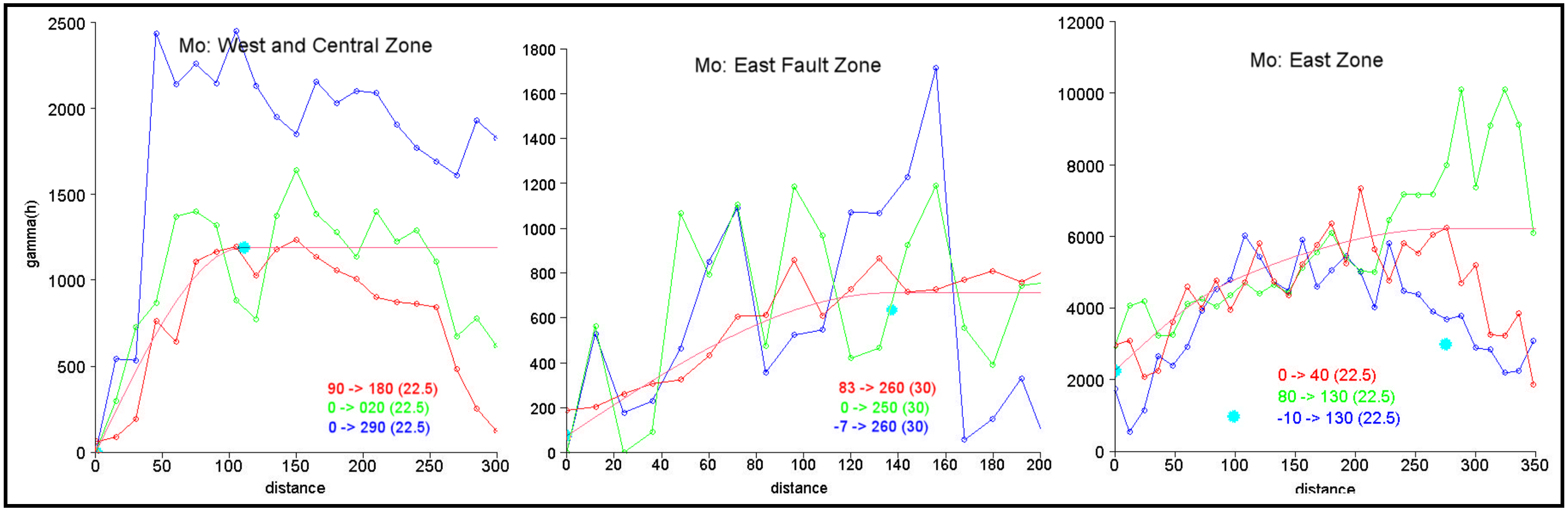


Figure 17.11 Semi-variogram Models for Mo by Zone



17.9 BLOCK MODEL AND GRADE ESTIMATION PROCEDURES

A block model was created in Surpac using a block size of 20 m x 20 m x 12 m. The parameters of the model are summarized in Table 17.5.

Table 17.5 Block Model Extents

	Min	Max	Dist	Size	# Blocks
x	669850	671650	1800	20	90
y	6118500	6120100	1600	20	80
z	300	1092	792	12	66

Hard boundaries were used for the four zone domains such that only composites falling within the individual zones were used to estimate the blocks within them. Post-mineral dykes were treated as dilution as they were too narrow and discontinuous to model in three dimensions.

Blocks were estimated by ordinary kriging in three passes. The search ellipsoids were oriented parallel to the maximum directions of continuity as established by the principal axes of the variogram models. Search parameters are summarized in Table 17.6.

Table 17.6 Model Search Parameters

Item	Zone	Search Ellipse Orientation		Ratio to Major Axis	Max Search (Pass)		
		Bearing	Dip		1	2	3
Cu	West & Central	-	-90		62	123	200
		044º	0	1.00	62	123	200
		134º	0	1.79	35	69	112
Au	West & Central	-	-90		62	123	200
		020º	0	1.00	62	123	200
		290º	0	1.66	37	74	121
Mo	West & Central	-	-90		37	74	222
		040º	0	1.42	26	52	156
		130º	0	2.25	12	23	69
Cu	East Fault	-	-90		60	121	180
		164º	0	1.00	60	121	180
		074º	0	2.78	22	44	65
Au	East Fault	-	-90		60	121	180
		160º	0	1.00	60	121	180
		070º	0	2.78	22	44	65

table continues…

Item	Zone	Search Ellipse Orientation		Ratio to Major Axis	Max Search (Pass)		
		Bearing	Dip		1	2	3
Mo	East Fault	080º	-83		46	92	275
		350º	0	1.72	27	53	160
		080º	7	2.53	11	21	63
Cu	East	-	-90		67	133	200
		030º	0	1.00	67	133	200
		120º	0	1.70	39	78	118
Au	East	-	-90		67	133	200
		045º	0	1.00	67	133	200
		135º	0	1.69	40	79	118
Mo	East	040º	0		69	138	275
		130º	80	1.22	57	113	225
		130º	-10	2.17	26	52	104

Figure 17.12 through to Figure 17.14 illustrate the grade distribution for Cu, Au, and Mo in a plan view of the 700 level.

Figure 17.12 Cu Grades – 700 Level

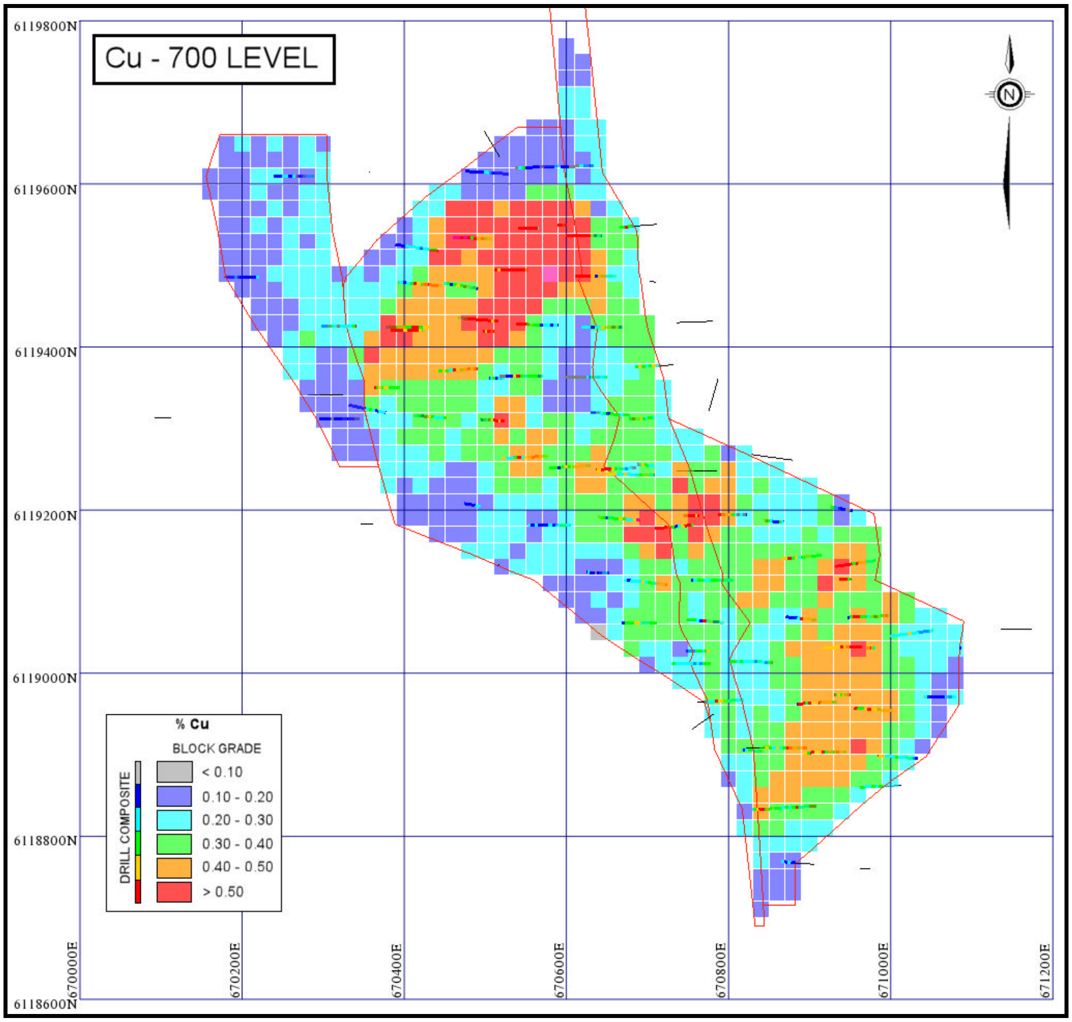


Figure 17.13 Au Grades – 700 Level

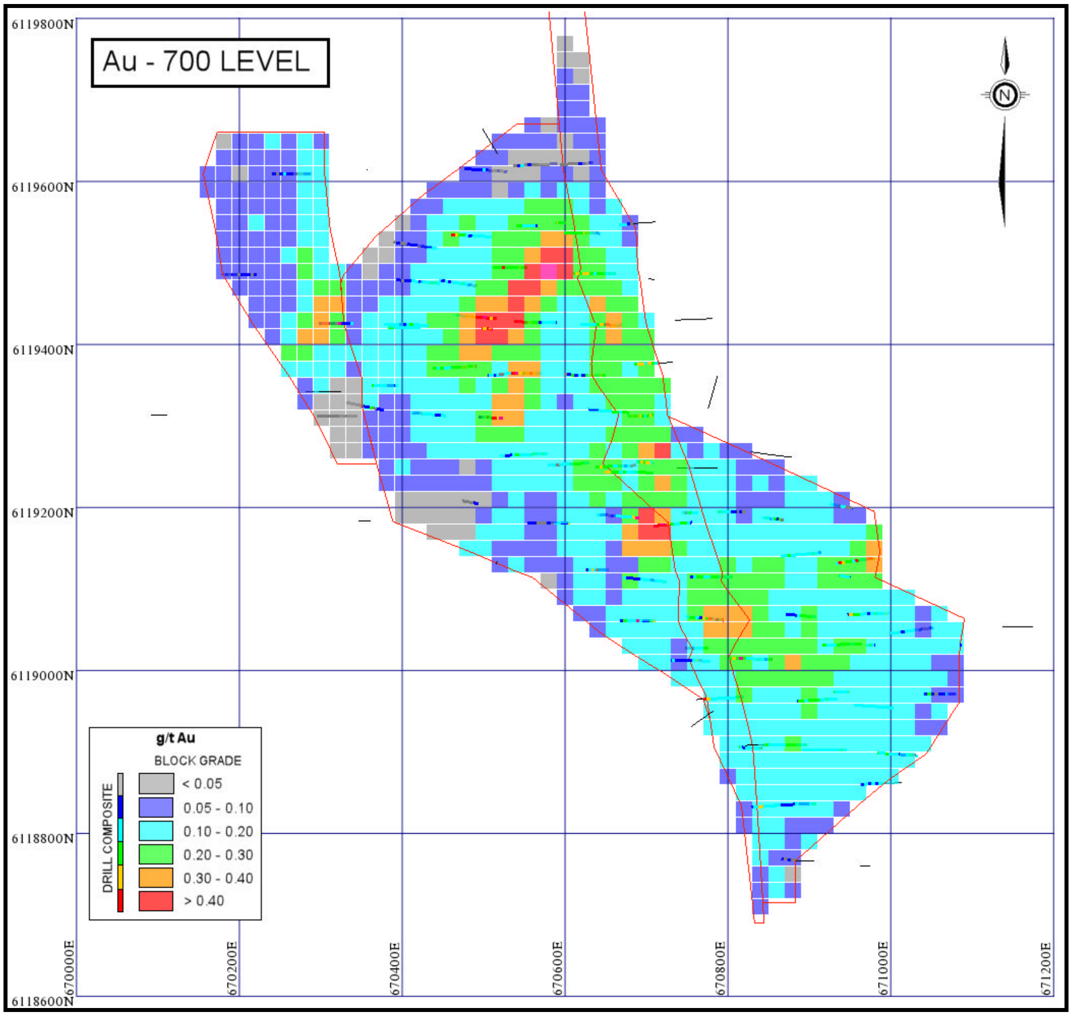
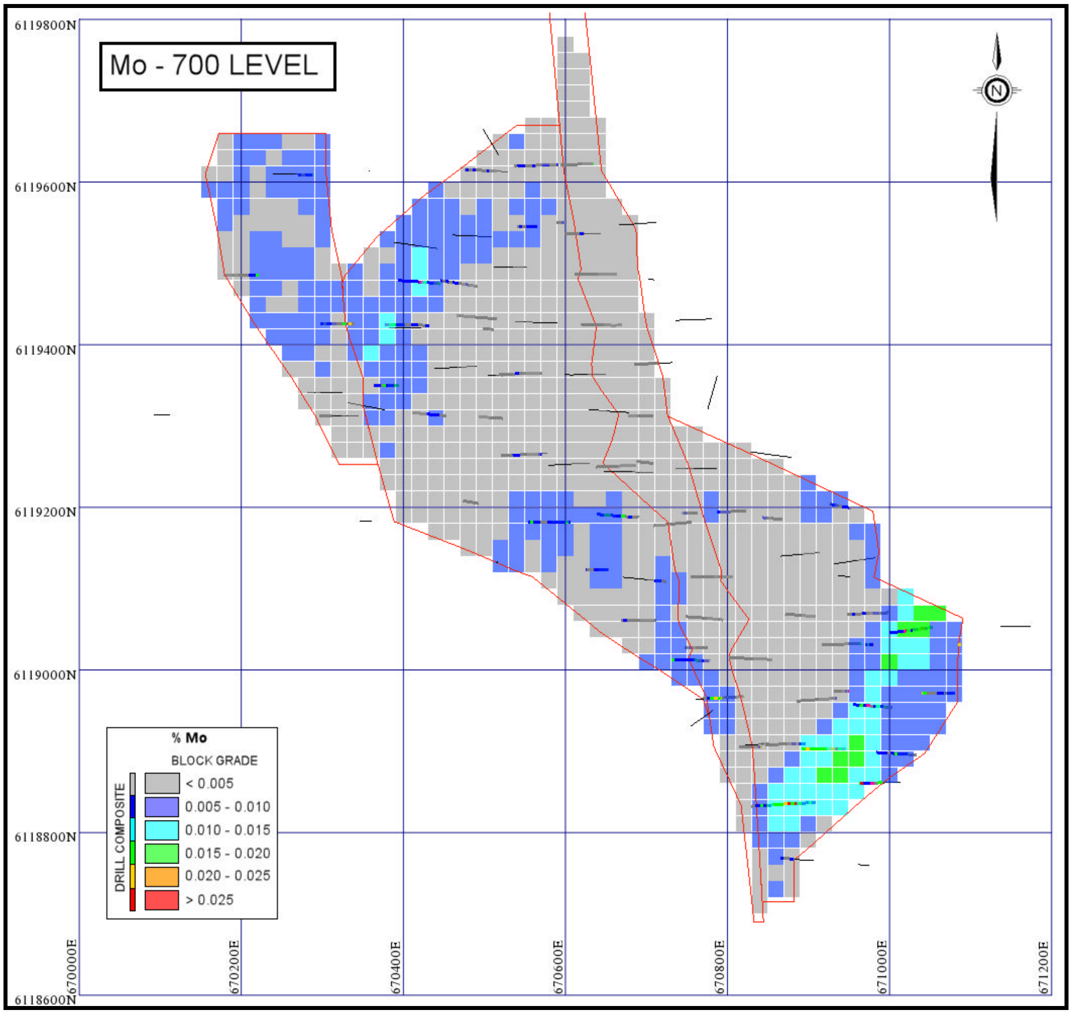
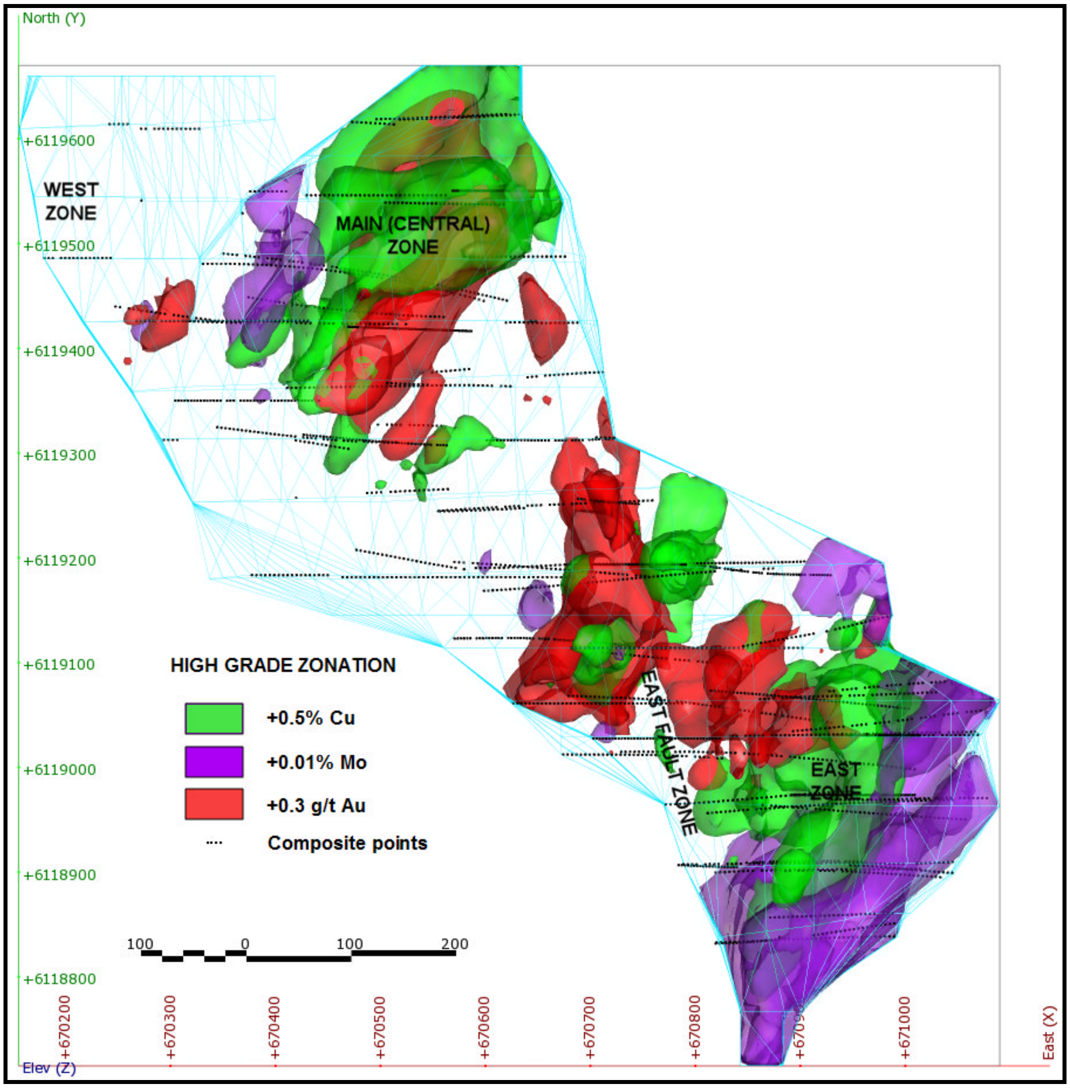


Figure 17.14 Mo Grades – 700 Level



The high grade zonation of copper, gold, and molybdenum is illustrated in Figure 17.15. The Central Zone has two coincident high grade copper and gold zones while the southeastern area hosts significant molybdenum mineralization but lower Au grades.

Figure 17.15 Zonation of Metal Distribution



17.10 MINERAL RESOURCE CLASSIFICATION

Resource classifications used in this study conform to the following definitions from NI 43-101:

- **Measured Mineral Resource** – *A 'Measured Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, physical characteristics are so well established that they can be estimated with confidence sufficient to allow the appropriate application of technical and economic parameters, to support production planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration, sampling and testing information gathered through* *appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough to confirm both geological and grade continuity.*

- **Indicated Mineral Resource** – *An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.*
- **Inferred Mineral Resource** – *An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.*

The estimated blocks were classified as measured, indicated, or inferred based on the three kriging passes utilizing the search parameters shown in Table 17.6. Where blocks overlapped zone boundaries the majority code was assigned based on the calculated block partial percentage. To be classifies as measured, a block was required to be estimated in the first kriging pass and have composite samples in at least five adjacent octants. Indicated blocks were required to be estimated in the second kriging pass and have composite samples in at least three adjacent octants. All remaining estimated blocks were assigned to the inferred category.

Figure 17.16 through to Figure 17.19 illustrate the distribution of the three classes in plan view and cross section.

Figure 17.16 Block Classification – 800 Level

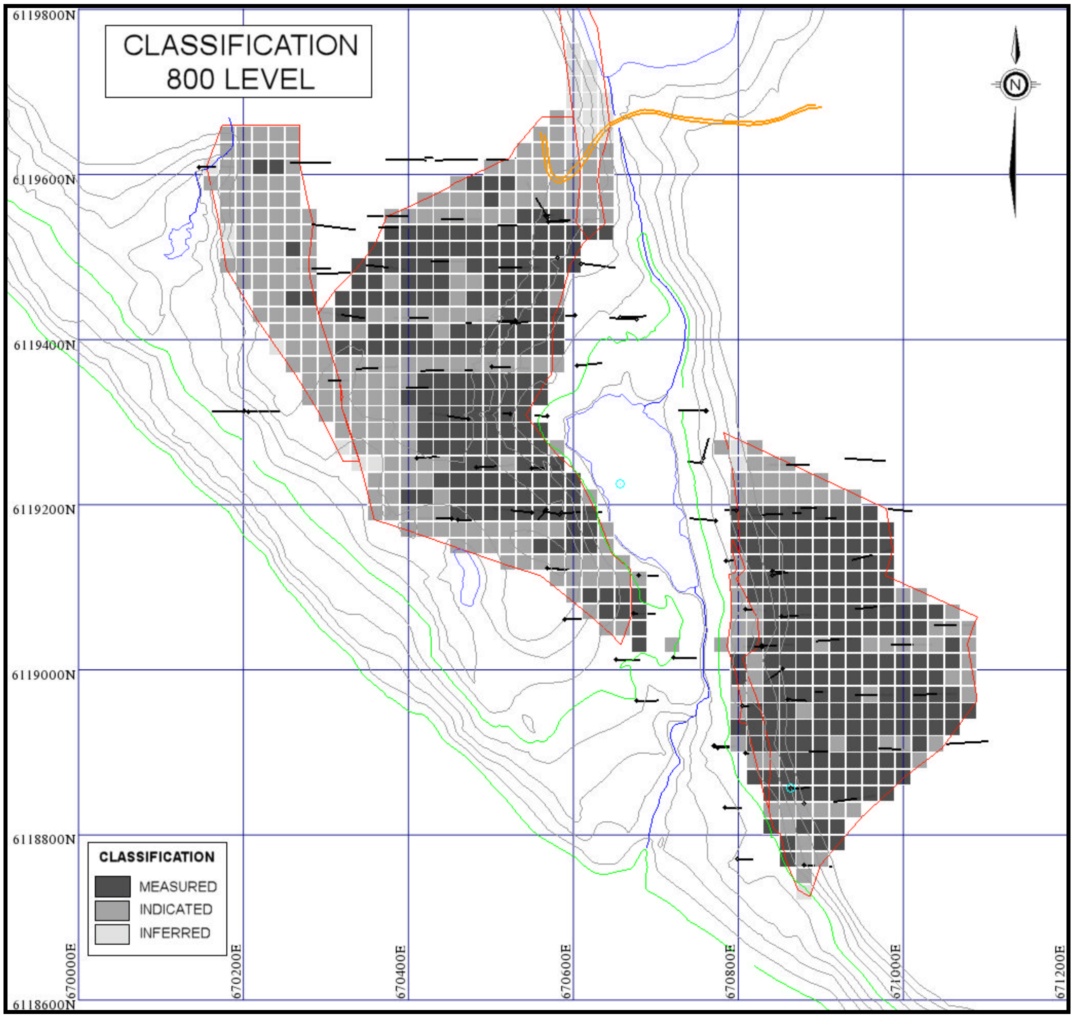


Figure 17.17 Block Classification – 600 Level

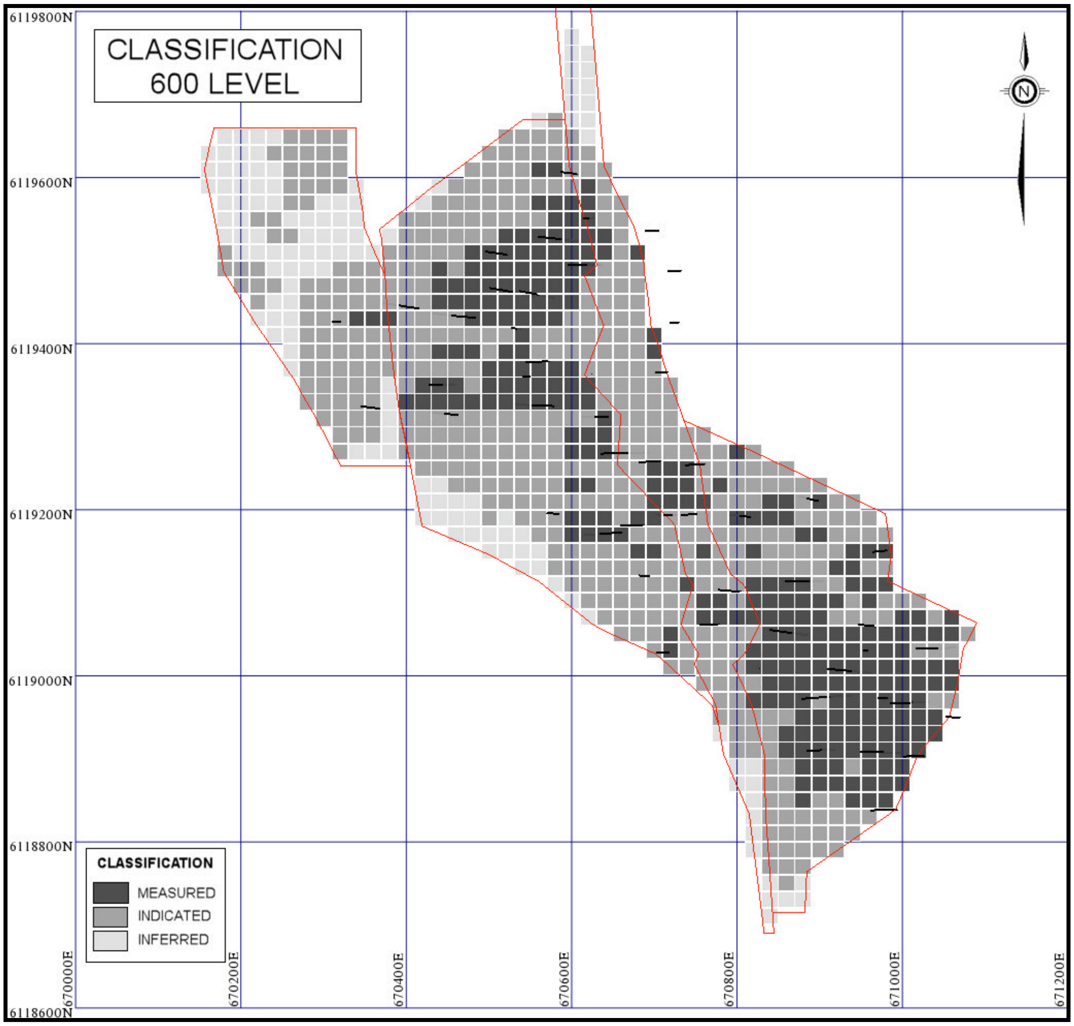


Figure 17.18 Block Classification – Section 9070 N

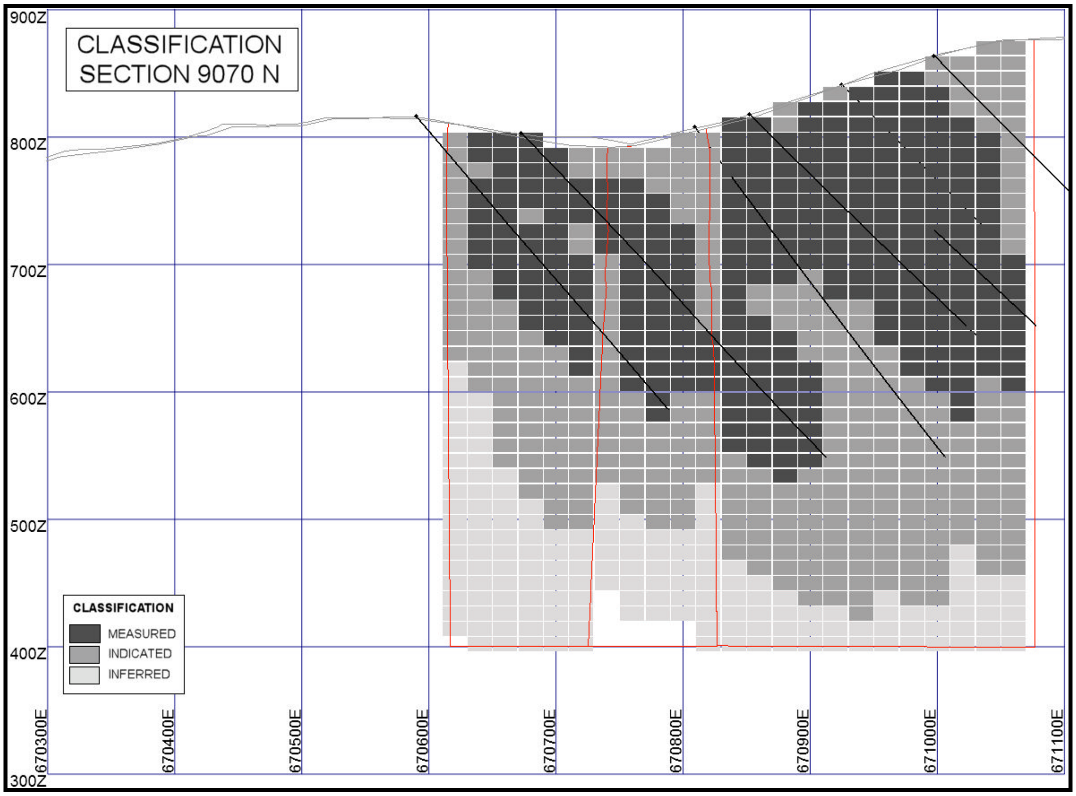
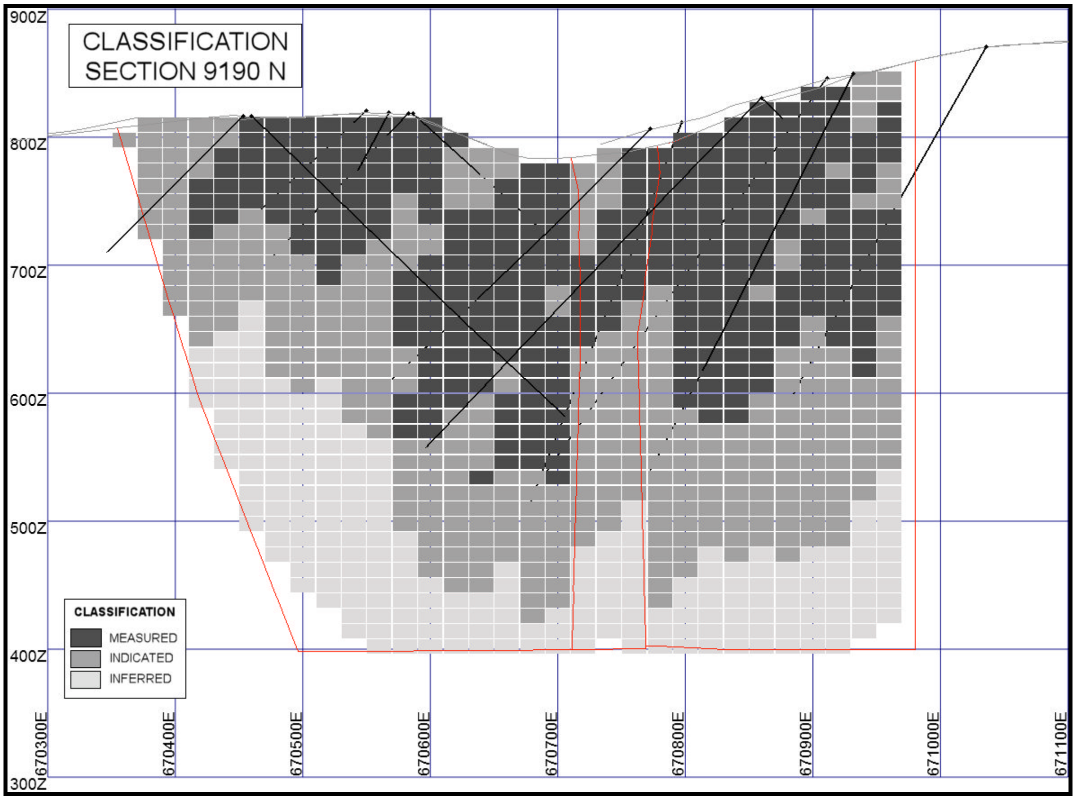


Figure 17.19 Block Classification – Section 9190 N



17.11 MODEL VALIDATION

Model verification was initially carried out by visual comparison of blocks and sample grades in plan and section views. The estimated block grades showed good correlation with adjacent composite grades.

The mean of the global block grades at zero cut-off compare very well with the global means of the capped composites and raw assay data (Table 17.7).

Table 17.7 Global Mean Grade Comparison

Item	Kriged Mean	Mean Grades (g/t Au)	
		Comps	Raw Data
% Cu	0.33	0.36	0.36
g/t Au (Capped)	0.16	0.18	0.18
g/t Au (Uncapped)		0.18	0.19
% Mo	0.004	0.005	0.005

Swath plots were generated to assess the model for global bias by comparing kriged values with nearest neighbour estimates on 40 m vertical panels through the deposit. Results show a good comparison between the three methods, particularly in the main portions of the deposit indicated by the bat charts as illustrated in Figure 17.20 and Figure 17.21.

Figure 17.20 Swath Plot for Cu – Section 9360 North

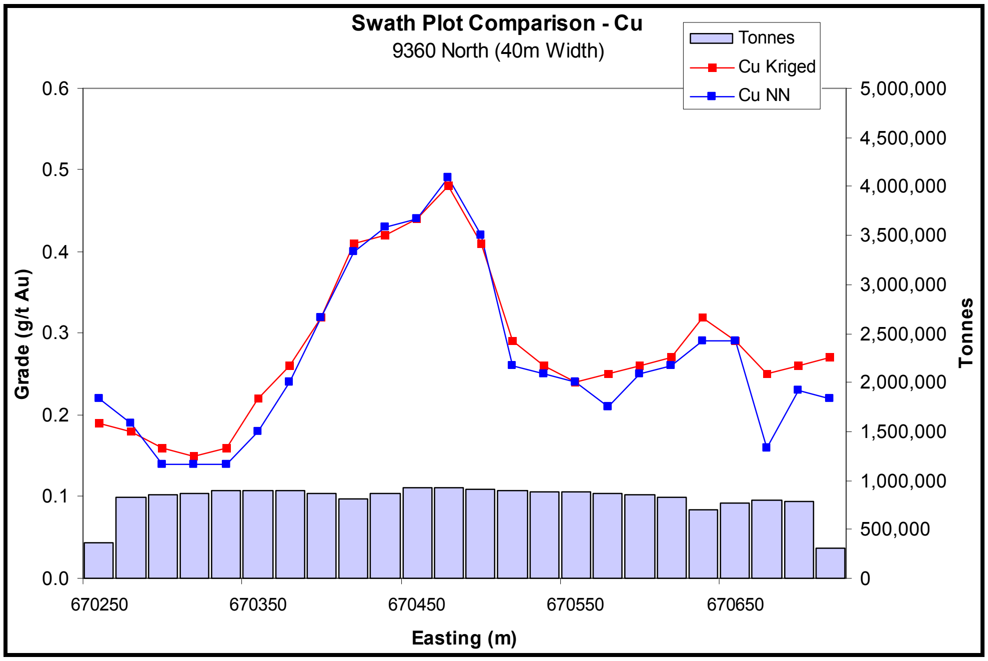
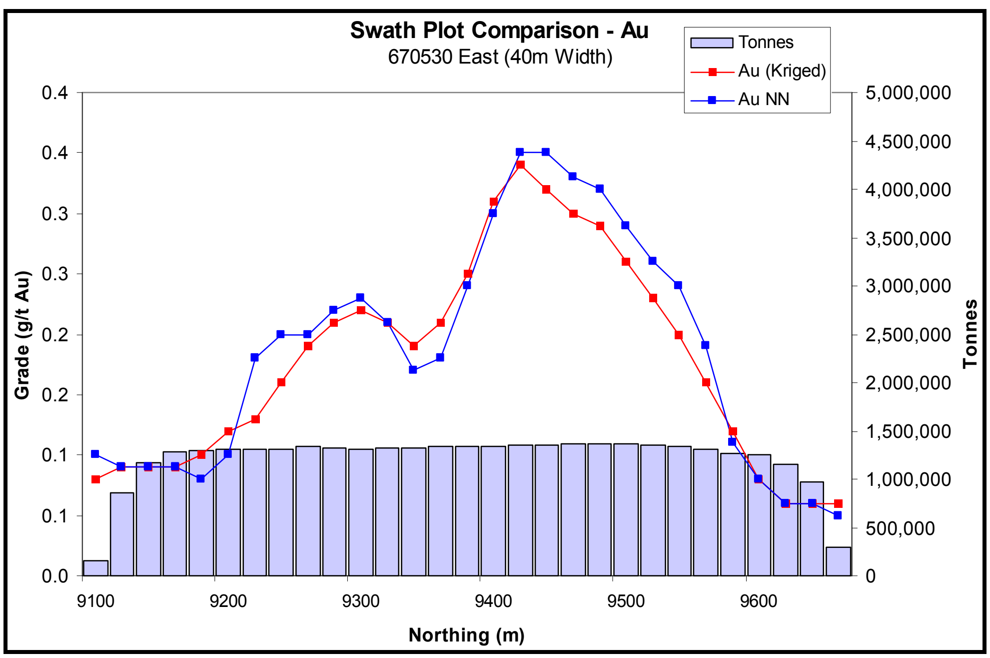


Figure 17.21 Plot for Au – Long Section 670530 East



17.12 MINERAL RESOURCE SUMMARY

The Morrison mineral resource presented in Table 17.8 through to Table 17.10 reported at equivalent copper cut-off grades ranging from 0.1 to 0.5%. The copper equivalent value was calculated using relative recovery and metal prices of $2.45/lb copper, $570/oz gold, and $28/lb molybdenum. For blocks containing molybdenum values greater than or equal to 0.005% Mo, the following equation was used:

Cu EQ = Cu+Au*0.23+Mo*7.794

For blocks with <0.005% Mo, the molybdenum was considered unrecoverable and eliminated from the calculation.

The Morrison mineral resource is presented in Table 17.8 through to Table 17.10 at a range of cut-off grades with the base case of 0.3% Cu equivalent shown in bold.

Table 17.8 Morrison Deposit – All Blocks Classified Measured or Indicated

Cut-off % Eq Cu	Measured					Indicated				
	Tonnes > Cutoff (000s)	Average Grade				Tonnes > Cutoff (000s)	Average Grade			
		% Eq Cu	% Cu	g/t Au	% Mo		% Eq Cu	% Cu	g/t Au	% Mo
0.10	122,098	0.42	0.36	0.18	0.004	167,328	0.38	0.32	0.15	0.005
0.15	120,670	0.43	0.36	0.18	0.004	162,427	0.39	0.32	0.16	0.005
0.20	116,486	0.43	0.37	0.18	0.005	150,772	0.41	0.34	0.17	0.005
0.25	109,119	0.45	0.38	0.19	0.005	132,892	0.43	0.36	0.18	0.005
0.30	**98,142**	**0.47**	**0.40**	**0.19**	**0.005**	**110,108**	**0.46**	**0.39**	**0.19**	**0.005**
0.35	81,644	0.50	0.42	0.21	0.005	89,290	0.49	0.41	0.20	0.005
0.40	64,209	0.53	0.45	0.21	0.005	69,831	0.53	0.44	0.21	0.006
0.45	48,076	0.56	0.48	0.23	0.006	53,005	0.56	0.47	0.22	0.006
0.50	33,909	0.60	0.51	0.24	0.006	36,484	0.59	0.50	0.23	0.006

Table 17.9 Morrison Deposit – Combined Measured and Indicated Resource

Cut-off % Eq Cu	Measured + Indicated				
	Tonnes > Cutoff (000s)	Average Grade			
		% Eq Cu	% Cu	g/t Au	% Mo
0.10	289,426	0.40	0.33	0.16	0.005
0.15	283,097	0.40	0.34	0.17	0.005
0.20	267,258	0.42	0.35	0.17	0.005
0.25	242,011	0.44	0.37	0.18	0.005
0.30	**208,250**	**0.46**	**0.39**	**0.19**	**0.005**
0.35	170,934	0.49	0.42	0.20	0.005
0.40	134,040	0.53	0.44	0.21	0.006
0.45	101,080	0.56	0.47	0.22	0.006
0.50	70,393	0.60	0.50	0.23	0.006

Table 17.10 Morrison Deposit – All Blocks Classified Inferred

Cut-off % Eq Cu	Inferred				
	Tonnes > Cutoff (000s)	Average Grade			
		% Eq Cu	% Cu	g/t Au	% Mo
0.10	93,021	0.38	0.32	0.16	0.004
0.15	88,898	0.39	0.33	0.16	0.005
0.20	83,055	0.41	0.34	0.17	0.005
0.25	73,505	0.43	0.36	0.18	0.005
0.30	**62,839**	**0.46**	**0.38**	**0.19**	**0.005**
0.35	48,695	0.49	0.42	0.21	0.005
0.40	37,735	0.53	0.45	0.22	0.005
0.45	28,567	0.56	0.47	0.23	0.006
0.50	20,745	0.59	0.50	0.24	0.006

18.0 ADDITONAL REQUIREMENTS FOR DEVELOPMENT AND PRODUCTION PROPERTIES

18.1 MINING OPERATIONS

18.1.1 INTRODUCTION

GENERAL COMMENTS

PBM owns the Morrison Property located in the Babine Lake area of BC, approximately 65 km northeast of the town of Smithers and 35 km north of the village of Granisle.

The Morrison deposit was discovered in 1963 by Noranda Exploration Company (Noranda) who, over a 10 year period, broadly defined the deposit.

The deposit is calc-alkaline copper-gold porphyry hosted by an intrusive body intruding into siltstones and greywacke.

Copper-gold mineralization consists primarily of chalcopyrite and minor bornite concentrated in a central zone of a potassium-rich igneous alteration zone. A pyrite halo exists in wall rock surrounding the zone.

18.1.2 SUMMARY

In 1997, PBM entered into an agreement with Noranda for a 50% interest and began exploration drilling to establish grade and continuity of copper and gold. In 2004, PBM purchased 100% interest of the Morrison Property from Falconbridge Ltd. (formerly Noranda). In 2007, GeoSim completed a NI 43-101 compliant measured/indicated resource estimate of 206,869,000 t grading 0.46% copper equivalent using a cut-off grade of 0.3% copper equivalent.

The PBM Morrison Copper/Gold Project is an open pit mine to be mined in 4 phases, which will require the removal of 15 Mt of overburden together with 169 Mt of waste, and 224 Mt of ore over a period of 21 years after the commencement of overburden stripping.

After 1 year of pre-production mining, the mill starts up then ore will be actively mined for just over 18 years. At the completion of ore mining from the pit, stockpiled low grade ore will be processed for approximately a further two years.

The mine will operate as a conventional truck shovel operation. The typical production cycle will be drill, blast, grade control, load, and haul. Primary equipment will be diesel powered with support equipment providing access development access, road maintenance, and equipment servicing capability

Overburden and waste dumps will be located in separate areas close to the open pit. Diesel hydraulic shovels will be used to load overburden, waste, and broken ore into 227 t diesel powered haul trucks.

HISTORICAL – BACKGROUND STUDIES

Since 1998, PBM has continued drilling exploration core holes on the Morrison site. There was a mineral resource estimate released August 11, 2004 for the project as part of a Preliminary Assessment report by Beacon Hill Consultants (1988) Ltd.

In 2007, GeoSim performed the most current estimate and estimated the Morrison deposit to contain a measured and indicated resource of 207 Mt averaging 0.39% Cu, 0.20 g/t Au, and 0.005% Mo.

HISTORICAL RESOURCE ESTIMATES – PRE NI 43-101

The earliest published resource estimate (1976) for the Morrison deposit was a “geological reserve” of approximately 86 Mt averaging 0.42% Cu, calculated at a cut-off grade of 0.30% Cu.

In 1992, a resource model of the Morrison deposit estimated the indicated and inferred resources were 190 Mt grading 0.40% Cu and 0.21 g/t Au.

In 2002, the measured and indicated resources were estimated at 62 Mt at 0.47% Cu and 0.22 g/t Au. In 2003, the estimate for measured and indicated resources was 115 Mt at 0.44% Cu and 0.20 g/t Au with a further inferred amount of 5 Mt at a similar grade. The following year, the estimated measured and indicated resources were 86 Mt at 0.45% Cu and 0.26 g/t Au with an inferred amount of 1 Mt at 0.36% Cu 0.26g/t Au.

(NB: These estimates were made with the same mineral selling prices and recoveries.)

PROVEN AND PROBABLE MINEABLE RESERVE CLASSIFICATION

The resource model includes measured, indicated, and inferred resources. Measured and indicated resources have been used to define the pit limits and for reporting of reserves for scheduling. Inferred resources have not been used in the mine plan.

Grade Estimation

The resource quantity and grade were estimated by Ronald G. Simpson, P.Geo, of GeoSim in May 2007.

18.1.3 2008 Open Pit Design

Economic Parameters Applied To Mine Design

Knight Piésold Consulting (KP) has undertaken a geotechnical investigation program that has provided the basis for the Feasibility pit slope design recommendations.

The overall stability of the pit slopes has been evaluated using conventional limit equilibrium analyses. The overall slope angles have been determined to achieve a minimum factor of safety of 1.3 for the various design sectors.

Pit optimization metal prices were based upon a 4-year trailing average London Metal Exchange (LME) database price from April 1, 2008. The copper price used was US$2.45/lb and the gold price used was US$570/oz. The molybdenum price used was US$28.00/lb for Mo contained in molybdenum tri-oxide. The exchange rate used was also based upon a 4-year trailing average that averaged US$0.87.

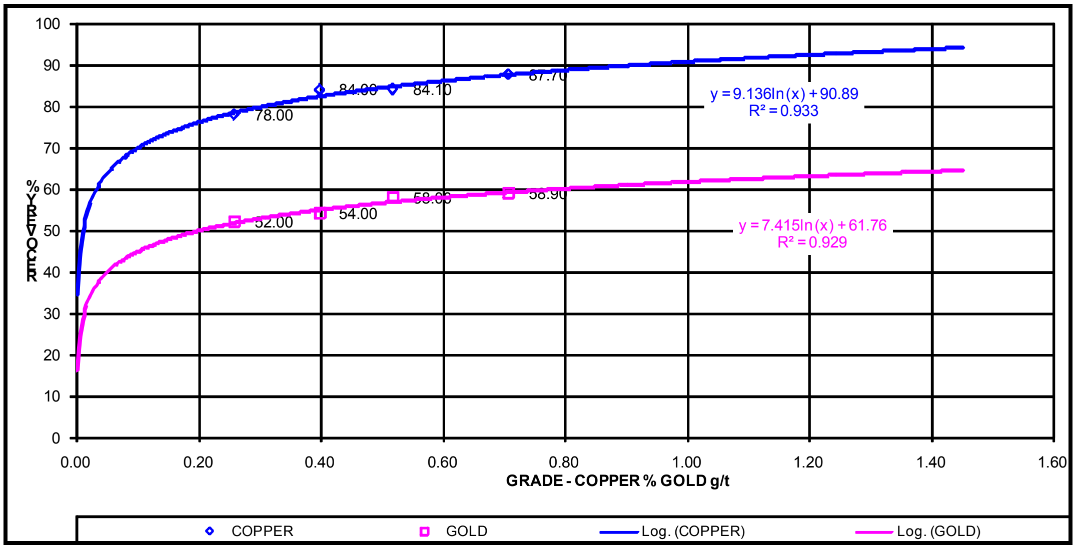
Initial Designs

Pit limits have been developed using a MineSight® variable slope Lerchs-Grossman algorithm. Several generations of pit optimization studies have been undertaken during the course of the Feasibility Study with increasing metal prices to reflect the current strong demand for base metals in general. The preliminary net mine gate revenue and operating costs were used to estimate the value of each regular block in the model. The block values were then discounted to reflect a sinking rate of five benches per year per phase. A series of 7 discounted values were calculated from 10% to 70% in 10% increments. The undiscounted and discounted nested pit limits were used to guide pit design.

Metallurgical Parameters – Concentrate Grade and Recoveries

Metallurgical recovery estimates have been provided by SGS Lakefield Research Ltd. The copper and gold recovery curves to copper concentrate are shown in Figure 18.1. The equations shown in the graph have been used to calculate recovery and recoverable copper and gold for each block in the resource model. The final production schedule has been used to provide the basis for annual recovery estimates.

Figure 18.1 Copper and Gold Metallurgical Recovery



INSITU DENSITY AND SPECIFIC GRAVITY

A total of 309 core samples from the 2001 and 2002 drilling programs were measured for specific gravity at Acme Analytical Laboratories in Vancouver. The statistics for the two major rock units and argillic-sericite altered fault zones are shown Table 18.1.

Table 18.1 Insitu Density and Specific Gravity

	BFP – Sediments	BFP +	Sediments	Fault Zones
Count	159	78	237	72
Minimum	2.57	2.50	2.50	2.27
Maximum	2.81	2.81	2.81	2.86
Mean	2.72	2.71	2.72	2.58
Median	2.73	2.71	2.72	2.61
Std. Dev.	0.041	0.056	0.047	0.13

The mean and median values between the BFP unit and the sedimentary rocks were almost identical and it was decided to use the overall mean/median value of 2.72/m^3 for both units. The east and west fault zone blocks were assigned a density of 2.6 t/m^3.

GEOTECHNICAL AND HYDROGEOLOGICAL SITE INVESTIGATIONS

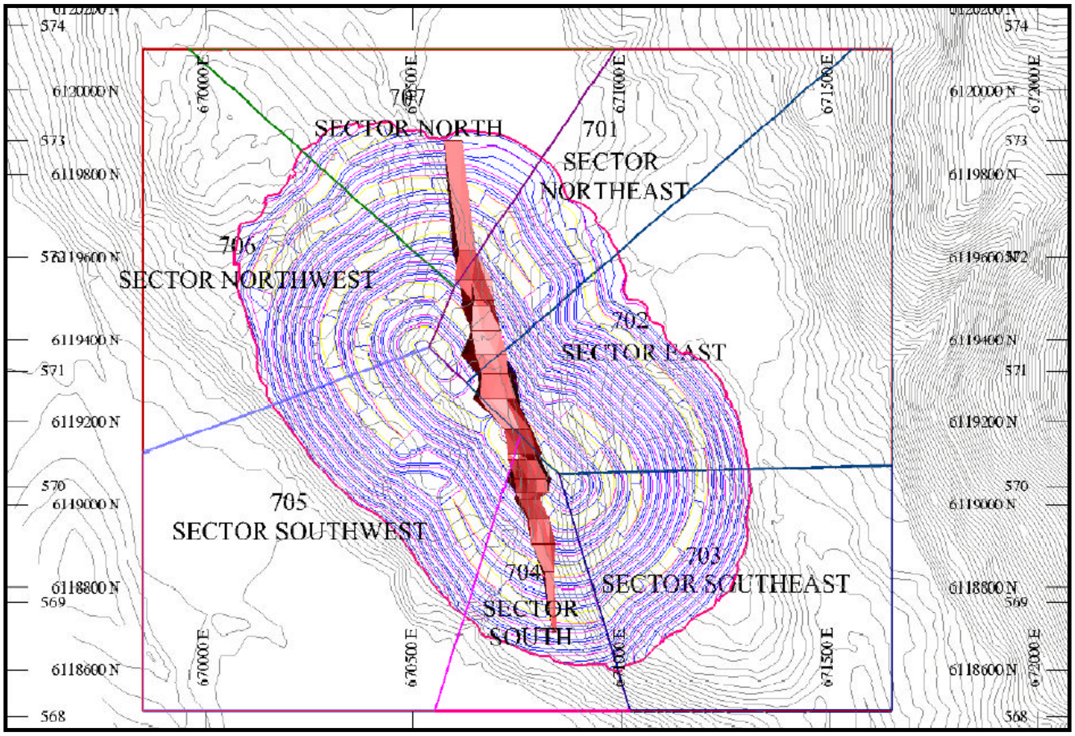
A geotechnical investigation program was completed at the Morrison site during January/February 2006.

Detailed geotechnical data is included in the KP report entitled “2006 Open Pit Geotechnical Investigations” (Ref. No. VA101-102/8-1, May 8, 2006).

OVERALL WALL SLOPE DESIGN SECTORS

KP has undertaken a geotechnical investigation program that has provided the basis for Feasibility pit slope design recommendations. The current geotechnical model incorporates three major geological domains: Jurassic Sediments, Intrusives, and Fault Zone.

Figure 18.2 Pit Design Sector Location



PIT BENCH DESIGN – OVERBURDEN AND ROCK FACES

The bench design was developed based on the geology, geomechanical, and geometrical characteristics of each main design sector.

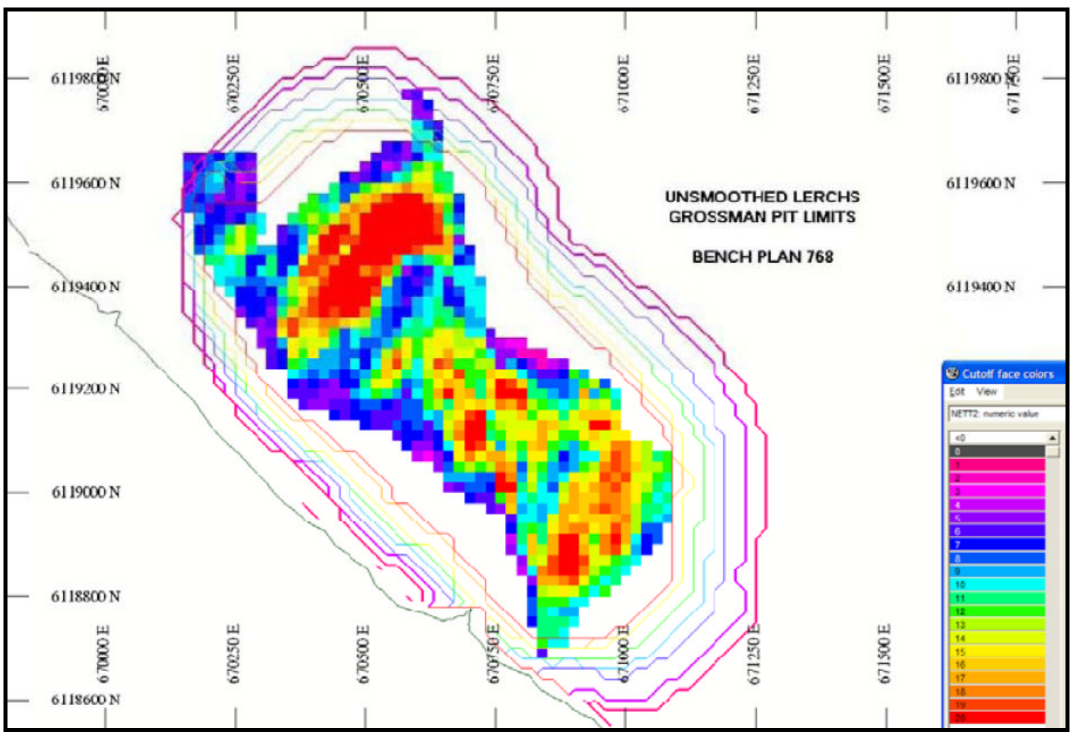
Table 18.2 Pit Bench Design

	Sector	Inter-ramp Angle	Bench Face Angle	Bench Height (m)	Single/ Double	Berm Width (m)
Northeast	701	48.0	65.0	30.0	Double	13.0
East	702	48.0	65.0	30.0	Double	13.0
Southeast	703	48.0	65.0	30.0	Double	13.0
South	704	41.0	60.0	15.0	Single	8.6
Southwest	705	48.0	65.0	30.0	Double	13.0
Northwest	706	48.0	65.0	30.0	Double	13.0
North	707	40.0	60.0	15.0	Single	9.2

ULTIMATE PIT DIMENSIONS

The unsmoothed Lerchs Grossman pit limits for Bench 768 are shown in Figure 18.3.

Figure 18.3 Plan View of Bench 768 Showing Pit Limits



COMPARISON OF LARGE OPEN PITS – SLOPE HEIGHT VS. SLOPE ANGLE

A technical review of other large open pit mining operations has been completed for this study.

- The Bell Mine: had an overall slope angle of 44° to 46° and had good stability even though bench scale failures did occur.
- The Granisle Mine: no major slope instability data has been recorded during mine development.
- The Highland Valley Mine: slopes include inter-ramp angles of 38° to 45° and large-scale failures have developed in the flatter west wall.
- The Island Copper Mine: the open pit experienced no significant slope stability problems during operations.

The study revealed that the proposed slope angles for the Morrison pit are generally comparable to the slope angles achieved in other deep pits. This comparison highlights the importance of developing and maintaining good controlled blasting practices, effective groundwater depressurization measures, and geotechnical data collection.

Table 18.3 Comparison of Large Open Pits in BC

Mine	Slope Height	Slope Angle (°)	UCS (MPa)	Failure Type Comments
Afton Mine	170/300	45 (O)	20~110	Unstable failure
Bell Mine, Most Pit Walls	300	44/50 (O)	50~175	No failures
Bell Mine, Southeast Wall	300	34/36 (O)	Low	No failures
Brenda Mine	335	45 (O)	150	Unstable failure
Cassiar Mine	180/370	42 (O)	80	Slow and stable failure
Highland Valley ® Lornex Pit	380/ 35(I)	30 (O)	(3)~140	Slow and stable failure
Highland Valley © Valley Pit	350 38(I)	35 (O)	(3)~140	Slow and stable failure
Highmont Mine	60/110	40 (O)	1~140	Slow and stable failure
Island Copper, South Wall	365	40 (O)	Medium	Slow failure; stepout
Island Copper, North Wall	500	50 (O)	Medium	No failures
Nickel Plate Mine	225	63 (I)	250~450	No failures
Proposed Morrison Pit Slopes				
North & South Wall	200/250	39 (O)	60	
East & Southeast Walls	330	47 (O)	80~90	

Note: (O) = Overall Slope Angle; (I) = Inter-ramp Slope Angle.

HAUL ROADS

In-pit roads will have gradients of 10% with turns being level. Road widths will be appropriate for the size of haul trucks being used.

MINING PLANNING – PHASE DEVELOPMENT AND RESERVES

The current development concept for the mine is as follows:

- Phase I: West pit starter pit with a ramp that commences on the north side counter-clockwise
- Phase II: East pit with stand alone access road from the north clockwise
- Phase III: West pit expansion with multiple switch backs
- Phase IV: East pit expansion.

GENERAL

The open pit mine has been designed for four phases of pit development by conventional truck-shovel methods. The overall life-of-mine (LOM) strip ratio is relatively low at 0.825:1.0 waste to ore.

18.1.4 OPEN PIT DESIGN

INTER-RAMP SLOPES

Overall inter-ramp wall slope recommendations were honoured in the pit phase designs. The inter-ramp slopes are determined by the relationship between bench heights, bench face angle, berm width, and berm interval in each sector.

OPERATING BENCH HEIGHT

The operating bench height in the open pit will be 12 m.

BERMS

Berm width is a function of the inter-ramp slope in these pit designs.

MINIMUM MINING WIDTH

When the pit bottom of Phase I and Phase II are mined, the pit bottom will be approximately 40 m wide.

Phase III and Phase IV pit expansion phases are typically no less than 60 m in width, which should provide adequate room for efficient mine operations.

ACCESS – CRUSHER AND DUMPS

Roads will connect the pit ramps to the crusher, low grade stockpile and waste dumps. Roads will be constructed three times the width of the largest truck with an allowance for safety berm.

PHASE LAYOUT AND BLENDING STRATEGY

The open pit mine development plan consists of four pit development phases expanding to a single large open pit on the edge of Morrison Lake. A waste dump and a low grade stockpile will be located 100 m north of the open pit. Overburden will be stockpiled south of the open pit. The plant site will be located west of the open pit with an active access corridor between the dump and stockpile area, and the open pit crest. The mine will operate to Year 19 and stockpile recovery will continue to Year 21.

DEVELOPMENT OF MINING PHASES

The pit will be developed in four phases. These phases are shown Table 18.4.

Table 18.4 Summary of Pit Reserves by Phase

Phase	Overburden (t)	Waste (tonnes)				COG $5.60 Net		Au (g/t)	Mo (%)	Net Cdn$/t	Total	Strip Ratio
		Unknown	PAG	NAG	Total	ROM (t)	Cu (%)					
I	8,363,000	8,000	28,286,000	1,527,000	29,821,000	87,102,000	0.330	0.166	0.003	15.25	125,286,000	0.44
II	1,820,000	-	33,618,000	2,879,000	36,497,000	59,904,000	0.332	0.164	0.005	15.95	98,221,000	0.64
III	3,885,000	46,000	40,755,000	6,347,000	47,148,000	48,865,000	0.305	0.144	0.004	14.18	99,898,000	1.04
IV	1,076,000	-	49,020,000	6,490,000	55,510,000	28,380,000	0.369	0.185	0.005	17.86	84,966,000	1.99
Total	**15,144,000**	**54,000**	**151,679,000**	**17,243,000**	**168,976,000**	**224,251,000**	**0.330**	**0.163**	**0.004**	**15.53**	**408,371,000**	**0.82**

Phase I Open Pit

The Phase I pit is located in the northwest area of the deposit. The top bench will be Bench 876 and the bottom bench will be Bench 576. The overall length of the pit will be 860 m in the northwest-southeast direction by 720 m. The access ramp to the Phase I pit exits at the north side of the pit at 835 m elevation.

Phase II Open Pit

The Phase II pit is located in the southeast area of the deposit. The top bench will be Bench 888 and the bottom bench will be Bench 576. The pit crest on the southern side is approximately 140 m from Morrison Lake.

Figure 18.4 Phase I Pit Design

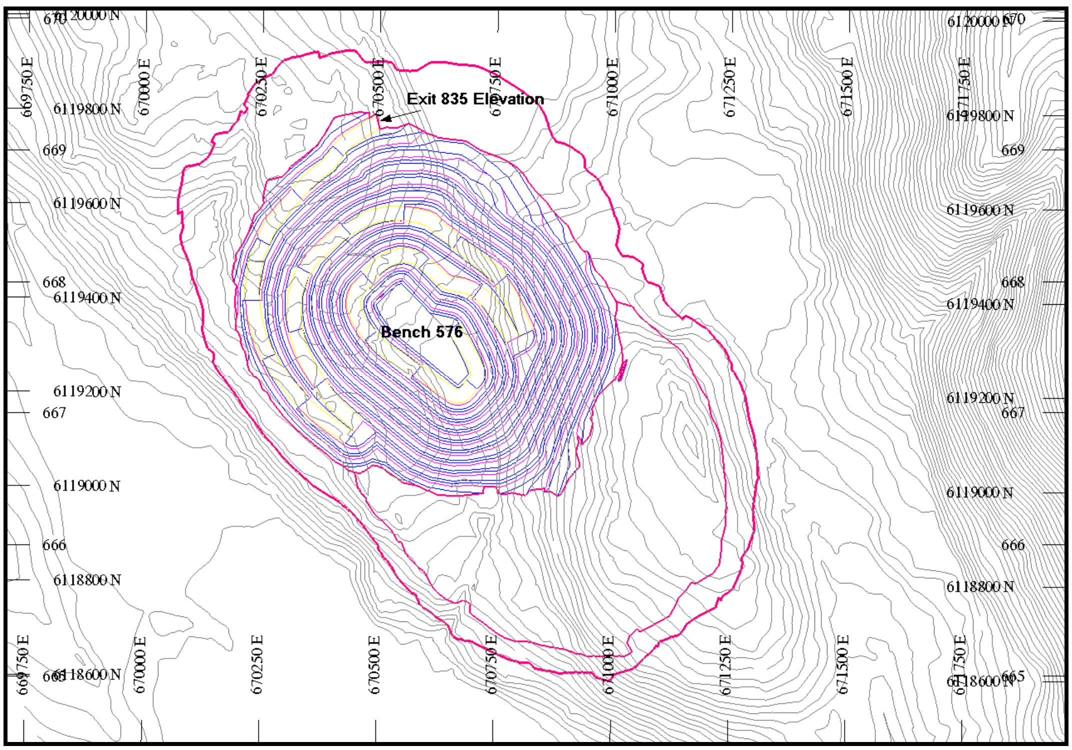


Figure 18.5 Phase I and II Pit Design

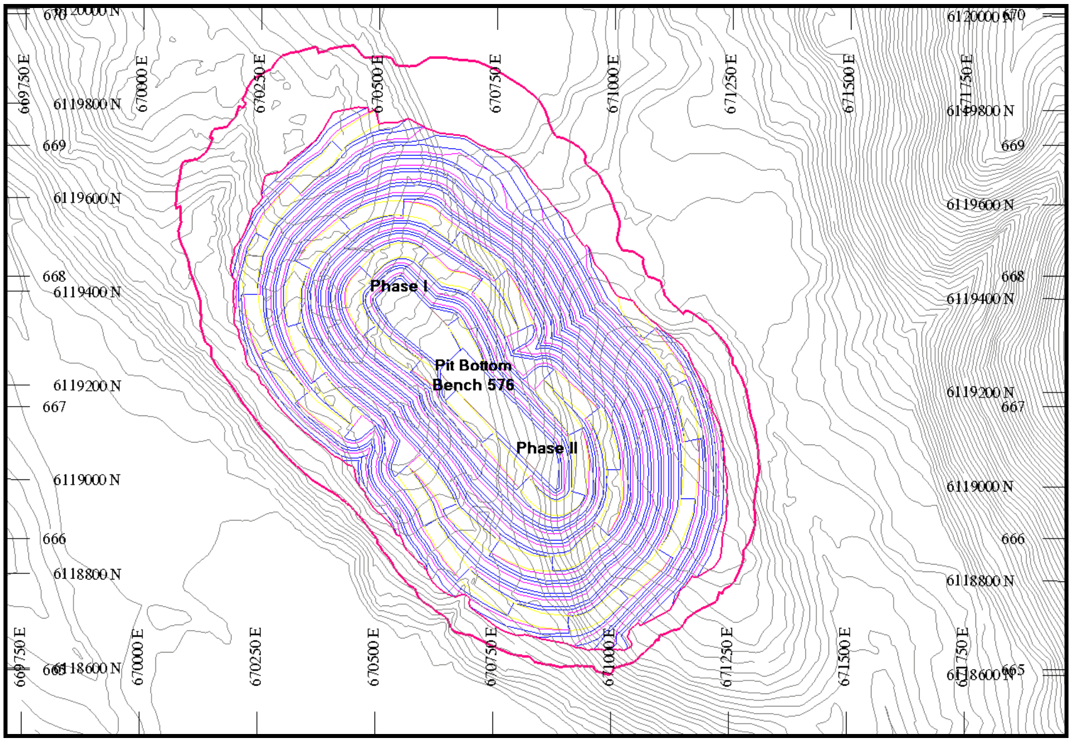
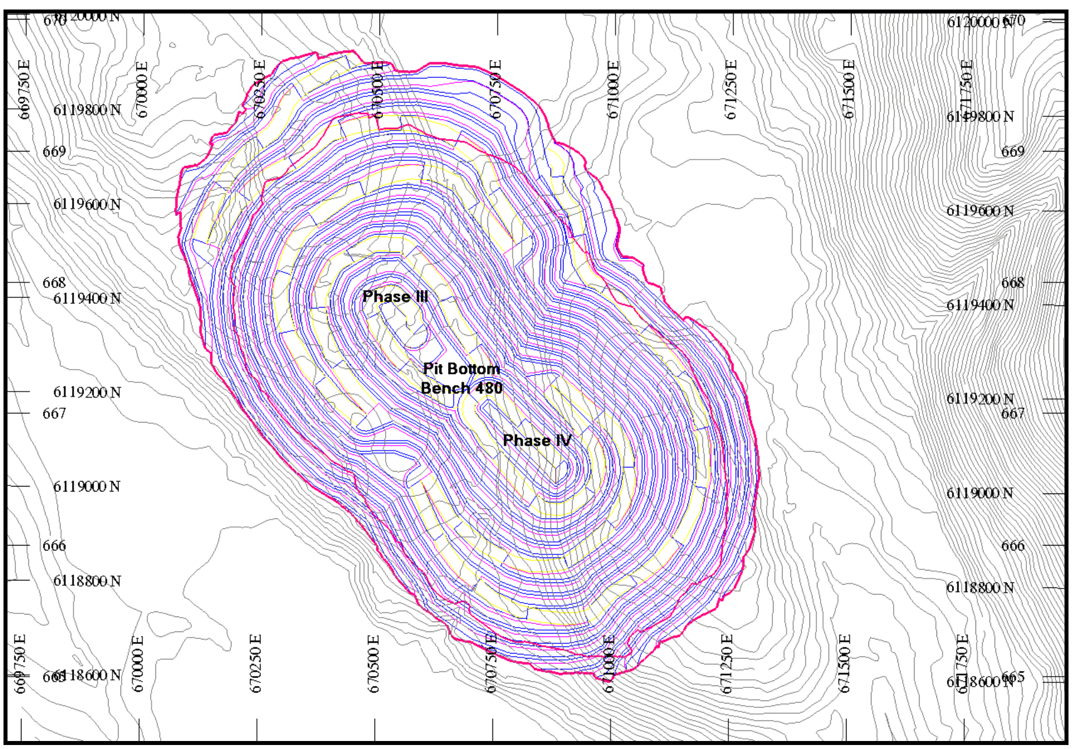


Figure 18.6 Phase III and IV Open Pits



Phase III and IV

The Phase III and Phase IV pits are expansions of Phase I and Phase II pits respectively. The pit crest on the southern side is approximately 85 m from Morrison Lake. The access ramp to the Phase III and Phase IV pits exit at the north side of the pit at 850 m and 840 m elevation respectively.

18.1.5 MINE PRODUCTION SCHEDULE

Table 18.5 shows the annual ore and waste production for Years -1 to 19.

Table 18.5 General Mining Plan – Ore and Waste Annual Production

Tonnes	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5
Potential Mill Feed	2,299,000	14,366,000	21,340,000	19,104,000	11,614,000	15,471,000
Waste	7,701,000	14,834,000	7,860,000	4,621,000	12,111,000	8,254,000
Total	10,000,0001	29,200,000	29,200,000	23,725,000	23,725,000	23,725,000

Tonnes	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Potential Mill Feed	14,349,000	13,566,000	9,917,000	8,872,000	11,328,000	13,051,000
Waste	7,551,000	8,334,000	11,983,000	13,029,000	10,572,000	8,850,000
Total	21,900,000	21,900,000	21,900,000	21,900,000	21,900,000	21,900,000

Tonnes	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Potential Mill Feed	-	-	34,000	811,000	5,420,000	9,625,000
Waste	7,950,000	8,544,000	12,379,000	12,856,000	11,071,000	2,880,000
Total	7,950,000	8,544,000	12,413,000	13,667,000	16,492,000	12,505,000

Tonnes	Year 18	Year 19	Total
Potential Mill Feed	10,884,000	1,607,000	**224,252,000**
Waste	616,000	289,000	**184,121,000**
Total	11,500,000	1,896,000	**408,371,000**

There is a stockpiling plan in place as the ore production exceeds the mill throughput on an annual basis.

PRE-PRODUCTION STRIPPING

- clear Phase I open pit
- clear and grub dump and stockpile footprint
- strip overburden and waste rock to release ore for Year 1 milling.

INITIAL MINE DEVELOPMENT

The production activities prior to mill start-up include the following:

- drain lakes
- clear and grub dump and stockpile footprint
- clear Phase I open pit
- establish sumps and drainage diversion ditches
- build roads to access plant site and shop areas, temporary fuel storage areas, magazines, and dump and stockpile areas
- strip overburden and waste rock to release ore for Year 1 milling.

Mine development of the Phase I pit during pre-production includes mining of 10 Mt of overburden, waste rock, and potential mill feed to stockpile. However, the total overburden removed is only 2.5 Mt or 30% of the total required to open up the total open pit surface of Phase I.

ANNUAL MINING PLANS

General

A series of drawings are shown in Figure 18.7 illustrating the sequence of mine development as defined in the detailed and summary production schedules.

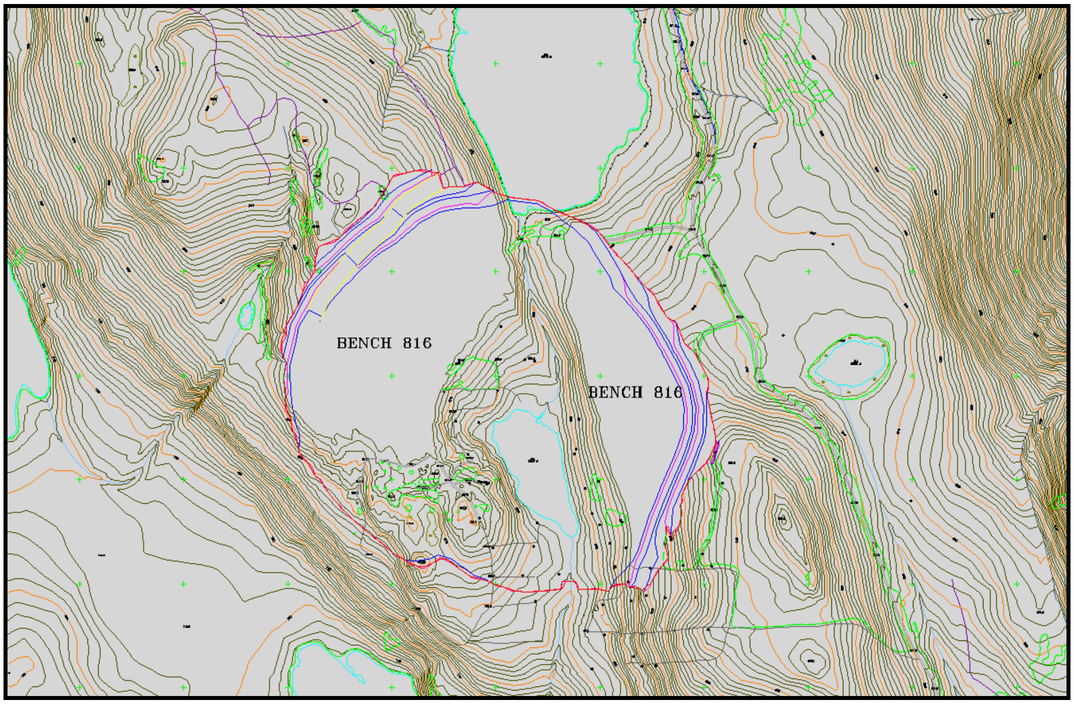
Mine Development Pre-production

- Phase I Pit:
  - During pre-production the access ramp to the Phase I pit is established.
  - Phase I pit is mined from the pre production year until Year 7. A total of 124,882,000 t of material are mined in Phase 1 at an average rate of 12,500,000 t/a.
- Phase II Pit:
  - Phase II pit is started in Year 4 and continues until Year 11. The total material mined in Phase II will be 98,257,000 t at an average rate of 12,300,000 t/a.
- Phase III Pit:
  - Phase III pit is started in Year 8 and continues until Year 17. The total material mined in Phase III will be 99,898,000 t at an average rate of 10,000,000 t/a.

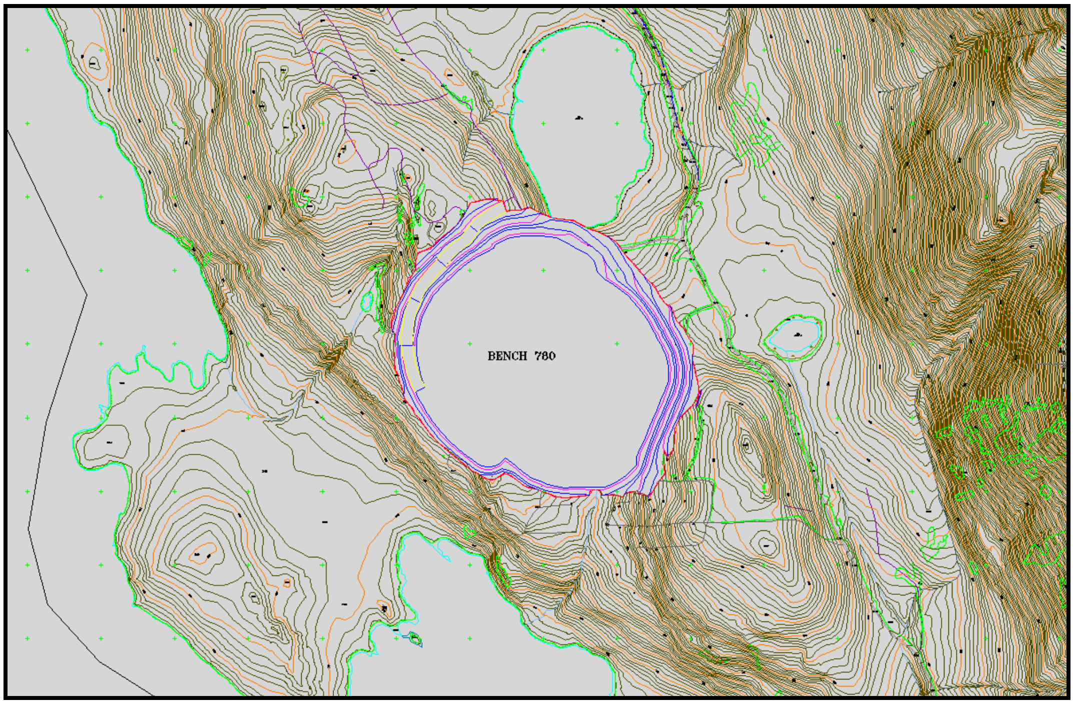
- Phase IV Pit:
  - Phase IV pit is started in Year 12 and continues until Year 18. The total material mined in Phase IV will be 85,398,000 t at an average rate of 12,200,000 t/a.
  - The final year will only see 1.9 Mt moved in the pit but stockpile recovery and processing will continue.

Figure 18.7 Mine Development

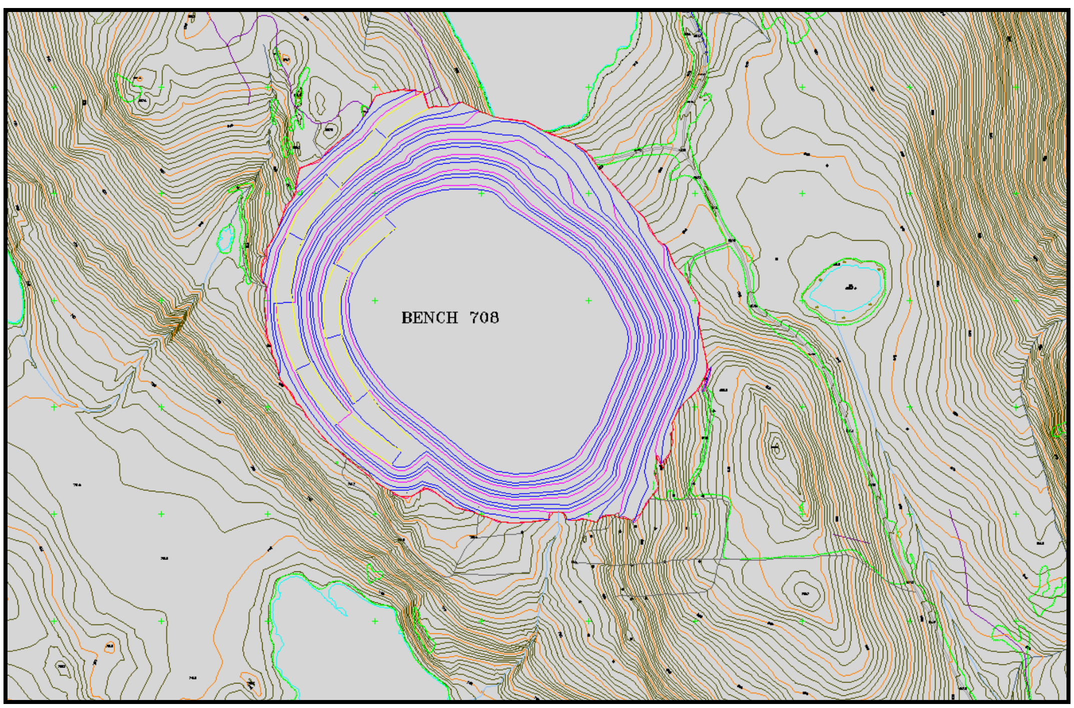
Year -1



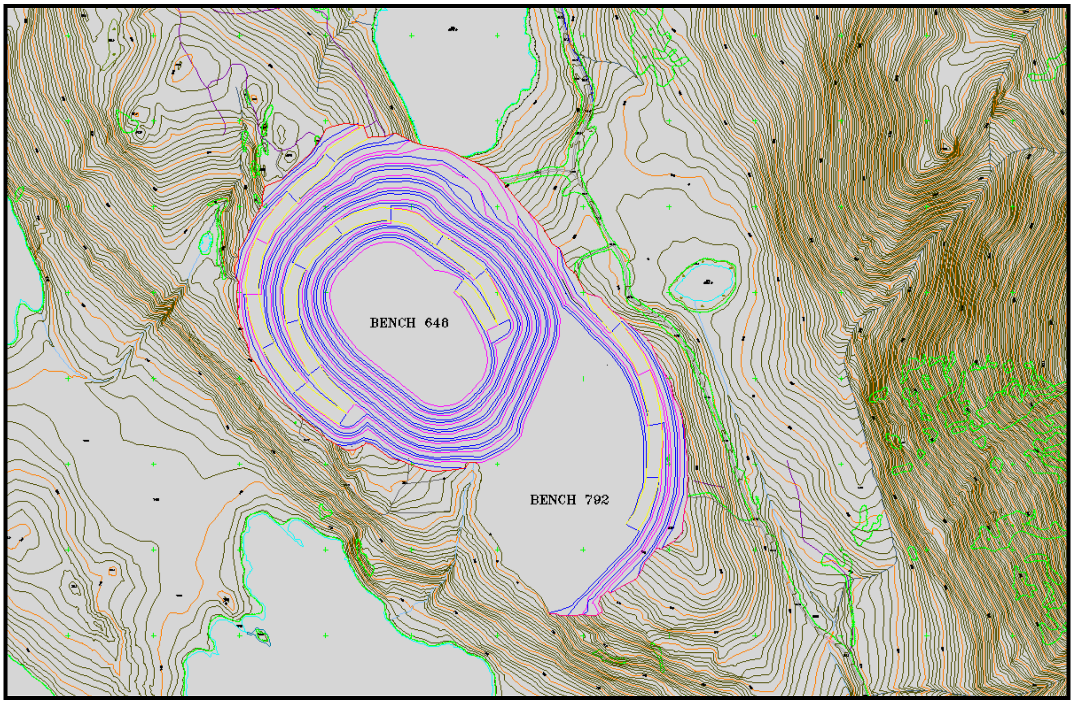
Year 1



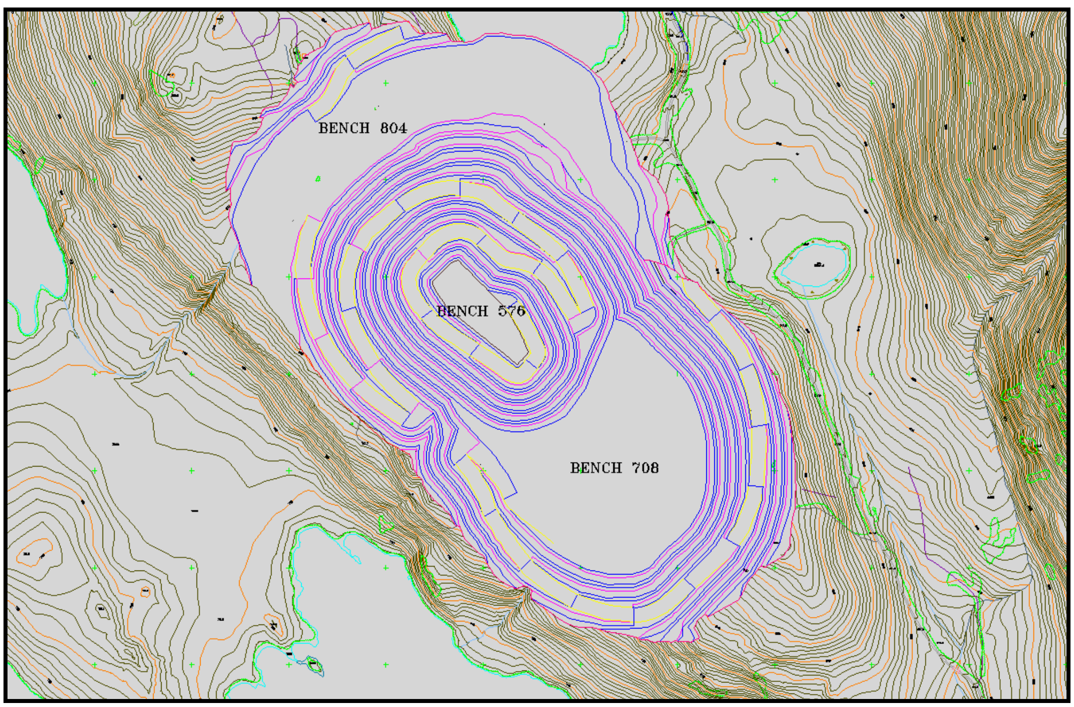
Year 3



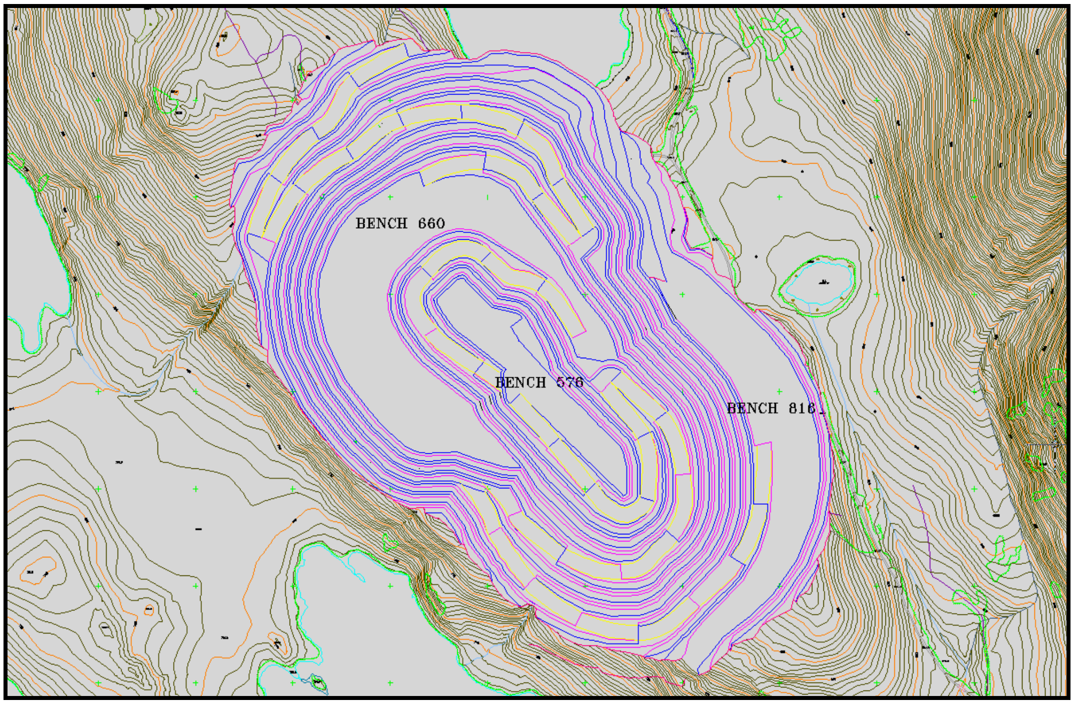
Year 5



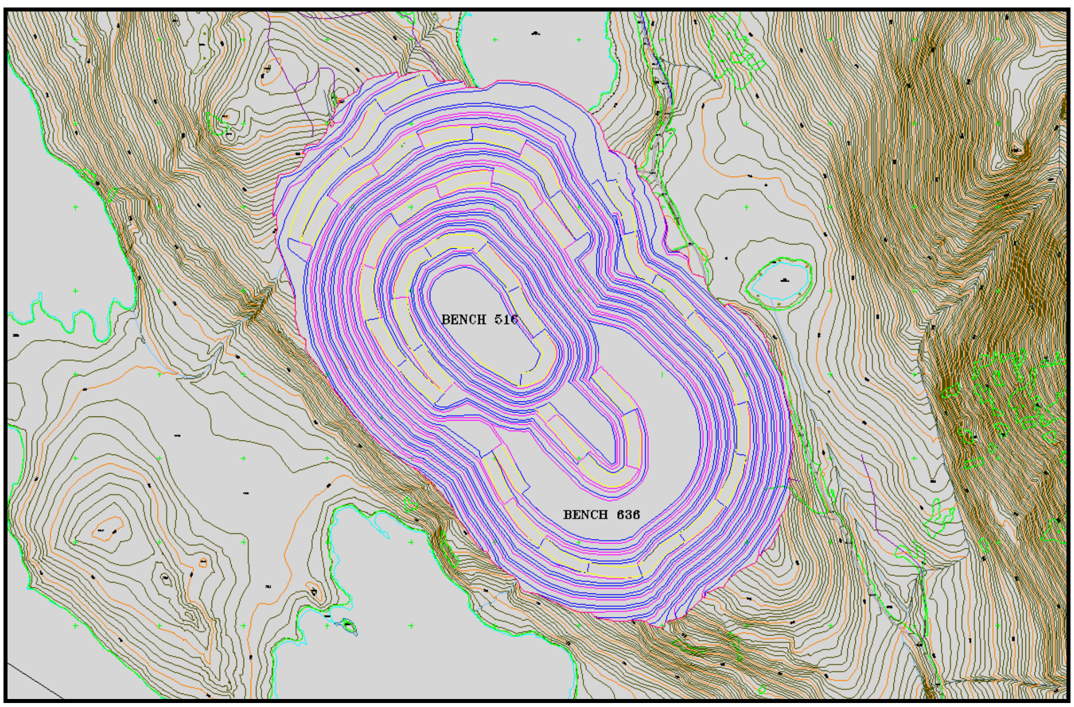
Year 8



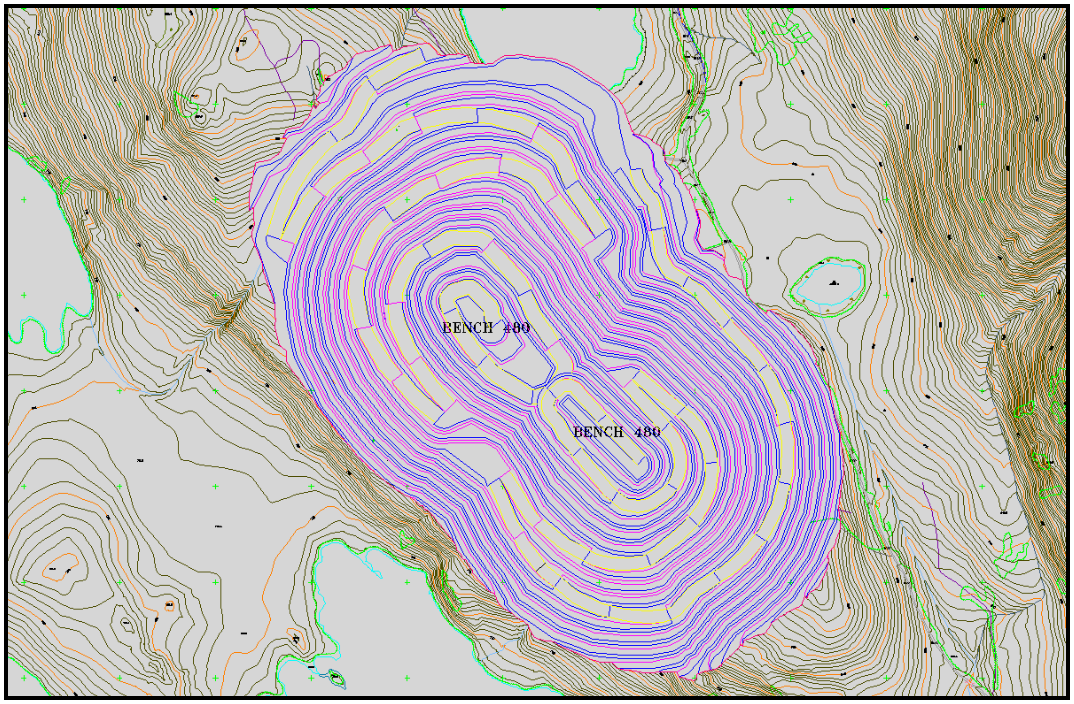
Year 12



Year 16



Year 19



18.1.6 TAILINGS STORAGE FACILITY – WASTE MATERIAL MANAGEMENT

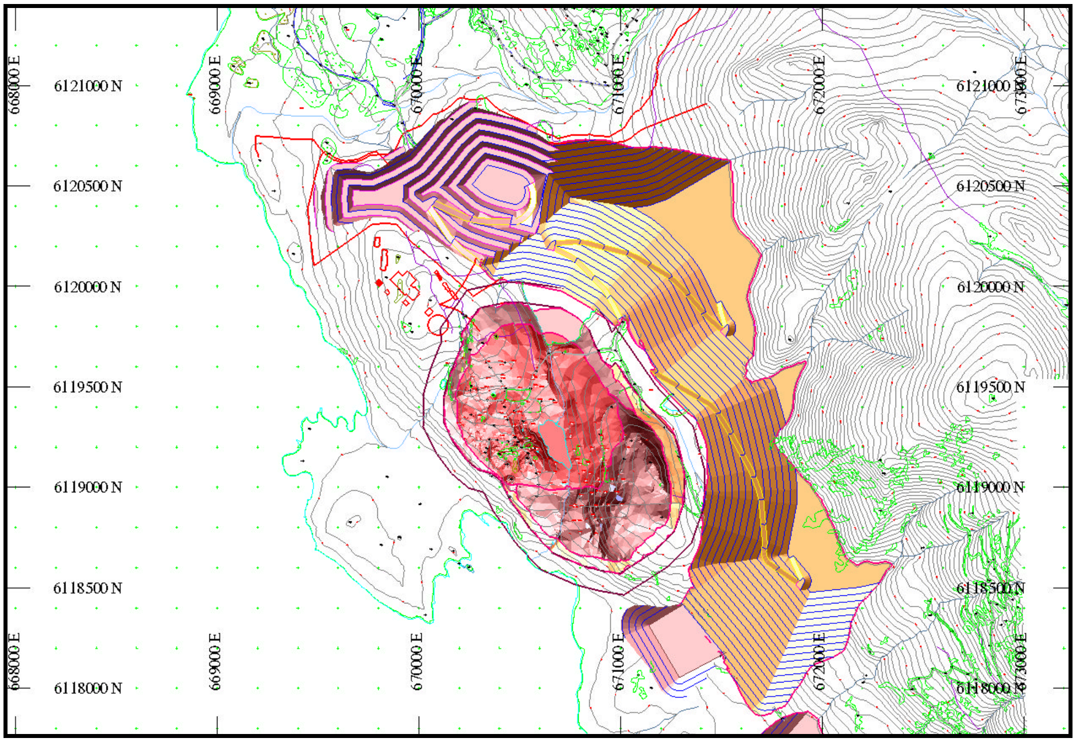
WASTE DUMPS

The Northeast and Southeast waste dumps are shown in Figure 18.8. Access to the dump surface will be by ramp at 10% ramps on the south side from the main haulage road to the primary crusher and tailings impoundment. This combined dump has been shown with 2.75:1 slopes as required for reclamation.

LOW GRADE STOCKPILE

Low grade material will be placed north of the pit and up against the waste dump slope. This low grade stockpile will be placed in 20 m lifts and may well overlap into the waste dump area to provide space for stockpile segregation of various levels of low grade material. The stockpile will also be constructed with 2.75:1 slopes but these slopes will not be reclaimed.

Figure 18.8 Waste Dump and Low Grade Stockpile



18.1.7 MINE EQUIPMENT FLEET

GENERAL COMMENTS

Haul trucks of 227 t capacity will be used, loaded by diesel hydraulic shovels.

MAJOR MINE EQUIPMENT NET PRODUCTIVE OPERATING TIMES

The mine will be scheduled to operate two 12-hour shifts per day. Effective operation after exclusion of meal breaks and equipment servicing is expected to be 550 minutes per shift. Availability is expected to be over 90% when operations start and will deteriorate as equipment ages.

18.1.8 DRILLING

Bench height in ore and waste will be 12 m. The ore will be drilled with 269 mm diameter holes drilled on a 6.3 m x 6.3 m pattern. Waste will be drilled with 269 mm holes on a 7.3 m x 7.3 m pattern. Two bench drills will be used for the ore and waste drilling and there will be a smaller secondary drill used in the case of breakdowns, blasting large lumps, drilling wall control angle holes, or drilling inclined water relief holes in the pit walls.

Blast Hole Drill – Net Productive Operating Time

The bench drills will be scheduled to operate on two 12-hour shifts each day. Actual operation is expected to average 550 minutes per shift due to meal breaks, equipment fuelling, and inspection. Availability is expected to be over 90% when operations start and will deteriorate as equipment ages. Equipment utilization is expected to exceed 80%.

Blast Hole Drill Productivity

It is expected that cycle times per hole drilled will average 27 minutes per hole when drilling ore, and 23 minutes per hole in waste.

Ore Grade Control

A Chief Geologist and two Geology/Grade Controllers will implement a blast hole ore sampling program in order to ensure that blasted ore and waste is sent to the appropriate dumping location. If the differentiation between ore and waste proves unusually difficult, additional staff and equipment will be required.

18.1.9 *Blasting*

General Blasting Conditions for Production Holes

Ammonium Nitrate Fuel Oil (ANFO) will be the explosive used, where possible, but it is anticipated approximately 5% of the holes will be wet and will require emulsion. Explosives usage is expected to be 0.24 kg/t of material.

An explosives supplier will operate an on-site mixing and storage facility and will deliver explosives to blast holes in a custom mixing vehicle. Mine staff will load the blast holes and conduct the blasting.

Final Pit Wall Blasting

Pre-splitting will be practiced and off-vertical holes will be drilled as required.

18.1.10 *Loading*

General Loading Conditions

Electric rope shovels and electric hydraulic shovels are often used in similar mining situations. Electric shovels will not be used on the project as the planned power supply to the site will not be sufficiently robust.

DIESEL HYDRAULIC SHOVEL – NET PRODUCTIVE OPERATING TIME

The diesel hydraulic shovels will be scheduled to operate two 12-hour shifts per day (effective shift operating time of 550 minutes). Initially availability is expected to be 90%.

SHOVEL LOADING PRODUCTIVITY

Two medium sized diesel hydraulic shovels (one each for ore and waste) will be purchased, which will each load over 3,000 t/h on average.

18.1.11 *HAULAGE*

GENERAL HAULING CONDITIONS

Equipment for all haulage duties will be mechanical drive rear dump 227 t haul trucks.

HAUL TRUCK – NET PRODUCTIVE OPERATING TIME

The haul trucks will be scheduled to operate on two 12-hour shifts per day. Due to one hour lunch breaks and operations such as fuelling and daily maintenance checks, effective operating times of 550 minutes per shift are expected.

HAUL TRUCK PRODUCTIVITY

Cycle times, based on haul distances and grades, were calculated for ore, waste, and overburden movement for each year of production. These times were then used to calculate fleet requirements.

18.1.12 *PRE-PRODUCTION MINE DEVELOPMENT*

MINE HAUL ROAD CONSTRUCTION

In-pit roads will have gradients of 10% with turns being level. Roads will be constructed to comply with best industry practice and the British Columbia mining regulations.

DEWATERING PUMPING SYSTEM

It has been assumed no major pumping will be required from the pits due to the low permeability of the country rock. Modest allowances have been made for pumps and their operation (KCBL, 2008a).

18.1.13 MINE OPERATING COSTS

GENERAL ESTIMATION APPROACH

Annual mine operating costs were based on actual budget quotes together with truck cycle times and local union labour rates.

SUMMARY MINE OPERATING COSTS

The calculated mine operating costs per tonne of material mined averages approximately $1.49/t excluding any contingency allowances. These costs are summarized in Table 18.6.

Table 18.6 Summary Mine Operating Costs ($/t Mined)

	Year							
	-1	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Load/Haul	0.47	0.47	0.52	0.59	0.61	0.69	0.69	0.73
Drill/Blast & Explosives Preparation	0.22	0.18	0.22	0.23	0.22	0.22	0.23	0.23
Auxiliary Equipment	0.13	0.09	0.09	0.11	0.11	0.11	0.12	0.12
Mine Labour	0.38	0.32	0.34	0.39	0.39	0.40	0.44	0.44
Other Mine Costs	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total ($/t Mined)	**1.21**	**1.07**	**1.18**	**1.33**	**1.33**	**1.44**	**1.48**	**1.52**
	Year							
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Load/Haul	0.54	0.58	0.64	0.66	0.72	0.75	0.84	0.86
Drill/Blast & Explosives Preparation	0.21	0.21	0.23	0.23	0.22	0.23	0.23	0.23
Auxiliary Equipment	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Mine Labour	0.44	0.44	0.44	0.44	0.45	0.46	0.48	0.48
Other Mine Costs	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Total ($/t Mined)	**1.32**	**1.36**	**1.44**	**1.47**	**1.53**	**1.57**	**1.67**	**1.71**
	Year							
	16	**17**	**18**	**19**	**20**	**21**		
Load/Haul	0.61	0.63	0.97	3.10	n/a	n/a		
Drill/Blast & Explosives Preparation	0.23	0.25	0.27	0.57	n/a	n/a		
Auxiliary Equipment	0.12	0.13	0.08	0.24	n/a	n/a		
Mine Labour	0.44	0.61	0.72	2.04	n/a	n/a		
Other Mine Cost	0.02	0.03	0.04	0.04	n/a	n/a		
Total ($/t Mined)	**1.42**	**1.71**	**2.07**	**6.00**	**n/a**	**n/a**		

***Note**: Costs do not include contingency.

SALARY AND HOURLY WAGE RATES

Local union rates were used. Typical salary rates for the industry were used for salaried positions. Salary and hourly wage rates are shown in Table 18.7.

Table 18.7 Salary and Hourly Wage Rates

Title	Hourly Rate ($)	Hours Per Year	Gross Annual ($)
Mine Superintendent	66.55	2,080	138,424
Chief Mine Supervisor	48.40	2,080	100,672
Clerk	24.20	2,080	50,336
Chief Production Geologist	42.35	2,080	88,088
Chief Engineer	45.98	2,080	95,638
Mine Engineers	44.77	2,080	93,122
Geology/Grade Control	30.25	2,080	62,920
Surveyor	39.93	2,080	83,054
Survey Helper	29.04	2,080	60,403
Mine Sh. Supervisors	39.93	2,007.5	80,159
Drill/Blast Engineers	38.12	2,080	79,290
Lube/Fuel Operators	28.44	2,007.5	57,093
Equipment Operators	36.30	2,007.5	72,872
Drillers	33.88	2,007.5	68,014
Drill Helpers	26.62	2,007.5	53,440
Blasters	33.88	2,007.5	68,014
Blaster Helpers	28.44	2,007.5	57,093
Mine Maintenance Supervisor	48.40	2,080	100,672
Maintenance Shift Supervisor	39.93	2,007.5	80,160
Mine Maintenance Planner	37.51	2,007.5	75,301
Light Vehicle Mechanics	39.51	2,007.5	75,301
Mine Maintenance Mechanics	37.51	2,007.5	75,301
Mine Maintenance Helpers	26.62	2,007.5	53,440
Welders	37.51	2,007.5	75,301

MINE PERSONNEL – SUPERVISORY, TECHNICAL, OPERATING, MAINTENANCE

The number of employees that will be required in the mine department varies over time between 105 and 146 within the four phase mine development plan. Personnel requirements are shown in Table 18.8 for Phase I and II, and Table 18.9 for Phase III and IV.

No camp will be required at site as a schedule of four operating crews will be utilized.

Table 18.8 Personnel Requirements Phase I and II

	Year											
	-1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Mine Superintendent	1	1	1	1	1	1	1	1	1	1	1	1
Mine Chief Supervisor	1	1	1	1	1	1	1	1	1	1	1	1
Clerks	2	2	2	2	2	2	2	2	2	2	2	2
Chief Production Geologist	1	1	1	1	1	1	1	1	1	1	1	1
Chief Engineer	1	1	1	1	1	1	1	1	1	1	1	1
Mine Engineers	2	2	2	2	2	2	2	2	2	2	2	2
Geology/Grade Control	2	2	2	2	2	2	2	2	2	2	2	2
Surveyors	2	2	2	2	2	2	2	2	2	2	2	2
Survey Helpers	2	2	2	2	2	2	2	2	2	2	2	2
Mine Supervisors	4	4	4	4	4	4	4	4	4	4	4	4
Drill & Blast Engineers	2	2	2	2	2	2	2	2	2	2	2	2
Lube/Fuel Operators & Helpers	4	4	4	4	4	4	4	4	4	4	4	4
Equipment Operators*	34	47	51	47	47	51	51	51	51	51	51	51
Drillers	4	4	8	4	4	4	4	4	4	4	4	4
Drill Helpers	4	4	8	4	4	4	4	4	4	4	4	4
Blasters	2	2	2	2	2	2	2	2	2	2	2	2
Blaster Helpers	4	4	4	4	4	4	4	4	4	4	4	4
Mine Maintenance Superintendent	1	1	1	1	1	1	1	1	1	1	1	1
Mine Maint. Shift Supervisor	4	4	4	4	4	4	4	4	4	4	4	4
Mine Maintenance Planners	2	2	2	2	2	2	2	2	2	2	2	2
Light Vehicle Mechanics	2	2	2	2	2	2	2	2	2	2	2	2
Mine Maintenance Mechanics	12	16	16	16	16	16	16	16	16	16	16	16
Mine Maintenance Helpers	8	12	12	12	12	12	12	12	12	12	12	12
Welders	4	8	8	8	8	8	8	8	8	8	8	8
Total Personnel	**105**	**130**	**142**	**130**	**130**	**134**	**134**	**134**	**134**	**134**	**134**	**134**

*One operator per shift is included to cover vacations and sick leave.

Table 18.9 Personnel Requirements Phase III and IV

	Year									
	12	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Mine Superintendent	1	1	1	1	1	1	1	0.5	0	0
Mine Chief Supervisor	1	1	1	1	1	1	1	1	0	0
Clerks	2	2	2	2	2	1	1	0.5	0.5	0.29
Chief Production Geologist	1	1	1	1	1	1	1	0	0	0
Chief Engineer	1	1	1	1	1	1	1	0.5	0	0
Mine Engineers	2	2	2	2	2	2	2	0.5	0	0
Geology/Grade Control	2	2	2	2	2	2	2	0.5	0	0
Surveyors	2	2	2	2	2	2	2	1	1	1
Survey Helpers	2	2	2	2	2	2	2	1	0	0
Mine Supervisors	4	4	4	4	4	4	4	2	4	2
Drill & Blast Engineers	2	2	2	2	2	2	2	1	0	0
Lube/Fuel Operators & Helpers	4	4	4	4	4	4	4	2	1	1
Equipment Operators*	55	59	63	63	51	42	34	19	13	12
Drillers	4	4	4	4	4	4	4	4	0	0
Drill Helpers	4	4	4	4	4	4	4	4	0	0
Blasters	2	2	2	2	2	2	2	1	0	0
Blaster Helpers	4	4	4	4	4	4	4	1	0	0
Mine Maintenance Superintendent	1	1	1	1	1	1	1	0.5	0	0
Mine Maintenance Shift Supervisor	4	4	4	4	4	4	4	1	0	0
Mine Maintenance Planners	2	2	2	2	2	2	2	1	0	0
Light Vehicle Mechanics	2	2	2	2	2	2	2	1	1	0.58
Mine Maintenance Mechanics	16	16	16	16	16	16	16	4	4	2.32
Mine Maintenance Helpers	12	12	12	12	12	12	12	4	3	3
Welders	8	8	8	8	8	8	8	4	1	0.58
Total Personnel	**138**	**142**	**146**	**146**	**134**	**124**	**116**	**55**	**29**	**23**

*One operator per shift is included to cover vacations and sick leave.
Year 19 part year only for most employees.

18.1.14 *Mine Capital Costs*

The mine capital costs are as follows:

- mobile equipment sub-total: Cdn$52,537,274
- other pit equipment sub-total: Cdn$1,654,500
- total mine capital equipment: Cdn$54,191,774.

Mine capital costs are detailed in Table 18.10 and Table 18.11.

Table 18.10 Mine Capital Cost – Mobile Equipment

Item	Manufacturer	Model	#	Cost Each FOB* Mine	Total ($)
Shovel	Komatsu	PC4000	2	7,300,000	14,600,000
Wheel Loader	Caterpillar	992G	2	2,400,000	4,800,000
Off Highway Trucks	Caterpillar	793C	4	3,990,000	15,960,000
Track Type Tractor	Caterpillar	D10T	2	2,000,000	4,000,000
Track Type Tractor	Caterpillar	D9T	1	1,350,000	1,350,000
Rubber Tire Dozer	Caterpillar	834B	1	1,950,000	1,950,000
Motor Grader	Caterpillar	16M	2	875,000	1,750,000
Skid Steer Loader	Caterpillar	216B	1	41,000	41,000
Integrated Tool Carrier	Caterpillar	IT14G	1	175,000	175,000
Water Truck			1	150,000	150,000
Utility Haul truck	Caterpillar	773E	2	750,000	1,500,000
Sand Truck			1	150,000	150,000
Bench Drill	Sandvik	D90KS	1	2,583,274	2,583,274
Secondary Drill	Sandvik	Pantera	1	605,000	605,000
Pick-up trucks			6	48,000	288,000
Crew-cabs/Suburbans			2	50,000	100,000
Fuel/Lube Truck			1	190,000	190,000
Mechanic's Truck			2	100,000	200,000
Welder's truck			1	110,000	110,000
Utility Crane (60 t)	Grove	RT760E	1	600,000	600,000
Flatbed Truck 7.3 t			1	135,000	135,000
Tractor and Lowboy	Freightliner		1	300,000	300,000
Rough Terrain Forklift	Sellick	SD-100	1	200,000	200,000
Utility Excavator			1	800,000	800,000
Sub-total – Mobile Equipment					**$52,537,274**

* FOB = free on board.

Table 18.11 Mine Capital Cost – Other Pit Equipment

Other Pit Equipment	#	Cost Each FOB* Mine	Total ($)
Mine Pumps, Piping		110,000	110,000
Shop Tools		200,000	200,000
Truck Dispatch System, No Depth Control		560,000	560,000
Mobile Radio Units		5,000	5,000
Lighting Units	6	30,000	180,000
10 Scott Airpacks and 30 masks		50,000	50,000
Rescue Clothing and Gear		30,000	30,000
Maintenance Mgmt System	1	5,500	5,500
Explosives Facility Site Commissioning Fee		80,000	80,000
Safety Equipment		117,000	117,000
Engineering & GIS Survey Equipment & Software		45,000	45,000
Computer Workstations	4	12,000	12,000
AutoCAD Software	4	35,000	35,000
Geology/Mining Software		25,000	25,000
Pump Switchgear, Cabling (Lot)			200,000
Sub-total – Other Pit Equipment			**1,654,500**
Total Mine Capital Equipment			**54,191,774**

* FOB = free on board.

GENERAL ESTIMATION APPROACH

Capital cost for mobile mine equipment is estimated to total $52.5 million. A further $1.66 million will be required for other pit equipment. These totals include freight.

Budget quotes were obtained from suppliers, with three suppliers of each category of equipment being contacted. Prices requested were ex-factory with freight to site, assembly, commissioning, and crew training detailed in the estimates.

18.2 PROCESS PLANT

18.2.1 MILL SERVICES

The mill services generally consist of the following:

- water distribution
- air supply and distribution
- building services.

WATER DISTRIBUTION

Process Water System

Process Water is supplied from the process water tank and comprises thickener overflow, tailings dam reclaim, and fresh water make-up.

Reclaim and Fire Water

There will be a combination reclaim/fire water tank located outdoors above the plant facilities at elevation 904 masl.

The upper portion of the tank will be for reclaim water supplied from the tailings pond and passing through to the process water tank at the plant. The lower portion of the tank will hold a dedicated quantity of water for fighting fires. Both portions of the tank are sized for a retention time of 2 h. This tank will be equipped with a vented roof and will be insulated on roof and walls. Fire water will be piped to all main facilities by gravity to connect with buried underground fire water ring mains around each of the facilities.

Fresh Water Systems

Fresh water is pumped from Morrison Lake to a fresh water holding tank in an open top atmospheric tank. Fresh water is distributed by a pump for start-up and emergency purposes, gland seal water, reagents, flotation cleaning stages, process water make up, and potable water. Gland seal water is pumped separately from the fresh water tank to all the process slurry pumps inside the processing plant.

Potable Water System

Distributed fresh water is collected in a potable water storage tank. The water is pumped from this tank through a hydro chlorinator and into a distribution piping ring to serve all the potable water users in all facilities including the processing plant. The main users of potable water include the plant workshop, the administration building, washrooms, and safety showers in the processing area.

AIR SUPPLY AND DISTRIBUTION

Compressed air to the plant is supplied and distributed as follows:

- Plant air is supplied by a common compressor for utility and instrument air.
- Instrument air is provided from the plant air compressors, which is then dried and stored in the plant instrument air receiver.

BUILDING SERVICES

Heating and Ventilation

The primary heating source will be gaseous propane, distributed from a single propane storage tank farm located south west of the mill building.

The HPGR building will not be heated. Ventilation air will be provided to maintain air quality within the building. Multiple ventilation fans will be provided to enable different air change rates to be applied during different activities and outdoor air temperatures.

The primary crushing will be provided with localized “spot” heating, with electric heaters to ensure that during a shutdown the area is freeze protected. Ventilation will be provided to remove the hot air generated from equipment drives.

The mill building will be provided with perimeter propane unit heaters as well as ventilation fans to ensure air quality within the building. Make up air will be provided to offset exhaust air from dust collection systems.

The administration building will be provided with heating ventilation and air conditioning systems, as well as local exhaust systems.

The service areas of the truck shop will be provided with heating and ventilation systems, with propane fired radiant heaters, exhaust fans, and make up air units. The warehouse area will be provided with propane fire unit heaters and exhaust fans.

The assay laboratory will be provided with dust collection systems in the sample prep area with propane fired make up air units and electric baseboard heaters as well as local lab exhaust systems.

The truck wash will be provided with propane fired radiant heaters and exhaust fans.

Dust Control

Dust control will be provided with aspirated systems, with dust hoods and ducting being connected to dry dust collectors at the following locations:

- primary crushing (below crusher)
- stockpile reclaim area
- secondary crushing
- HPGR building
- concentrate load out.

Water sprays will be utilized at the truck dump pocket and at the feed to the coarse ore stockpile during non-freezing weather.

The fines from the dust collectors will be collected in separate tote bins for manual transportation back into the process.

Fire Protection

The plant site will be provided with a fire protection system comprised of the following:

- A reclaim/fire water tank will be located above the processing plant facilities. The tank will hold a dedicated quantity of water for fighting fires.
- Firewater will be piped to all main facilities by gravity to connect with buried underground fire water ring mains around each of the facilities. Each of these buried ring mains will carry water to a network of year fire hydrants located around the buildings; and to riser pipes feeding indoor wall hydrants, sprinkler systems and hose stations. The ring mains will include isolating valves strategically located such that any potential fire could be fought with water from more than one direction.
- In addition, all buildings will be equipped with hand held fire extinguishers of two types. General purpose extinguishers for inside plant areas and dry-type extinguishers for inside electrical and control rooms.

Specific fire protection systems will include the following:

- Mill Building:
  - wet Class 2 standpipe hose systems
  - clean agent automatic suppression system in the control room
  - automatic wet sprinklers will be provided to protect reagents, lube units, compressors, and office areas.
- HPGR Building:
  - dry Class 2 standpipe hose systems (unheated building)
  - automatic dry sprinklers will be provided to protect conveyors within the building, lube units, compressors, and office areas.
- Conveyors:
  - dry risers from grade up to walkway where walkway exceeds 12 m above grade
  - crushed ore conveyor – portable fire extinguishers and access by fire truck along length of conveyor.
- Truck Shop and Warehouse Complex/Tire Change and Truck Wash:
  - wet Class 2 standpipe hose system will be provided throughout the building

- automatic wet sprinklers will be provided throughout the building.

- Administration/Dry:
  - the IT room will be protected by an automotive clean agent suppression system.
- Assay Laboratory:
  - automatic wet sprinklers will be provided throughout the building.

It should be noted that the above is in addition to fire detection systems specified elsewhere.

18.2.2 Instrumentation and Process Control

Overview

The plant control system will consist of a Distributed Control System (DCS) with PC based Operator Interface Stations (OIS) located in two separate control rooms. The DCS, in conjunction with the OIS, will perform all equipment and process interlocking, control, alarming, trending, event logging, and report generation. DCS Input/Output (I/O) cabinets will be located in electrical rooms throughout the plant and interconnected via a plant wide fibre optic network.

Field instrumentation will consist of microprocessor based "smart" type devices. Instruments will be grouped into process areas and wired to local field instrument junction boxes located within those areas. Signal trunk cables will connect the field instrument junction boxes to DCS I/O cabinets.

Primary Crusher

A control room in the primary crushing building will be provided with a single OIS. Control and monitoring of all primary crushing, conveying, and stockpiling operations will be conducted from this location.

Mill

A central control room in the mill building will be provided with three OIS. Control and monitoring of all processes in the mill building, secondary crusher, and HPGR will be conducted from this location.

All the plant interlocking, monitoring and control functions are implemented within the DCS. This will comprise graphical operator workstations in the control room, windows based hardware and software application, and a system of manufactured I/O cabinets to allow the control system to interface with the motor starter, valves, and associated equipment that perform the actual plant control.

SPECIALTY SYSTEMS

Optimization systems for grinding and flotation have been identified for inclusion in order to assist the facility in maximizing the recovery from and efficiency of its grinding operations. These “expert” systems operate on stand-alone computers but are able to interface with the plant DCS system in order to exchange data and control process equipment.

18.3 ON-SITE INFRASTRUCTURE

18.3.1 ACCESS ROADS

All on site access roads are gravel surfaced and 12 m wide (except the mined ore haul road) with ditches on both sides for drainage. The main access road travels from the entrance gate towards the northwest, passing the open pit mine and overburden stockpile, past the ore treatment plant and on to the explosive magazine facility and then on to the ammonium nitrate and emulsion silos. Berms will be installed along the road side where necessary to prevent rocks and earth sliding down onto the road (e.g. from the overburden stockpile).

There are several short secondary off-shoot roads from the main access way to service each of the different facilities. In addition there are several off shoot roads from the secondary roads to the pond area. These include a road to each of the tailings pumps booster stations, a road to the cyclowash pump station, and a road to the reclaim/fire water tank area.

18.3.2 HAUL ROAD

The mined ore haul road is a short gravel surfaced road made up of three sections linked together (approximately 2.4 km total length) running between the open pit mine and the primary crusher. The road will be 30 m wide with drainage ditches on both sides. This road is a heavy duty design to carry loaded ore trucks and will run from the southeast towards the northwest and traffic will be two-way.

18.3.3 CONCENTRATE PRODUCT HAUL ROADS

On site, the concentrate product will be loaded out from the ore treatment plant by belt conveyors into 40 t-capacity truck trailers for hauling to a port near Stewart, BC. The loaded truck trailers will travel along the main plant entrance road to exit the site through the main gate.

18.3.4 POWER DISTRIBUTION

Power from the electrical utility will be provided to a main substation located to the north of the main process building. The subject of the power line access, suitability of supply, cost, and substation technical details are described in a report by Kaehne.

Electrical power is supplied from the secondary of two 13.8 kV transformers and delivered to a 13.8 kV switchgear (circuit breaker) line up located in a prefabricated metal building on the substation site.

Power from that location is delivered at 13.8 kV via a combination of overhead lines and underground power cables.

The main feeders are:

- An overhead power line to primary crushing then via an underground cable to the pit perimeter.
- An overhead power line to smaller process plant area facilities including cold storage, sewage treatment, administration building, maintenance shop, truck wash, and fuel storage. A tap and feeder cable to the lake fresh water make up station is also located along this power line.
- An overhead power line to the explosives storage and ammonium nitrate emulsion storage.
- Underground feeder cables to tailings pumping station #2 then extending past the fire/reclaim water holding tank to the south seepage pond and tailings pond. This arrangement suits the design input from the tailings designers KCBL. Two main underground cable feeds to the main process plant then via cable tray to process building electrical room.
- One underground feeder cable to the HPGR building by way of the process building and conveyor systems.

EMERGENCY POWER

Critical Power

Items are identified on the equipment list as critical equipment are those loads which cannot remain stopped for significant amounts of time without the plant incurring restarting costs (agitators). The associated infrastructure loads needed to operate the critical equipment (control room power, lights, and similar items) are also included as critical equipment.

The total critical power for this area has been assessed at this stage to approximate a 1.3 MW running load and is primarily located within the main process building. The ability of the power system to meet this requirement will be met by manual transfer scheme such that, upon loss of normal utility power, operation and electrician actions will start one diesel generator unit located adjacent to the main process plant and power the critical power loads. During operation in this manner, operator control will be required to limit the electrical load applied to the diesel generator.

This process plant diesel generator will be interlocked with the plant 600 V distribution system to prevent inadvertent paralleling of sources of energy. A fuel tank for this emergency generator will be provided to allow for five days of operation at full load.

Other remote areas such as primary crushing, HPGR building, and as identified on the single line diagram will have local backup generators to provide power upon normal power failure for small, local loads.

FIRE ALARM SYSTEM

Provision for a digital fire alarm system has been included for the main process plant facilities.

This system will include a central, password-protected operator interface terminal with a graphic display of all operating zones, trouble and alarm logging historian, and control panel. The system will have the ability to incorporate a single alarm and trouble dry contact type signals from other stand alone and pre-manufactured buildings into a centralized facility. Each separate facility will be tracked as a separate zone only.

18.3.5 *DIESEL FUEL STORAGE AND DISTRIBUTION*

Diesel fuel requirements for the mining equipment and process and ancillary facilities will be supplied from above ground diesel fuel storage tanks located near the truck shop. The diesel fuel storage tank will have a capacity sufficient for approximately three days of operation. Diesel storage will consist of above ground tanks and containment pad and will be complete with loading and dispensing equipment conforming to regulations. A fuel dedicated service truck will transport diesel to the mining equipment.

18.3.6 *SEWAGE COLLECTION AND TREATMENT*

The sewage disposal system will comprise of a buried gravity collection system from the process and ancillary facilities to the sewage treatment plant located to the west of the maintenance building. The plant site layout allows for gravity sewage collection throughout.

The sewage treatment plant will be a pre-packaged rotating biological contactor (RBC). The plant will be manufactured off site and containerized for simple connection to the collection system on site. Treated sewage will be pumped into the tailings pumpbox for discharge into the tailings storage facility (TSF) in accordance with a Waste Discharge Permit under the Environmental Management Act.

18.3.7 Propane Distribution

The process plant and ancillary buildings will be heated mainly with propane furnaces and unit heaters.

Propane will be transported to site from Smithers in tanker trucks and stored in propane tanks located beside the northwest corner of the process plant. Tanks will be sized to hold the 7-day supply of propane required during winter months.

18.3.8 Buildings

Administration Complex

The administration complex is a two level building that will be provided in fully complete modular type buildings and is comprised of the following:

- assay laboratory
- sample preparation area
- wet laboratory
- mechanical room
- men's/woman's dry facilities
- work stations to accommodate 34 personnel
- offices and training room.

The administration complex is located to the west of the process plant.

Maintenance Complex and Warehouse

The principal function of the Maintenance Complex is to provide servicing facilities for mine equipment and heated warehousing. The complex will be 100 m long by 22 m wide.

The main floor is comprised of equipment services bays, maintenance shops, warehousing, emergency response vehicle garage, lube storage, and offices.

The facility will be constructed of structural steel with metal cladding wall and roof systems. Foundations will consist of conventional concrete perimeter walls and strip/spread footings. Grade level floor construction will be a reinforced concrete slab, including concrete approach aprons at all service bay locations.

The truck shop and warehouse will be comprised of the following facilities:

- two heavy duty repair bays
- one weld bay
- one light vehicle repair bay
- maintenance workshops
- emergency response facility
- warehouse
- offices
- lube storage.

COLD STORAGE WAREHOUSE

For items that need to be stored under cover but not heated, an exterior unheated storage facility will be provided.

Pallet racking bins and carousels will be provided in the warehouse.

TRUCK WASH/TIRE CHANGE

The facility will be constructed of pre-engineered steel frames with metal cladding wall and roof systems. The foundation will be constructed of conventional concrete perimeter walls with spread footings bearing on suitable ground. Grade level construction will be a reinforced concrete slab with sumps and trenches to facilitate truck washing operation.

The truck wash/tire change building consists of the following:

- tire bay
- lubrication bay
- wash bay.

READY LINE

A ready line will be constructed, remote from the maintenance complex. It will provide outdoor parking for seven vehicles. Each stall will be sized to accommodate the haul truck.

The stalls will be sloped towards a berm so that, in the case of brake failure, the vehicles will roll into the berm rather than across the site.

18.3.9 EXPLOSIVES

GENERAL CONCEPT

The general concept is based on the Site Mixed Emulsion (SME) solution. The components are brought to site as:

- ammonium nitrate (AN) in bulk (big bags)
- fuel-false (special for the emulsion)
- emulsifier in drums
- primers (explosives)
- detonators (explosives).

The components are mixed on site in a purpose-built explosive mixing facility and transported to the mine site in purpose-built mixing trucks. All explosives are to be delivered, mixed, and handled accordingly.

STORAGE AREAS

The explosives storage areas are located to the northwest of the open pit. The requirement for storage is mainly for AN. The AN is brought to the port site in 20 ft containers and left at a storage area at the port. A two-week buffer storage is placed closer to the mixing facility.

Primers and detonators are placed in special explosive storage containers close to the mixing facility. For safety reasons, the explosive storage area is divided into two.

The fuel-base and emulsifier are placed in heated storage at the mixing facility.

18.3.10 COMMUNICATIONS

The project telecommunications design will incorporate proven, reliable, and state-of-the-art systems to ensure that personnel at the mine site will have adequate data, voice, and other communications channels available. The telecommunications system will be supplied as a design-build package.

The base system will be installed during the construction period then expanded to encompass the operating plant.

The major features of the communication system will include:

- a satellite communications for voice and data
- Ethernet cabling for site infrastructure
- provision for two-way radio communications at site.

A variety of communications media (copper and wireless during the construction phase and fibre optic during the operating phase) will be incorporated in the overall design.

The requirements for communications, particularly satellite bandwidth, are a function of the voice and data requirements of the active participants in the Project. The expectation is that the need for satellite bandwidth will build to a peak during the plant construction phase, and then taper off slightly as the initial construction crew yields to plant operations.

18.4 OFF-SITE INFRASTRUCTURE

18.4.1 SITE ACCESS AND LOCAL ROADS

The Morrison property is located on the east side of the southern end of Morrison Lake. It is accessed from Highway 118 that turns north off Highway 16 at Topley to Michelle Bay (11 km south of the village of Granisle), then by an all-season barge (which can transport up to 10 fully loaded logging trucks) across Babine Lake to Nose Bay from where Forest Service Roads (FSRs) extend to the Morrison deposit.

The FSRs consist of the following sections:

- Nose Bay – 2.61 km
- Jinx – 8.20 km
- Hagan – 31.31 km
- Morrison East – 6.52 km
- **Total – 48.64 km**

The FSRs meets all of the Forest Service Road Specifications and are constructed to off-highway standards, which is over and above FSR specifications. However, to ensure adequacy for 24/7/365 use, initial maintenance is required for a cost of approximately $1,186,000. This maintenance is primarily for the addition of a new surface layer of crushed rock.

18.4.2 TELECOMMUNICATIONS

The Morrison Copper/Gold Project telecommunications design will incorporate proven, reliable, and state-of-the-art systems to ensure that personnel at the mine site will have adequate data, voice, and other communications channels available. Telecommunications systems will be supplied as design-build packages. The base systems will be installed during the construction period then expanded to encompass the operating plant.

The systems will include:

- satellite internet for data and VoIP
- satellite telephone
- radio and radio telephone (Towertel) services as are available from local suppliers
- cellular telephone (i.e. if available from the village of Granisle).

The requirements for communications, particularly satellite bandwidth, are a function of the voice and data requirements of the active participants in the Project. The expectation is that the need for satellite bandwidth will build to a peak during the plant construction phase, and then taper off slightly as the initial construction crew yields to plant operations. Technologies and services to be provided include the following:

- Construction Phase:
  - local VOIP wireless network
  - satellite link for voice, data and video services
  - personal computer Local/Wide Area Network (PC LAN/WAN)
  - mobile radio system
  - internet service
  - telephone system for voice and fax
  - video conferencing to minimize travel during design and construction
  - ground-to-air communications system (VHF Radio).
- Operation Phase (includes selected services above):
  - process monitoring and control for efficient operation and maintenance
  - security access control
  - closed circuit television (CCTV) for process, security and safety.

18.4.3 POWER SUPPLY

The Morrison Copper/Gold Project will be provided with a supply of electricity from the BC Hydro transmission grid with a 138 kV service connection at the existing BC Hydro Babine Substation located near the township of Granisle. A tentative agreement with Xstrata, the owners of the former Bell Mine and the existing 138 kV power supply facilities between Babine Substation and the former Bell Mine, will allow PBM to utilize these facilities and to extend a new 138 kV transmission line approximately 25 km to the Morrison Copper/Gold Project.

Arrangements are being made with BC Hydro to provide a 138 kV power supply with a maximum contract demand of 40 MVA at Babine Substation which will provide capacity for the Morrison Copper/Gold Project load, the former Bell Mine load (currently in “care and maintenance” mode) and transmission losses between the revenue meter and the load.

The new 138 kV transmission line will run in a northerly direction from the former Bell Mine site over Crown land which has been mostly logged by Canfor which holds timber lot licences along most of the route. Good access to the line is provided by existing logging roads. The line will consist of wooden poles and wishbone crossarms with suspension insulators and ACSR conductors. An overhead ground wire will be provided with a built-in optical fibre core. A cleared right-of-way will be maintained to a width of 30 m. This line may be temporarily energized at 25 kV to provide construction power to the Morrison Copper/Gold Project, before it is permanently energized at 138 kV prior to the start of production.

The former Bell Mine has been receiving its power supply via Xstrata-owned 138 kV facilities which were re-energized at 25 kV several years ago when the mine ceased production and the load diminished significantly. It will therefore be necessary for BC Hydro to re-establish a new 138 kV service bay at Babine Substation. This will consist of a new circuit breaker with isolation and protection equipment and BC Hydro’s revenue metering for the combined Morrison and Bell loads, for which PBM will sign a new Electricity Supply Agreement (ESA) with BC Hydro, replacing the existing Xstrata ESA.

In order for BC Hydro to supply the Morrison Copper/Gold Project load, some system upgrades will be required upstream of the Babine Substation. The capital cost of these upgrades will be covered by a Revenue Guarantee provided to BC Hydro by PBM.

Subject to reaching a final agreement with Xstrata, PBM will take over operating and maintenance responsibility for the existing Xstrata-owned 138 kV facilities and, in return, provide electrical supply to Xstrata at the former Bell Mine site via a new substation at no charge.

The Xstrata-owned 138 kV facilities consist of an overhead line from Babine Substation to the western terminal of a submarine cable crossing Babine Lake, four single conductor 300 MCM 138 kV submarine cables across Babine Lake (three phase conductors plus a spare), and a single wooden pole 138 kV overhead line from the eastern cable terminal to the former Bell Mine site. The overhead line will require some repairs which will be carried out by PBM. The submarine cables have been recently repaired and tested by a specialist contractor and have been confirmed as suitable for re-energizing at 138 kV. The submarine cables have a capacity of 60 MVA.

The new Bell Substation will be supplied via a short line tap from the new Morrison line and will consist of a circuit breaker with isolation and protection, check metering (non-revenue) and a 3 MVA 138-25 kV power transformer. Xstrata will be responsible for 25 kV distribution beyond the new substation.

The new Morrison Substation will consist of an incoming line terminating structure and overhead bus, lightning protection, isolation, circuit breakers (2), check metering (non-revenue), and two 138-13.8 kV power transformers, each of 30 MVA capacity at an ONAN (naturally cooled) rating and 40 MVA at an ONAF rating (forced cooled). This allows PBM to continue to operate at full rated production with the loss of one transformer. Secondary 13.8 kV bus will feed to a main 13.8 kV switchgear line-up in an adjacent electrical room from where 13.8 kV feeders will extend to the various load centres throughout the plant.

18.5 WATER MANAGEMENT PLAN

The mine facilities will be operated as a closed system with all process water and "contact" surface water collected and recycled to the plant site for use in the milling process. Clean surface water will be diverted around the facilities to reduce the quantity of contact water. Nonetheless, in approximately Year 8, there is a net surplus water balance, which will require storage in the TSF until closure. A water reclaim pump barge and pipeline will return water from the TSF to the plant. A water balance model was developed, which links the mine area drainage and the TSF. The water balance accounts for all inflows, both into the mine area and into the TSF, as well as all losses to tailings voids, groundwater, evaporation, and processing.

The main water management components for the mine are summarized as follows:

- TSF:
  - Seepage recovery ponds to collect seepage water and construction water from the cyclone sand process, which is returned to the TSF. The seepage pond has an emergency spillway for dam safety.
  - Flood management for the TSF and for the Seepage Recovery dams for dam safety.
  - Operation of the TSF will reduce, during operations, the stream flows in the creek immediately downstream of the Main dam, and, to a much lesser extent, the stream flows downstream of the North dam.
  - Surface water diversion ditches to reduce water inflows during operations.
  - Upon mine closure, a permanent spillway will be constructed to provide for long term dam safety.
- Mine and Plant Site Facilities:
  - A "clean" water intake on Morrison Lake to provide clean water for the plant site.
  - "Clean" water diversion ditches to reduce water inflows into the waste rock dump, open pit, and plant site areas.
  - Collection ditches and sumps to collect runoff from the waste rock dumps, open pit, and plant site areas for return to the process plant

- Sediment control ponds downstream of overburden stockpiles to provide settling of suspended solids prior for discharge.

18.5.1 TAILINGS AND RECLAIM WATER HANDLING

The main components of the tailings delivery and reclaim systems are summarized in the following sections.

TAILINGS PUMPING

Two-stage pumping is required: Pump Station No. 1 is located within the process plant building, and Pump Station No. 2 is located midway between the plant site and the TSF. Each pump station includes four centrifugal slurry pumps. Slurry pump testing is required for final design and may indicate the need for additional pumps. Power supply will be via underground cable.

TAILINGS PIPELINE

The tailings delivery pipeline will be HDPE and HDPE-lined steel (for the higher pressure sections of the line), approximately 760 mm diameter. The pipeline will be laid on the ground surface and emergency backflow storage ponds will be provided to allow drainage of the pipeline. The pipeline will deliver tailings to the crest of the Main Dam and, starting in Year 2, to the crest of the North Dam. In Year 4, the tailings pipeline will be extended to the West Dam via the Main Dam.

CYCLONE SYSTEM

Cyclones will be used to produce cyclone sand for dam construction. The cyclone system will consist of two mobile skids mounted with six hydrocyclones to be located on the dam crest. One cyclone set will be in operation while the second is being relocated.

WATER RECLAIM SYSTEM

The reclaim water system consists of a reclaim barge with three vertical pumps, a reclaim line from the tailings pond to the reclaim/fire water tank, then continuing to the plant site. The barge consists of a 12 m long by 8.5 m wide and 2.4 m deep fabricated steel hull and access ramp. The 450 mm to 710 mm diameter reclaim pipeline will be a buried HDPE pipeline. An emergency storage pond will be provided to allow drainage of the pipeline.

SEEPAGE POND RECLAIM SYSTEM

Seepage pump stations (at the North and Main Dams) will have a pre-cast concrete intake with two vertical turbine pumps. The pumps will be housed in a pre-engineered steel frame building. The seepage reclaim pipeline will be a 180 mm diameter HDPE pipe from the pump station to the TSF.

FRESH/PROCESS WATER SYSTEM

The fresh/process water make-up system consists of a pump house located on the shore of Morrison Lake, and a discharge pipeline to the plant site. Two vertical turbine pumps will draw water from a well, connected to the lake by HDPE or steel pipe. The pumps will be housed in a pre-engineered steel frame building. The pipeline will be a 220 mm HDPE pipe from the pump house to the plant site.

The tailings and water handling systems are designed without a standby system, but with backup parts stored in an on-site warehouse. There is a risk of the tailings system being out of service for the duration required to replace the necessary components in the event of failure. Repairs may not coincide with process plant maintenance and may affect the availability target of the process plant.

18.5.2 WATER BALANCE

A monthly water balance model was developed for four stages of the mine:

1. Starter Dam (Year 1)
2. Operations (Year 10)
3. Ultimate Dam (Year 21)
4. Closure.

Two subcomponents of the water balance were assessed:

1. the TSF
2. the open pit, plant site, and waste rock dump areas

The two sub-components are linked into an overall water balance, which is used to determine requirements for diversion and storage. The monthly water balance is tracked on an annual basis, with seasonal storage provided within the TSF. The precipitation and evaporation parameters are based on the average monthly values. Table 18.12 presents a summary of annual average inflows and outflows to the mine water management system.

Table 18.12 Water Balance Summary

Parameters	Average Annual Flows (m^3/h)			
	Starter Year 2	Operations Year 10	Pre-closure Year 21	Closure
TSF Water Inputs (m^3/h)				
Whole Tailings Water (Direct Discharge)	1,062	1,062	1,062	-
Cyclone Overflow Water (85% Operational)	1,416	1,416	1,416	-
Cyclone Underflow (sand) Water (85% Operational)	67	67	67	-
Precipitation on Pond	76	261	318	286
Runoff from Undiverted Catchment	102	19	19	167
Excess Plant Site Catchment Runoff	-	-	-	-
Seepage Reclaim	4	4	4	-
Subtotal	**2,727**	**2,829**	**2,886**	**454**
TSF Water Losses (m^3/h)				
Pond Evaporation	54	184	225	202
Tailings Voids	211	190	171	-
Cyclone Overflow Voids	230	189	170	-
Cycloned Sand Voids	30	30	30	-
Seepage	10	10	10	10
Pump to Cyclowash	109	109	109	-
Water Reclaim to Process Plant	2,083	2,033	1,983	-
Subtotal	**2,727**	**2,746**	**2,698**	**212**
Plant Area Water Inputs (m^3/h)				
Water Reclaim to Process Plant (see above)	2,083	2,033	1,983	n/a
Open Pit Dewatering	-	50	100	n/a
Runoff from Undiverted Catchment	89	134	132	n/a
Seepage from Diversion Ditch	-	-	-	n/a
Ore Void Water (3% MC)	39	39	39	n/a
Make-up to Freshwater Tank	87	87	87	n/a
Subtotal	**2,366**	**2,410**	**2,409**	**n/a**
Plant Area Water Losses (m^3/h)				
Tailings Transport Water	2,405	2,405	2,405	n/a
Concentrate Load Out	1	1	1	n/a
Freshwater to Potable Water	3	3	3	n/a
Subtotal	**2,409**	**2,409**	**2,409**	**n/a**
Net Balance (m^3/h)	**-**	**83**	**188**	**242**

Annual water surpluses will be stored during operations and discharged to the open pit on closure or to the environment when the water quality is acceptable.

18.5.3 Surface Water Diversions

To minimize the requirements for water storage in the TSF, it is necessary to maximize the amount of surface water diversion. Accordingly, diversion ditches will be constructed for the Year 4, Year 8, and Year 20 TSF impoundments to divert approximately 6.0 km^2, 5.5 km^2, and 4.4 km^2, respectively. The ditches are designed to pass the 100-year average snowmelt/runoff flows of 4.4 m^3/s (based on British Columbia Flood Maps).

A diversion ditch will be constructed along the uphill side of the waste rock dump and will divert approximately 2.4 km^2. The design peak 100-year flow, based on British Columbia Flood Maps, is 1.5 m^3/s.

18.5.4 Closure

On closure, the impoundment will contain up to 14 Mm^3 of residual process water. Dilution of this water, with natural surface water inflow, will eventually change the water quality to baseline concentrations; however, this could take up to 5 to 10 years. Although residual process water contains very low levels of metal concentrations, pond water will be monitored regularly to confirm that the pond water meets water quality requirements before allowing discharge through the emergency spillway. If discharge is not permitted, the annual surplus water accumulating in the impoundment, which would be approximately 1.0 Mm^3/a, would be pumped to the open pit, using the existing pump barge and reclaim water pipeline, until natural dilution of the tailings lake water meets discharge criteria.

The impoundment water quality and downstream compliance stations will continue to be monitored monthly until steady state conditions have been achieved and the water quality meets discharge water quality requirements. The potential for re-suspension of fine tailings during wind events will be monitored. Erosion and sediment control of runoff from the dam slopes would be monitored.

The TSF closure spillway is designed to pass the peak flow from a probable maximum flood (PMF) and will be excavated in bedrock. The Morrison TSF provides several spillway locations located in rock and away from the Main Dam. The main closure spillway will be constructed in the left abutment of the Main Dam to convey water flows for the downstream aquatic environment. In addition, an emergency secondary closure spillway will be constructed in the right abutment of the North Dam, at a higher elevation, to provide a secondary safety release of water in the event of failure of the main spillway.

18.6 Waste Management Plan

The Morrison Copper/Gold Project will produce approximately 224 Mt of tailings and 170 Mt of waste rock. The TSF is located approximately 3.2 km northeast of the open pit, approximately 190 m higher in elevation than the plant site. The TSF will initially be formed with a 50 m high Starter Dam, which will be expanded to include North and West Dams with ongoing mining to an ultimate height of approximately 95 m.

The majority of the mine waste rock is potentially acid generating and will be stored adjacent to the open pit in a dump reaching about 150 m in maximum height. A temporary stockpile will store low grade ore, which will be milled as required during the mine life.

18.6.1 *Waste Rock*

The majority of the 170 Mt of waste rock is potentially acid generating and could leach metals under neutral conditions. Accordingly, the waste rock will be stored adjacent to the open pit in a waste rock dump, with all drainage recycled to the process plant. A temporary stockpile will store low grade ore adjacent to the waste rock dump, which will be milled later in the mine life.

Overburden from stripping of the open pit will be stockpiled near the open pit and potentially used for construction of the tailings Starter Dam. Organic bearing material will be stockpiled for use in reclamation. Foundation preparation for the waste rock dump and low grade ore stockpile will include removal of marshy soils and any other weak or soft materials, and disposal in a separate location.

The approximate volumes of waste rock, low grade ore, organic bearing material, and overburden that may be stored on the mine site within the facilities as designed are summarized in Table 18.13.

Table 18.13 Summary of Waste Rock, Low Grade Ore, and Overburden Design Capacity

<table>
<tr><th colspan="2">Dump Site</th><th>Footprint (ha)</th><th>Toe Elevation (m)</th><th>Crest Elevation (m)</th><th>Storage Volume (m^3)</th><th>Tonnage (t)</th></tr>
<tr><td colspan="2">Waste Rock Dump</td><td>175</td><td>810</td><td>991</td><td>85,000,000</td><td>170,000,000</td></tr>
<tr><td colspan="2">Low Grade Ore Stockpile</td><td>20</td><td>776</td><td>910</td><td>19,000,000</td><td>38,000,000</td></tr>
<tr><td colspan="2">Overburden Stockpile</td><td>30</td><td>740</td><td>800</td><td>7,410,000</td><td>12,600,000</td></tr>
<tr><td rowspan="2">Overburden & Organic Sediment Dump</td><td>Organics & Weak Sediments</td><td rowspan="2">18</td><td rowspan="2">796</td><td rowspan="2">840</td><td>1,150,000</td><td>1,730,000</td></tr>
<tr><td>Overburden</td><td>555,000</td><td>1,050,000</td></tr>
<tr><td colspan="2">Organic Bearing Material Stockpile No. 1</td><td>2.6</td><td>820</td><td>860</td><td>325,000</td><td>550,000</td></tr>
<tr><td colspan="2">Organic Bearing Material Stockpile No. 2</td><td>5.3</td><td>743</td><td>766</td><td>113,000</td><td>190,000</td></tr>
</table>

Non-acid Generating (NAG) waste rock will be preferentially placed in drainage channels and towards the south side of the waste rock dump. The waste dump design is based on waste rock placed in 10 m to 20 m high lifts with intra-slope benches built to an average overall slope of 2.75H:1V. A low permeability soil cover will be placed over the dump surfaces progressively as the dump is raised to minimize infiltration of water.

After closure, the open pit will collect runoff and seepage from the waste rock dump. A provision for a water treatment plant is included to treat contaminated seepage water from the waste rock dump and from the remaining exposed pit wall rock above the pit lake level. The disturbed areas of temporary stockpiles will be covered with soil and reclaimed.

18.6.2 TAILINGS

To accommodate 224 Mt of tailings, the TSF is located approximately 3.2 km northeast of the open pit, approximately 190 m higher in elevation than the plant site. Tailings will be pumped to the TSF via a tailings pipeline. Cyclowash cyclones, located on the dam crest, will be used to cyclone sand for construction of the dams between March and October of each year.

The facility has been designed to store 224 Mt of mine tailings, or approximately 150 Mm^3 of tailings.

The facility will be operated as a “zero” discharge system and seepage collection dams will be constructed downstream of the dams to collect and return any seepage water to the TSF. Seepage losses from the impoundment are predicted to be relatively low due to the low permeability glacial till, which blankets most of the impoundment area, and the use of a low permeability core zone in the dams.

On closure, the dam slopes will be revegetated and the TSF will become a natural water pond. All potentially acid generating tailings, if present, will be permanently saturated with a water cover. A closure spillway, excavated in bedrock in the left (east) abutment of the Main Dam, will be constructed for long term management of flood waters.

18.7 GEOTECHNICAL DESIGN

18.7.1 PLANT SITE FOUNDATIONS

The process plant will be built on a knoll north of the mine pit, on two approximately level platforms to suit the terrain. A balanced cut and fill site grading is proposed, resulting in cuts and fills of up to 15 m depths and heights. The drilling and test pitting program conducted for this study indicates that the site is underlain by very stiff to hard till over sandstone and porphyry bedrock.

Results of the geotechnical foundation design indicate that the undisturbed native till and bedrock are considered suitable as foundation soils to support the process plant structures on conventional spread footings. Major settlement sensitive machine foundations, such as the crushers, HPGR, and ball mills, should be founded on bedrock. Lightly loaded or settlement-tolerant structures may be founded on compacted structural fill. The excavated till is considered a suitable material to be reused as fill at the site; however, the excavated silty/clayey till material is moisture sensitive and care must be taken during construction to avoid the material from getting wet prior to placement and compaction.

18.7.2 Waste Dump and Low Grade Ore Stockpile

The waste rock dump and low grade ore stockpile will be constructed as a hillside dump located adjacent to the open pit and plant site area. The waste rock dump will cover an area of approximately 220 ha and reach a maximum height of approximately 150 m.

Zones of weak soils occur in localized boggy areas and in Booker Lake. In addition, a soft to firm clay layer occurs up to 6 m deep beneath the west side of the low grade ore stockpile. Soft, weak, and deleterious materials will be removed from the critical foundation areas beneath the slopes of the waste rock dump and low grade ore stockpile.

After removal of soft materials, the foundations of the waste rock dump and low grade ore stockpile and overburden and organic sediment storage areas will consist primarily of a medium dense glacial till overlying bedrock. The glacial till is a saturated fine soil that can generate pore pressures due to loading from construction of the piles. The geotechnical properties of the soil were determined from laboratory testing of an undisturbed sample, collected during geotechnical site investigations in 2008. The shear strength of the glacial till is relatively high, $\varphi = 37°$.

The main geotechnical consideration is the potential pore pressure generation during loading. A $\overline{B}$ (pore pressure response parameter) value of 0.4 was assumed for post-construction stability analysis of the ultimate waste rock dump and low grade ore stockpile based on laboratory testing and numeric modelling, and a $\overline{B}$ value of zero was assumed for long term closure.

Waste rock is a free draining material with relatively high shear strength. The phreatic surface was assumed to be 1.0 m above the base of the dump for the purpose of analysis. Based on a poorly graded, loose dump rock and/or gravel, we conservatively assumed a waste rock drained strength $\phi' = 38°$.

Factor of Safety (FOS) results from the stability analysis ranged from 1.6 to 2.0 during operations (static conditions) and from 1.7 to 2.1 after closure (seismic conditions). The FOS was well above the required FOS of 1.2 and 1.1, respectively. Seismic deformation analysis also indicates that waste rock dump displacement at the design earthquake event is less than 1.0 m.

18.7.3 TAILINGS STORAGE FACILITY

GENERAL

The Main Starter Dam will be constructed as a homogeneous fill dam using glacial till borrow material from the interior of the TSF and from stripping of the open pit. A sand and gravel blanket drain will be placed under the downstream toe of the dam to control seepage.

The Main Dam and the North Dam will be raised by the centerline method, with compacted cycloned sand placed in the downstream and upstream shells of the dam. A vertical 10 m wide low permeability core zone would be extended from the starter dam to the ultimate dam crest. The cyclone sand will act as a natural filter zone for the glacial till core to control the risk of piping. The downstream slopes of the dams will be 3H:1V.

Seepage and piping control will be with a 1 m thick sand and gravel blanket filter drain placed under the downstream shell of the dam. The starter dams for the North Dam and West Dam will be constructed later in the mine life and will consist of an approximately 5 m to 10 m high homogeneous fill dam, with a downstream blanket drain.

A seepage cut-off trench will be excavated to approximately 3.0 m deep along the upstream toe of the dam to ensure a positive connection between the dam core and the foundation.

The main zones in the dams are described as follows:

Glacial Till Dam Fill and Core Zone

Glacial till will be borrowed from areas within the impoundment and from stripping the open pit. The borrow areas will be stripped and topsoil stockpiled for use in reclamation. The glacial till is a well graded silt-sand-gravel mixture, which will be placed in 300 mm thick loose lifts and compacted with a minimum of 6 passes with a 10 tonne vibratory roller. The material has a low permeability and is anticipated to be an excellent construction material. The moisture content will be controlled in the field within a range suitable for meeting the compaction specification of 95% of the Modified Proctor Density. Scarifying between lifts may be required if smooth surfaces are observed on the surfaces. Coarser graded borrow material will be preferentially placed towards the downstream side of the dam.

Any borrow pits developed within the impoundment will leave a minimum of 2.0 m of glacial till over the underlying bedrock to minimize the potential for seepage into the bedrock.

Sand and Gravel Blanket Drain

Sand and gravel will be obtained from Borrow Area #2, located approximately 1.5 km northwest of the plant site. The sands and gravels typically contain 3% to 5% fines (<75 µm sieve size) and the material may need to be washed as part of the processing to produce a material with <3% fines. Additional testing will be carried out to confirm the requirements for wash processing. The sand and gravel borrow will be placed in 450 mm thick lifts and compacted with a minimum of 6 passes with a 10 tonne vibratory roller.

Cycloned Sand

Tailings will be delivered to hydrocyclones located along the crest of the dam that will produce cycloned sand for dam construction. The cyclone underflow will be discharged with a flexible pipe into construction cells located parallel to the dam centerline. Each cell will be infilled with approximately 0.5 m thickness of tailings, which will be spread and compacted with bulldozers. An insitu density of 95% of the Standard Proctor Density will be specified. Excess water will be decanted from the cell and directed towards the seepage recovery pond for reclaim to the impoundment.

Cycloned sand will also be used to support the upstream toe of the central glacial till core. Cyclone sand for the upstream zone would be discharged directly to the upstream slope and would not be compacted.

The gradation criterion of the cyclone sand is <17% fines (75 µm) to allow drainage and compaction of the sand. In addition, the quantities of sand required for the dams, and the available construction/cycloning months, require that approximately 24% of the total tailings be recovered for 8 months of dam construction.

DESIGN BASIS

The TSF is designed to store all tailings generated from the mill over the mine life. Additional tailings storage is also achieved by the use of tailings for the construction of cycloned sand dams. The tailings dams are designed to international standards, using International Congress of Large Dams (ICOLD) Guidelines (1990), Canadian Dam Association (CDA) Safety Guidelines (2007), and BC Ministry of Energy, Mines, and Petroleum Resources (BC MEMPR) and BC Dam Safety Regulations.

The TSF could be categorized as a “Very High” classification facility (according to the CDA, 2007). However, the selected criteria for flood and seismic design have been upgraded to meet the more conservative “Extreme” classification to reflect the potential for future land use in the area. Accordingly, the tailings dams are designed for the maximum credible earthquake (MCE) and the PMF.

The environmental design is based on protecting aquatic habitat in Morrison Lake and Nakinilerak Lake. The receiving surface water quality will meet BC aquatic life water quality guidelines (30-day-average values), which generally are more strict than drinking water guidelines.

LAYOUT AND OPERATING STRATEGY

The Starter Dam for the Main Dam will be a 50 m high homogeneous compacted earthfill dam designed to store 1 year of tailings. During operations, skid mounted cyclones will be located along the crest of the dams and the cyclone underflow would be used for dam fill. The cyclone overflow would be discharged into the impoundment, forming a beach and water reclaim pond. When the cyclones are not operating, total tailings would be spigotted from the east side of the impoundment. After Year 1, when the North Dam is required, a tailings line will be directed to the North Dam for cycloning. After Year 4, whole tailings will periodically be directed to the West Dam for deposition from the dam crest and building tailings beach.

Tailings will be deposited from the cyclone overflow from the dam crests and from the east side of the impoundment. The tailings beach slope will vary, with an estimated average slope of approximately 1%. Tailings deposition will occur from the dam crests as cyclone underflow during the construction season and otherwise from the east and west slopes as whole tailings.

Seepage recovery ponds and collection dams will be built downstream of both the Main Dam and the North Dam of the TSF. The dams will be constructed as homogenous glacial till fill dams. The dams will intercept seepage water, local runoff, and residual water from the cyclone sand construction of the dams. Water captured in the pond will be recycled to the tailings impoundment. The seepage pond intake will consist of a concrete intake “box” with a trash rack, leading to the pump house. The seepage ponds will store the 200 year, 7 day inflow from a rain/snowmelt event plus seasonal storage requirements. Larger flows will be discharged over the emergency spillway.

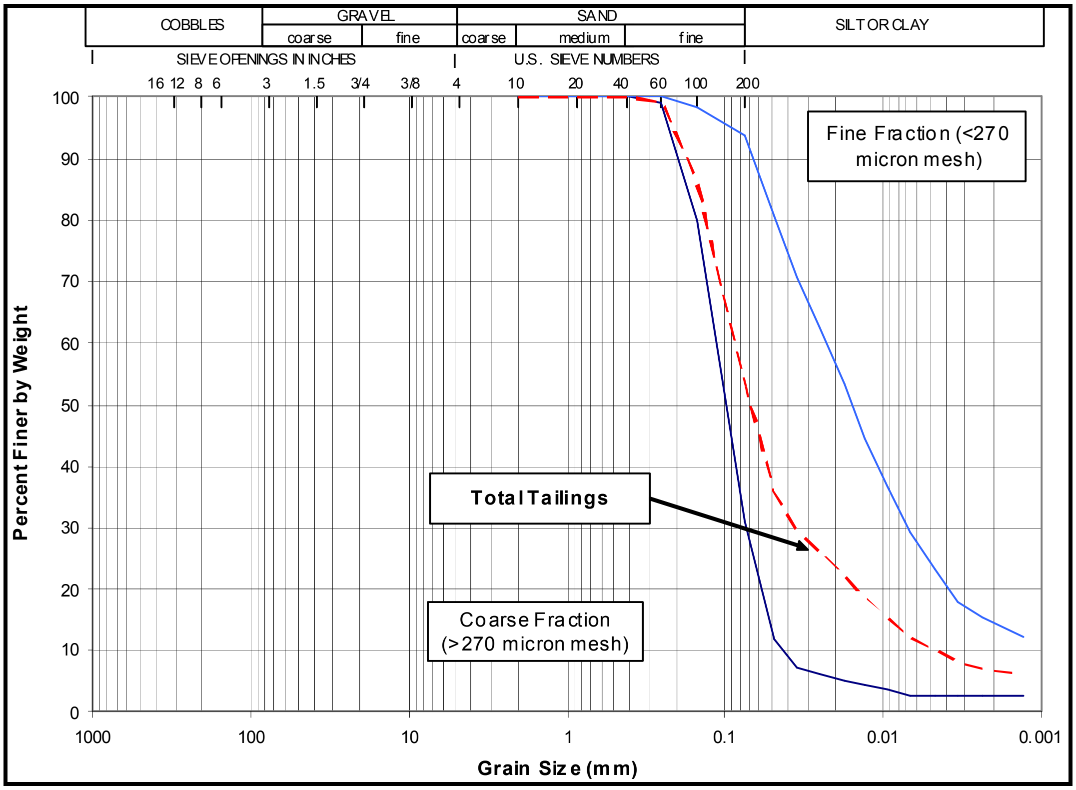
TAILINGS CONSOLIDATION ANALYSES

The Morrison tailings are of a relatively coarse grind in comparison with other copper tailings in BC. The total tailings have approximately 53% fines. Gradation analyses of the samples are shown on Figure 18.9. Geotechnical laboratory tests were carried out on the materials by KCBL to determine consolidation behaviour. These tests included:

- jar settling tests – 5 days starting at 33% solids by weight
- a consolidation test at low stress (<10 kPa)
- a consolidation test at high stress (at 700 kPa).

The results indicate that settled densities in the impoundment will be higher than normal copper tailings. Tailings densities were selected as 1.4 t/m^3 for the starter dam and 1.5 t/m^3 for the final dam. Actual values will be measured during operations and the impoundment versus volume curve will be adjusted accordingly.

Figure 18.9 Grain Size Distribution Curve of Morrison Tailings



Note: Whole tailings combined from 65% Coarse Fraction and 35% Fine Fraction (by weight).

TSF Seepage Analysis

The TSF is designed to minimize seepage, as far as practical, with low permeability zoned dams and a seepage cut-off key into the low permeability glacial till foundations and bedrock. Two-dimensional (2D) seepage analyses were carried out to model potential seepage flows through the dam and through the TSF impoundment area and foundations.

Groundwater in the tailings impoundment area flows predominately through fractured bedrock south-westerly towards “Main Dam” Creek and Morrison Lake. The majority of the fractured bedrock within the TSF is overlain by glacial tills of relatively low hydraulic conductivity. Before the dam and tailings were added to the models, the models were calibrated against baseline precipitation and base flow in the downstream creek.

Table 18.14 summarizes the results of the 2D seepage analyses for the Main Dam and extrapolated values for North and West Dams. The hydrogeologic conditions at the North and West Dam sites are similar to the Main Dam; however, potential seepage flows are estimated to be lower because of the lower dam heights.

Table 18.14 Summary of Predicted Seepage Flows from the TSF

Dam	Seepage Estimates (L/s)		
	Dam Structure Reporting to Seepage Pond	Dam Foundations	
		Base Case	Upper Bound
Main Dam	2.4	0.6	3
North Dam	1.5	0.4	2
West Dam	0.5	0.25	1

EMBANKMENT STABILITY ANALYSES

Stability analyses were carried out using GeoSlope International SLOPE/W (2004) for the Starter Dam and Ultimate Dam cases and used the following conditions:

- Both effective stress and total stress (using undrained strength in the foundation) analyses were carried out for the Main Starter Dam.
- Strength and pore pressure parameters used are summarized in Table 18.15.
- The pseudostatic seismic analysis used a 0.065 g effective horizontal acceleration.
- Upper bound displacements were assessed using relationships proposed by Hynes-Griffin and Franklin (1984).

The geotechnical properties used for design are summarized in Table 18.15.

Table 18.15 Summary of Geotechnical Design Properties

Soil Unit	Bulk Unit Weight (kN/m^3)	Static Drained Shear Strength	Pore Pressure Response $\overline{B}$	Static Undrained Shear Strength-Cohesion[1]
Cycloned Sand at Downstream	18	Φ'=35˚ C'=0 kPa	0	-
Cycloned Sand at Upstream	19	Φ'=29˚ C'=0 kPa	0	-
Tailings	19	Φ'=29˚ C'=0 kPa		-
Till Core	21	Φ'=32˚ C'=0 kPa	0	
Start Dam-Till	21	φ'=32˚ C'=0 kPa		
Glacial Till Foundation	21	φ'=37˚ C'=0 kPa	0.5 Starter Dam 0.3 Ultimate Dam	Su=200 kPa
Blanket Drainage Sand	18	φ'=35˚ C'=0 kPa	0	-
Bedrock		impenetrable	0	drainage layer

[1] For Starter Dam only.

The main factors controlling stability of the Ultimate Dams were the elevation of piezometric surface and the effective pore pressure response parameter $\overline{B}$ of the glacial till foundation. A conservative piezometric surface was used for the analyses and the actual surface is expected to be lower. The pore pressure response parameter $\overline{B}$ value also conservatively assumed a higher initial value, which then reduces during the life of the mine. The estimate was also based on the maximum till thickness of 30 m. Foundation areas with thinner till layers would consolidate faster.

The analyses indicate that the design dam slopes are stable with a FOS >1.3 at operation stage and a FOS >1.5 at closure stage under static load. Under seismic load, pseudostatic analyses indicated that the slopes were stable with a FOS >1.1; the upper bound of displacement at the design earthquake events was less than 1.0 m.

18.8 PROJECT EXECUTION PLAN

18.8.1 INTRODUCTION

The Project Execution Plan presents how PBM will successfully complete the Morrison Copper/Gold Project. The Project Execution Plan specifies the project approach, tasks, and schedule. As well, it identifies and addresses any unique challenges facing the project.

The project will be designed and constructed to industry and regulatory standards, with emphasis on addressing all environmental and safety issues. Adherence to the Project Execution Plan will ensure timely and cost effective completion while ensuring quality is maintained.

18.8.2 PROJECT APPROACH

To achieve successful project execution, PBM will assemble a Project Management Team (PMT). The PMT will be comprised of personnel with appropriate skills, knowledge, and experience and will act with the support of multi-discipline consultants and contractors. The PMT will, with the support of its consultants and contractors, ensure that checks, balances, progress monitoring, regulatory guidance, and quality assurance/control to provide the information to manage effectively, are implemented.

Project work will be carried out by a Primary Contractor (the Contractor) with, subject to PBM approval, appropriate sub-contracting support. Further to PBM's determination, the primary contractor's responsibility will be either:

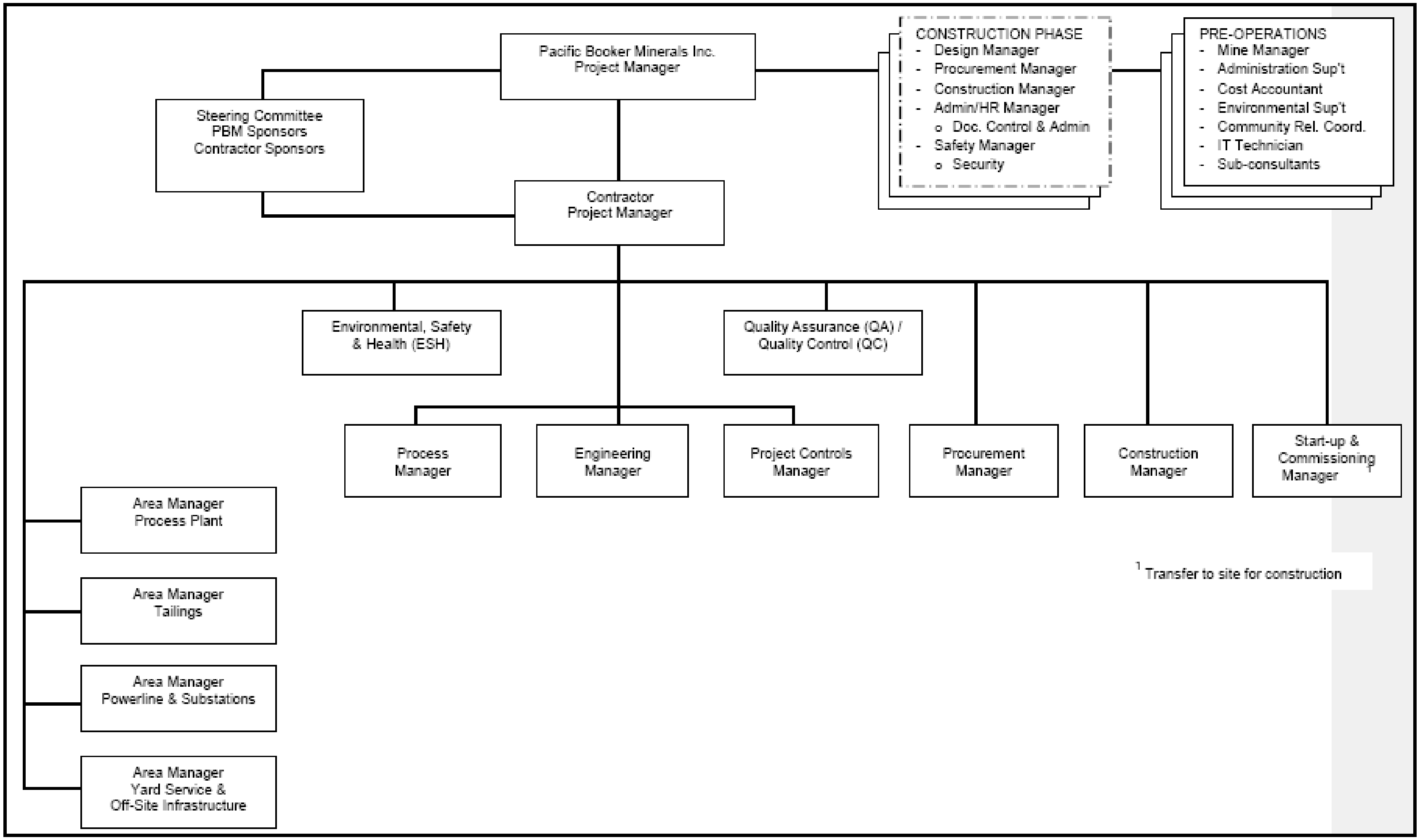
- Engineering, Procurement, and Construction Management (EPCM)
- Engineering, Procurement, and Construction (EPC).

Irrespective the nature of the contract, EPC or EPCM, the contractor will be required to implement the following:

- Project Management System
- Engineering Records System
- Procurement System
- Logistics Plan
- Health and Safety Plan
- Construction Managing and Contract Plan
- Quality Assurance/Quality Control System
- Environmental Management Plan
- Labour Relations Plan.

The Project Management organizational chart is shown in Figure 18.10.

Figure 18.10 Project Management Organization Chart



PROJECT MANAGEMENT SYSTEM

A proven and integrated Project Management System (PMS) will be utilized by the Contractor to facilitate monitoring and control of the Project. The PMS will provide precise and accurate information to the Contractor and PBM, enabling them to make decisions and implement actions for the successful execution of the Project. The PMS will also provide reporting of the status of the Project, ensure documentation of scope changes, track the budget and schedule; it will also compare actual performance with planned activities and report the effect of anticipated changes on the final date and cost.

PROJECT CONTROLS PERSONNEL

An integral part of the PMS is the project controls function. The personnel assigned to this function will plan and control the schedule and costs of the project by use of an integrated project control system, which will encompass the functions of scheduling, cost control, estimating, change control, monitoring and reporting for the engineering, procurement, construction, and pre-operational testing of the project.

Project Controls personnel will utilize PMS to perform the following functions:

- Planning and Scheduling
- Cost Control
- Cost Engineering/Estimating.

Planning and Scheduling

The project schedule will set out the project's planning and controlling schedules. At the commencement of the Project, the following planning and control activities will be undertaken:

- The Project Master Schedule will be developed as the principal control document.
- The Front End Schedule is essentially a schedule produced early in the project to monitor and accumulate detailed activity status and progress.
- The Detailed Project Schedule will be developed as scope definition and work packages are finalized.
- The Control Level Schedules represent the day-to-day tasks which summarize activities and/or deliverables.

Engineering Cost Monitoring and Control

Budgeted, committed, and actual costs of hours for engineering and procurement activities will be monitored within the project cost control system together with other engineering costs and expenses. Monthly reports will be produced from the detailed schedule, man-hour monitoring and forecasting system, and the project cost control system showing the status of the engineering and procurement phase progress and costs.

Cost Control will include cost monitoring, trending, and forecasting in order to measure performance in relation to project budget and schedule.

The Project Control Budget will be formed on the basis of the approved Feasibility Study estimate. Cost Control personnel will maintain cost trending and forecasting accountability by keeping the originally approved Feasibility Study capital cost estimate and maintaining an audit track of specific decisions managed through scope changes. The Control Budget will include items such as:

- original contract price
- approved changes
- current contract price
- billings this period and to date
- changes submitted but not approved
- forecasted final contract price.

Cost Estimating

Cost Engineering/Estimating includes developing capital cost estimates for the overall project, estimating in support of value engineering, scope change estimates, and fair bid estimates for construction contracts.

TRENDING/CHANGE REQUESTS

Trends and Change Requests may originate from any member of the project team and/or PBM.

Typically initial sources are identified from:

- design instructions
- minutes of meetings
- performance analysis
- procurement changes due to vendor data, market prices and supply demand

- construction changes due to soils reports, weather, labour, equipment, material and field instructions
- environmental changes due to social, economic, and political forces.

An order of magnitude estimate is prepared and schedule impact is assessed. The trend is then reviewed, and if required, corrective action is initiated. If the corrective action is successful and the trend does not affect cost and schedule, the trend log is updated accordingly. If the corrective action is not successful, a trend report is prepared and other affected task force members are notified. The cost impact is incorporated in the project cost forecast and schedules are updated accordingly.

Trend meetings will occur on a regular basis to review changes and strategy for corrective action. All trends will be expeditiously priced. Routine changes will be estimated within two to five days depending on the complexity and the availability of information. Depending on the magnitude or nature of the impact, a Change Request may be required.

18.8.3 PROJECT EXECUTION SUMMARY

A well-managed plan will be initiated from the date that project execution begins. An effective project management system will be implemented to assist in managing project costs and scheduling. The team will ensure that:

- the critical path schedule of construction is met or improved upon
- engineering and procurement activities are completed to support construction requirements
- costs are monitored, controlled, and reported to PBM on a regular basis.

The Project will be executed over a 30-month duration. Within six months from the project go-ahead, the following will be completed:

- award of contract
- project control structure including budget, schedule, procedures, and work plans
- bidders lists
- completed flowsheets and material balances
- Project Procedures Manual (PPM)
- process design frozen
- final site layout
- all design criteria including, but not limited to, environmental, applicable codes, materials of construction, and control philosophy
- process equipment list with Request for Proposal (RFP) packages

- the assignment of package contract numbers
- modularizing, pre-assembly, and purchasing strategies
- finalized contracting strategy
- approved training program
- contracts for early construction activities tendered, received and evaluated
- Health and Safety Management Plan (HSMP)
- QA/QC Plan
- Environmental Management Plan (EMP)
- Construction Plan
- all project management systems in place
- all geotechnical and site survey data completed.

18.8.4 PRE-PRODUCTION SCHEDULE

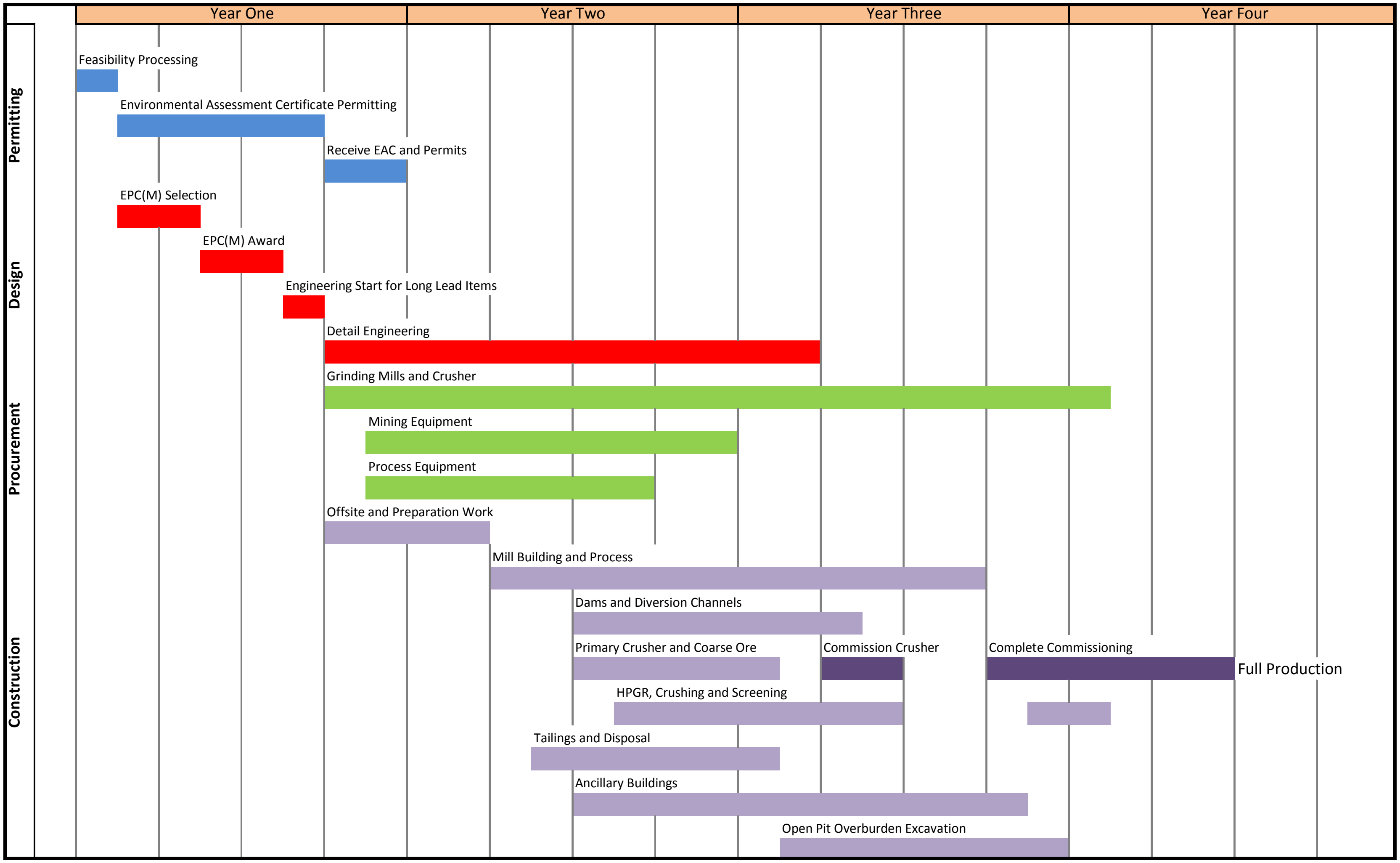
SCHEDULE DEVELOPMENT

Basis

A preliminary schedule for the project has been developed using Microsoft Project scheduling software, showing the project development phase and is summarized in Figure 18.11. The schedule was developed based on:

- the number of man-hours required to execute each activity as outlined in the capital cost estimate
- the logistics plan and schedule and operation of the forestry access road and barge
- discussions with suppliers, fabricators, and vendors to determine lead times for manufacturing and delivery of equipment and materials.

Figure 18.11 Preliminary Pre-production Schedule



CONSTRUCTION SCHEDULE

The first construction schedule issue will be to identify activities that clearly outline the project logic. This logic is constrained by a number of factors:

- PBM's direction on start-up date
- government approval of the project
- environmental permits
- winter and weather conditions
- sufficient laydown areas to receive materials
- sufficiency of fuel(s) supply on-site
- off-site camp availability and related amenities
- BC Hydro's extension of a powerline to site for temporary power
- buildings closed in before winter
- capacity for transport of personnel
- availability of consumables, such as explosives, cement, and rebar.

The construction schedule will expand with sub-schedules addressing specific activities and contracts. The construction schedule will typically control all activities. For example, activities in years two and three are essential to the project's timing and limiting commitments; therefore, a sub-schedule will outline the "ramping up" activities in detail. Scheduling will be linked as required to the construction contract packages, which will in turn be required to produce schedules, depending on the nature of the individual contracts. These in turn will be monitored by the EPCM controls staff.

CONSTRUCTION PACKAGES

For this scope of work it is anticipated the primary Contractor will split the activities into the packages outlined in Table 18.16.

Table 18.16 Construction Packages

Contract Name	Scope
Construction	
Civil Contract	Diversion ditches and dams
	Buildings foundation drilling and excavation
	Laydown areas at mine site
	Site roads and pipe benches
General Contractor	Foundations and building erection
	Mechanical installation
	Electrical installation
	Piping and instrumentation installation
	Supervision of all other construction sub-contractors
Power Transmission Contractor	25kV power lines to site for construction (Upgrade transformer for 138kV operations by BC Hydro)
Mining Contractor	Excavation of open pit
	Maintenance of mining equipment
	Excavate overburden
Services	
Site Services Contractor	Site road maintenance
	Repairs to trucks and equipment
	Site sewage treatment and water supply
	Warehousing and supplies
	Janitorial and first aid
Barge Operator	Access across Babine Lake
Trucking Contractor	Logistics and shipping of construction equipment to site
Fuels and Lubricants	Supply of fuel and lubricants for the construction period.
Canfor Contract	For use of shared forest road

18.8.5 ENGINEERING

The detailed design engineering program will include all disciplines from geotechnical to computerized controls. Each discipline will utilize both recent technological advances and proven techniques as are appropriate for this project.

Once PBM has authorized the project to proceed, the Contractor will establish the engineering organization and assemble the necessary resources required to meet project demands.

The first step of establishing project standards and procedures melding with those required by PBM and the relevant regulatory bodies has been completed during the Feasibility level design resulting in a set of Design Basis Memoranda. The design basis is based on local requirements, industry guidelines, and North American standards. The design basis addresses all aspects to be considered during the detailed design (e.g. Health & Safety, structural, architectural, environmental, etc.)

and specific requirements raised by PBM. Additionally, and in compliance with the Design Basis Memorandum, the Feasibility level design provided Process Design Criteria, Process Flow Diagrams, Piping and Instrumentation Diagrams (P&ID), and general arrangements. During the detailed design, the internal, public, and environmental review process may highlight the need for revision of these documents. Such changes will be noted and any alterations or improvements precipitated by this process will be incorporated in the facility design on a continuous basis.

In addition to detailed design drawings, detailed engineering will provide:

- work scope definitions
- installation specifications
- modularization detail where appropriate
- shipping requirements for larger or more delicate items
- heavy lift instructions.

These will be coordinated with the work packages, construction schedule, and logistics schedule. The Construction Manager will undertake constructability reviews throughout the development of detailed designs.

The list of project activities with a budgeted time for each activity and a corresponding list of deliverables (drawings, specifications, data sheets, requisitions, MTOs, BOMs) will be placed into the Engineering Management System for project control purposes.

Additionally, engineers and technical staff will be assigned to the construction program for drawing interpretation, and updating drawings to an "as built" status. The final engineering step will be the cataloguing and entering of all design and procurement information into the PBM central library including computerized drawing and administration files at the site and head office in Vancouver.

18.8.6 Procurement Plan

Procurement

Procurement of goods and services will adhere to the highest ethical standards and will be performed in a transparent manner. The Procurement group will develop and implement procurement policies that:

- comply with Project technical requirements
- comply with the Health, Safety, and Environmental (HSE) policy
- comply with legal and regulatory

- deliver goods and services to satisfy project schedule requirements
- where quality, price, and availability are competitive on a global basis, sourced within Canada.

The Procurement group will prepare procurement procedures and a procurement plan for the execution of the project, including procedures for purchasing, inspection, progress monitoring, material control, expediting, batch crating and packaging, transshipping, consolidating, and transportation.

CONTRACTS

Contract Form

PBM will use a widely recognized standard Form of Contract for all tendering including the primary EPC or EPCM Contract. Use of such a contract form ensures key aspects of the contract (i.e. arbitration) are not overlooked. As well, Contractors tendering should already be familiar with the Form of Contract so will not require excessive time understanding and assessing the implication of any nuances in a project specific unique contract form.

In support of the standard Form of Contract, project specific Terms of Reference, Scope of Work, and Deliverables will be prepared. These Contract Sections as well as source data will be assembled to comprise a Tender Package.

It is anticipated that the Contract Deliverables will include items of each of the following types:

- Lump Sum – fixed amounts for specified works
- Re-measureable – unit prices with re-measureable quantities
- Provisional Sum – fixed amounts for specified works that may or may not be executed.

CONTRACT PACKAGING PLAN

Construction Management (CM) begins with an overall basic EPCM project philosophy. All planning from conceiving project environmental strategy through to the stages of project approval and financing to final design and procurement phases are involved in developing the actual construction program into logical consulting, technical, service, equipment supply and construction contract packages.

18.8.7 LOGISTICS PLAN

INTRODUCTION

In developing the Logistics Plan, it is important to note that the project site lies within an area that is remote and accessible by barge across Babine Lake.

The Logistics Plan addresses the need to procure and deliver materials, equipment, and supplies to meet the restricted transportation delivery windows to the site. The team work and implementation of the logistics plan is critical and must be agreed upon by all concerned.

The scope of the logistics plan provides for and encompasses the services necessary for the efficient transport, traffic, warehousing, and marshalling of personnel and all materials and equipment, fuel, and cement required to construct the facilities. The objective of the traffic and logistics plan is to ensure that equipment, materials, and personnel are transported to the project site in a safe, efficient, economical, and timely manner to meet construction schedules. It is imperative that materials and equipment transported during the shipping window arrive at the site without loss or damages and according to the planned window sequences to enable all work to be completed on schedule.

The project will require one main marshalling point; this will be in Granisle, BC. This facility will be used to marshal the majority of the goods for onward shipment to the project site via the Babine Lake barge and forestry access road to the Morrison Lake mine site.

Load plans will be established based on the priority cargo to be shipped and the configuration of the nominated vessel prior to vessel loading. Load plans are generated by the super cargo (load master) and approved by the marine surveyor and vessel captain prior to commencement of loading. When the vessel(s) are completed loading, the cargo is blocked and lashed to protect that cargo from shifting.

Goods arriving from overseas and via ocean shipping are expected to arrive in the port of Vancouver, BC. Freight forwarding will be pre-arranged to have cargo trucked or shipped via rail up to Granisle.

To execute procurement and materials control across the various parties and work break down areas, certain policies, procedures, forms, and coding structures will be standardized (e.g. vendor communication policy, material requisition forms, material takeoffs (MTO), material status reports, document numbering systems, material reference codes, etc.).

PROCUREMENT SCHEDULES

The procurement activities of preparing and issuing the RFP bid tabulation and the purchase order deliverable items list will be tracked. Milestones will be developed where the typical activities include:

- Expediting:
  - Expediting ensures a continuous flow of equipment and, materials to the marshalling yards, at the scheduled time and in the proper sequence to facilitate timely transport to site.
- Logistics:
  - The Logistics System function will track material and equipment deliveries to multiple project yards and job site lay down areas and maintain a control over multiple inventories at the various sites.
- Materials Control:
  - Materials control evolves from initial definition and packaging of materials by engineering, through purchasing, expediting, fabrication, delivery, receiving, and use. Site materials management involves multi-warehousing, receipts, issues, returns, inventory management, and inter-warehouse transactions.
  - The system provides status reported on purchasing and expediting along with materials controls database to track equipment and materials from the design stage to final delivery and installation.
- Traffic and Logistics Coordination:
  - The Traffic and Logistics (T&L) will consist of support staff, computer systems, communications equipment, leased marshalling yard, and warehousing facilities. Logistics will be the advanced planning for the movement of material from its point of origin to the location where it is required.

18.8.8 CONSTRUCTION PLAN

CONSTRUCTION MANAGEMENT

The CM group will be responsible for the management of all field operations. Reporting to the Owner, the Construction Manager will plan, organize, and manage construction quality, safety, budget, and schedule objectives.

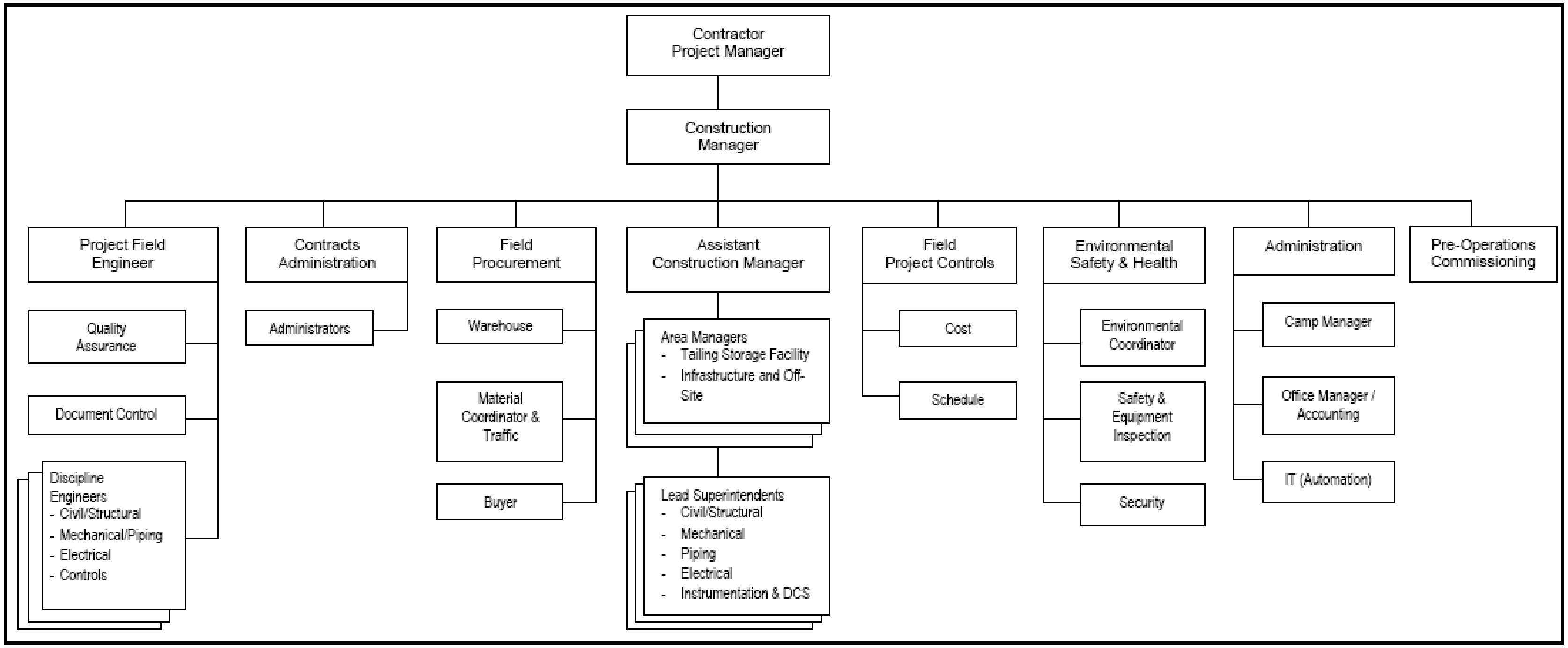
Construction of the project will be performed by contractors under the direction of the CM team, reporting to the Owner's representative. The CM key objectives are to:

- Conduct Environmental, Health, and Safety policy training and enforcement for all site and contractor staff. Site hazard management tools and programs will be employed to achieve the no harm/zero accident objective.

- Apply contracting and construction infrastructure strategies to support the Project execution requirements.
- Develop and implement a construction-sensitive and cost-effective master project schedule.
- Establish a project cost control system to ensure effective cost reporting, monitoring, and forecasting as well as schedule reporting and control. A cost trending programme will be instigated whereby the contractor will be responsible for evaluating costs on an ongoing basis for comparison to budget and forecasting for the cost report on monthly basis.
- Establish a field contract administration system to effectively manage, control, and coordinate the work performed by the contractors.
- Apply an effective field constructability program, as a continuation of the constructability reviews performed in the design office.
- To develop a detailed field logistics and material control plan to maintain the necessary flow and control of material and equipment to support construction operations.
- Meet the schedule for handover of the constructed plan to the commissioning team.

The CM Organization Chart (Figure 18.12) shows the CM team organization plan for the site.

Figure 18.12 CM Organization Chart



TEMPORARY CONSTRUCTION FACILITIES

The temporary construction facilities include:

- Construction Power:
  - The construction power system will be supplied from a new line installed by BC Hydro. Initially the existing 25 kV line to Bell Mine will be extended 24.5 km to the Morrison site. The feed will tie-in to the existing grid and will provide 2 MW of power for the construction phase. The line will later be upgraded to 138 kV and provide 30 MW of power for the operations phase. This will be accomplished by a BC Hydro transformer upgrade at the Babine Substation.
  - The initial construction set up of site infrastructure will rely on portable generators until the site distribution for temporary construction power is completed. The anticipated tie-in and completion date of the site construction power is in year one.
- Construction Fuel:
  - Fuel will be required for portable generators, portable light towers, portable heaters, mobile equipment used for construction, mobile equipment used for mining, and building heating.

CONSTRUCTION ACCOMMODATIONS

There will be no accommodations on-site. Construction personnel will be housed off-site of the mine.

WAREHOUSING

Construction warehousing will evolve with the Project. All freight delivered will be received at a temporary warehouse and stored there or in designated laydown areas.

Initially, fabric or fold-out type structures will be erected to serve as the light and heavy vehicle maintenance shops and general shop/warehouse area for the relevant contractors.

LAYDOWN AREAS

Rapid development of the laydown areas at the site is absolutely essential to tie-in with the arriving loads.

All laydown areas will be clearly marked with sign posts and will be laid out in a grid system to eliminate confusion due to snow cover.

CONCRETE BATCH PLANT

The concrete batch plant will be managed by the General Contractor as a service to the project and will be operated by the general or site services contractor.

WATER SUPPLY AND TREATMENT PLANT

The construction project will require fresh water for the following:

- potable drinking water
- truck washing
- concrete batching
- road dust control
- fire water
- building cleaning
- washroom and cleaning purposes.

SEWAGE TREATMENT

A portable temporary Sewage Treatment Plant (STP) will be among the first items shipped to the Morrison project. It will be a modular system that is very easy and quick to set up.

COMMUNICATIONS

The initial mobilization period will utilize the existing area communications system following which a permanent tower and systems will be installed for the following services:

- connections to the surrounding world
- radios relay connections between the plant site, explosives site, offices, and tailings area
- satellite internet for data and VOIP
- satellite telephone
- cellular telephone.

GENERAL SERVICES

A Site Services Contractor will be used for the general services to the site. These duties will include:

- site road maintenance
- repairs to trucks and equipment
- site sewage treatment and plant operations
- water supply and delivery
- water treatment plant operation and maintenance
- warehousing and supplies receiving and delivery
- janitorial services to buildings
- maintenance to buildings and equipment after construction
- generator maintenance
- first aid services for all workers
- fire protection services
- mine rescue coordination.

QUARRY/CRUSHING

Process and infrastructure development at the plant site can utilize the materials from rock excavation on site at the main pit and from gravel identified as borrow pits.

The batching plant at the plant site will be set up to produce concrete aggregates. The gravel will be driven through a crusher and screener to achieve suitable aggregate sizes.

18.8.9 PERSONNEL PLAN

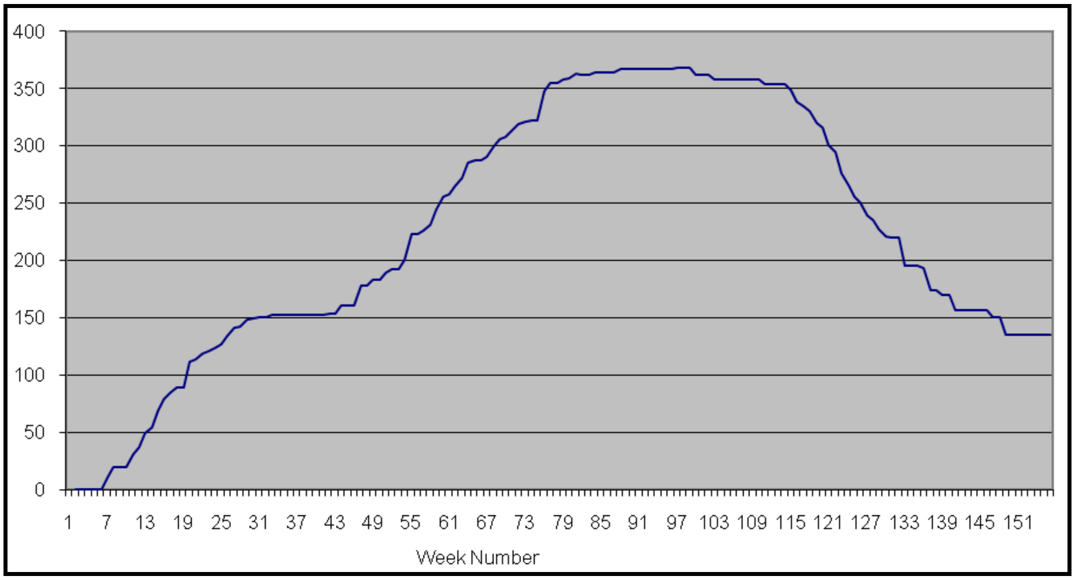
CONSTRUCTION MANPOWER

Introduction

It is foreseen that the majority of both skilled and non-skilled resources will come from the local areas. Additional personnel including some specialized personnel will fly in from other areas in BC.

The construction manpower histogram including pre-mining is shown in Figure 18.13.

Figure 18.13 Construction Manpower Histogram



LABOUR RELATIONS

A sound labour relations plan will be in place to ensure that quality work, at good productivity rates with a content workforce, is achieved while maximizing local labour and business content and at the same time providing useful training to the local population.

LABOUR STRATEGIES

The following labour strategies will be implemented to minimize labour disputes:

- Training Programs – Pre-construction:
  - To assist construction contractors in securing qualified and trained local workers on the project, it is recommended to enter into early discussions with the local communities to encourage and support them in their work with training programs for the local work force.
- Training Programs during Construction:
  - During the construction phase, the possibility for on-the-job training will be evaluated as the project develops. This will also include the possibilities of having more formal training like apprenticeship programs on site. Apprenticeship programs are best planned together with the provincial educational institutions.
- Orientation Training:
  - During the construction phase, orientation programs will be required for all first time employees.

- Operations Build-up:
  - The turnover will be coordinated with PBM to ensure proper staffing levels are available from the operations workforce to assume responsibility for the facilities.

18.8.10 Health, Safety, and Environmental Management

To ensure safety of the workforce and environmental protection, Health, Safety, and Environmental Plans will be implemented on the project. Continuous monitoring and improvement of these plans is essential along with a strong commitment from PBM, the team, and construction contractor's senior management. These plans include:

- emergency response plan
- hazardous materials management plan
- waste management plan
- quarry management plan
- explosives management plan
- blasting management plan
- construction area and activity environmental management plan
- construction health, safety and security program
- water management plan.

18.8.11 QA/QC Plan

QA/QC will necessarily require PBM and the EPCM Contractor to set broad guidelines in terms of plant operability, safety of operation, and adherence to all regulatory requirements including environmental, safety, health, and welfare of employees during all project phases. A strong company policy will apply to all project participants from suppliers to design engineers, contractors, and individual company employees. Each contract, purchase order, agreement, public statement, public or site meeting, and official project announcement will reiterate this policy.

The Project Quality Plan will provide a list of engineering, procurement, and construction activities that will be audited to ensure that the objectives of the QA/QC program are achieved. The objectives are:

- products and services conform to specified requirements
- contractual and regulatory requirements are met
- all facilities designed and equipment procured are safe, reliable, operable, and maintainable

- errors and deficiencies are minimized, thereby creating efficiencies and cost effectiveness.

Audits will be performed on each project discipline to provide information to project management on the degree of adherence and conformance to project objectives.

18.8.12 Pre-operational Testing and Start-up

Process Plant

When construction is complete on any process unit, the construction organization will turn over responsibility to the Commissioning Manager for pre-operational testing and turnover of the facility to PBM prior to introducing ore into the plant for commissioning and start-up.

PBM’s operating personnel will be involved in the pre-operational testing phase to the extent that they will progressively accept responsibility for sections of the plant as they are checked and handed over.

Pre-operations testing of equipment will begin once the equipment items have been delivered to site, erected, and tested by the vendor's engineers.

The pre-operational testing phase for the process facilities will include all aspects of dry mechanical and electrical testing of equipment and water testing of process equipment, including pressure testing of pipework and wet pre-operational testing as far as practicable.

The following procedure and tagging system will be adopted in the execution of assignments as work is being completed.

Visual Inspection

Visual inspection is the non-operational examination of an installation to check that it is in accordance with the engineer’s and the manufacturer’s drawings, specifications, and manuals.

Pre-operational Test

A pre-operational test is the initial no-load test of a piece of equipment with test media such as water or air where required.

Visual inspection and pre-operational testing (Yellow Tag) will occur upon completion of installation of plant and equipment where the Construction Contractor will submit one copy of the appropriate pre-operational check forms, which will notify that the plant and equipment are ready for inspection and the following have been put into effect and/or completed.

Checkout and Acceptance (Green Tag)

This procedure allows for the transfer of responsibility from the Contractor to PBM. This procedure establishes that the installation of the equipment and ancillaries has been completed in accordance with the Contractors' drawings, specifications, and codes and the equipment has been energized to prove its readiness for the process commissioning and start-up. On acceptance, PBM assumes responsibility for operation and maintenance.

START-UP

Start-up (introduction of ore) is performed under the direction of the PBM Start-up Manager, and involves a select staff from pre-operations, process specialists, and PBM's operating personnel. This will be the beginning of operations under load conditions and the systematic increase in capacity until process through-put and recovery requirements are met and sustained.

18.9 PROJECT PHASES

18.9.1 PRE-PRODUCTION

Project implementation will occur during a 24 month pre-production phase, during which the on-site components and off-site infrastructure are constructed. An additional pre-production activity is stripping of the open pit overburden.

18.9.2 PRODUCTION

Production will commence when the mine components are operational and other pre-production activities are complete. Production activities include mining, milling, waste disposal, and on-going construction of the TSF.

18.10 HUMAN RESOURCES

During the pre-production period most activities will be completed by contractors. Approximately 450 contract personnel will be required during peak construction periods. In addition, PBM will begin hiring and training its own workforce so that, at handover, PBM will be prepared to begin production effectively and efficiently.

At full production, the total number of PBM employees at Morrison mine site is estimated to be 251, of which 141 are to be employed in the open pit operations, 82 in mineral processing with 28 staff employed as management, professional, office, and clerical personnel. In addition, PBM anticipates another 50 people will be employed through contract services such as concentrate haulage, road maintenance, barge operation, bus transportation, and supply of consumables including fuel, lubricants, explosives, and tires. The majority of the workforce will work a 12-h shift based upon a four-on/four-off schedule while staff will work a 5-day week, 8 h/d.

Hiring practices will be established to promote the hiring of First Nations and local personnel.

18.11 ENVIRONMENTAL

18.11.1 ENVIRONMENTAL BASELINE STUDY

OVERVIEW

Comprehensive environmental and socio-economic baseline studies have been undertaken as required by the Environmental Assessment Project Terms of Reference. Studies were undertaken in accordance with provincial inventory standards of data acquisition, quality assurance, and reporting. One or more years of data are required for some study topics to provide the basis for modelling seasonal effects. Several studies were initiated prior to 2005 and all planned studies are now completed. Further input to the scope of studies will be considered during public consultation to confirm valued ecosystem components (VECs) against which the project impacts will be assessed. Lake Babine Nation (LBN) members were involved in conducting many of the field studies. Baseline environmental and socioeconomic study areas assessed the mine development areas, power transmission line corridors, along with adjacent lands tailored to the needs of the study topic (e.g. watershed, affected communities). Environmental baseline studies included:

- Atmospheric and Climate Studies
- Air Quality
- Noise
- Hydrology
- Hydrogeology
- Aquatic Biology
- Surface and Groundwater Quality
- Terrain Hazard Assessment
- Socio-economics
- Land and Resource Use
- Wetlands
- Visual and Aesthetic Resources
- Soils and Overburden
- Ecosystems and Vegetation
- Metal Leaching/Acid Rock Drainage
- Reclamation
- Fisheries
- Wildlife
- Archaeology and Heritage
- Traditional Use/Knowledge
- Navigable Waters
- Country Foods
- Access and Infrastructure

Following is a brief discussion of the work performed for select baseline studies.

BASELINE STUDIES

Meteorology and Air Quality

A meteorological station was established at the mine site in May 2006 to continuously collect climate data such as temperature, humidity, wind direction, and speed. Dust-fall collection stations were also established for background air quality.

Hydrology

Hydrological surveys were undertaken to establish surface water flow and water quality. Hydrometric station locations were identified in 2006 and monitored through 2008 to gain stream flow measurements and freshet monitoring and analysis. Hydrological and meteorological studies contribute to water balance analysis and environmental permit applications.

Hydrogeology

The regional and mine site groundwater conditions were established through a network of strategically located groundwater monitoring wells. Groundwater monitoring wells were installed in 2006, 2007, and 2008 to conform to the developing mine plan. Groundwater levels were measured and hydraulic tests on the bedrock performed. Groundwater samples from the monitoring wells were analyzed for water quality. Groundwater monitoring wells were established in proximity to the proposed tailings impoundment facilities to assess local conditions for geotechnical engineering design and seepage flow analysis. Hydrogeological data is used for groundwater modelling, pit inflow analysis, and contaminant transport predictions.

Aquatic Resources

Aquatic resource baseline surveys included surface water quality, sediment chemistry, and determination of biological productivity of aquatic systems by assessing benthic invertertebrates, zooplankton, and phytoplankton. Watercourses draining mine features and reference sites were assessed. Surface water quality data was acquired during 2005-2008 and will continue in future monitoring programs.

Fish and Fish Habitat

An objective of fish and fish habitat surveys is to inform Federal Fisheries and Oceans Canada of any potential for federal trigger of Fisheries Act authorizations. Fish habitat, population, species surveys, and spawning assessments were undertaken on streams and waterbodies within the Project area. Reference sites were also documented. Seventeen fish species were identified in Morrison Lake along with an important salmon shore spawning location. Surveys were undertaken in the area of proposed tailings storage facilities and additional areas east of the mine site development area with potential to be within waste rock storage and infrastructure areas, including the power transmission corridor. The tailings impoundment area, Booker Lake, and Ore Pond were confirmed as non-fish bearing.

Wetlands

A wetland baseline survey was conducted in the mine development area and power transmission line alternative alignments. The studies identified the number and types of wetlands and the functions of these wetlands within the study area such that the effects of the Project can be later be evaluated.

Soils and Overburden

Soil information contributes to ecosystem and vegetation analysis, as well as planning for material salvage and handling for reclamation planning. Information is used to design reclamation programs which meet Canadian Council of Minister of Environment (CCME) guidelines. Soil mapping and soil chemistry surveys were conducted over the mine development area and peripheral areas to determine soil type distribution and chemistry.

Terrestrial Ecosystems and Vegetation

Studies were conducted to provide a description of ecosystems, vegetation, plant species, and terrain to provide meaningful ecological units for impact assessment. Species or features that are locally or regionally at-risk (tracked by BC Conservation Data Centre [CDC] or listed by COSEWIC) or sensitive to disturbance will be described in conformance to BC Resource Inventory Steering Committee (RISC) standards. Invasive plants surveys and plant metal content analysis were undertaken to provide a baseline for future reclamation and vegetation management plans.

Terrain Hazard Assessment

The objective of terrain hazard assessment in the mine development area is to identify and manage for risk of terrain instability, rock, and snowslide hazard zones. The mine development area and power transmission line alternatives were assessed. No serious hazards were identified.

Wildlife

Wildlife habitat suitability maps were developed from ecosystem mapping (predictive and terrain-based) and field surveys conducted for bird and amphibian species, critical use habitat (i.e. winter ungulate) and listed or at-risk species. There were 52 wildlife species identified and information will be used to develop management plans.

One amphibian species listed as of concern was detected and a specific management plan for mitigating impact was developed.

Archaeology

Archaeological studies in the mine development area were conducted under authority of a Heritage Conservation Act Permit following referral to the LBN. An Archaeological Overview Assessment was conducted to identify areas of high potential, and an Archaeological Impact Assessment involving field site testing was conducted on areas proposed for physical alteration by the mine proposal. A Chance Find Recovery Procedure will be established for chance finds during construction.

Metal Leaching/Acid Rock Drainage

Information on potentially net acid generating rock will be used to guide waste rock management systems and water quality modelling and treatment plans. Metal Leaching/Acid Rock Drainage (ML/ARD) studies have been undertaken in conformance with the BC Guidelines on Acid Rock Drainage Prediction and Management as required by the BC MEMPR. There were 512 acid base accounting (ABA) (static) and solid phase ICP-MS geochemical tests performed on ore and waste rock from 101 drill holes; over 30 ABA tests on overburden, primarily from the open pit surface; Reitveld XRD analysis, mineralogical analysis of tailings samples and aquatic toxicity tests of tailings supernatant, and leach pad and humidity cells kinetic tests running over 150 cycles as of writing were completed.

18.11.2 Socio-economic Considerations

Socio-economics

The objectives of socio-economic studies are to:

1. Develop a comprehensive and thorough socio-economic baseline study report.
2. Identify and assess potential effects of the human environment (including social, economic, cultural, and other community-related aspects) of the proposed mine.
3. Develop appropriate and effective mitigation and management strategies to address potential effects.

An initial step to inform and frame the socio-economic baseline study and assessment was undertaking an issues scoping exercise to inform the effects assessment.

STUDY COMMUNITIES

The Morrison Mine socio-economic effects study area will incorporate nearby communities and settlements in the Regional District as outlined in Table 18.17.

Table 18.17 Communities, Settlements, and Regional Districts

Name	Description
Smithers	City, major service centre for northwest BC
Granisle	Former mining town on Babine Lake
Houston	Village, supply centre
Burns Lake	City, supply centre
Topley Landing	Rural settlement
Topley	Rural settlement
Fort Babine (Wid'at)	LBN village
Tachet	LBN village
Woyenne	LBN village
Old Fort (Nedo'ats)	LBN village
Burns Lake (Woyenne)	LBN village

ECONOMIC ANALYSIS

An Input-Output analysis will be performed with information on the Project supplied by PBM utilizing a model conforming to provincial standards. The potential project effects on the following were assessed:

- population structure
- availability of housing and accommodation
- property and land values
- community infrastructure and services
- community quality of life and well-being
- government revenues
- employment
- business sectors
- job training requirements
- transportation and traffic
- environmental conditions with social consequences.

LAND AND RESOURCE USE

Land and resource use studies examine potential effects on existing land uses, tenures, asserted rights, and other interests. In addition to LBN, users and stakeholders may include guide outfitters, trappers, recreationists, commercial tourism operators, and other business interests (e.g. mineral, forestry). Land and resource use studies are linked with many other disciplines and may draw from socioeconomic, cultural heritage, wildlife, terrestrial, and archaeological studies. Traditional uses will be identified in conjunction with the LBN discussions and integrated with land and resource baseline studies and effects assessments.

TRADITIONAL ECOLOGICAL KNOWLEDGE

In BC, environmental assessment of major projects requires that Traditional Use information is brought into the environmental assessment process. In addition to establishing baseline conditions, the information can be particularly useful in providing a historical perspective, identifying ecological and cultural linkages, and where other information and land use planning may contain gaps. A traditional ecological knowledge (TEK) study was completed for the LBN with their elder participation.

18.11.3 CONSULTATION PROGRAM

Consultation is fundamental to major project environmental assessment review. The objective of a successful consultation program is to provide all interested parties with the opportunity to learn about the project, identify issues, and provide input with the goal of positively enhancing project planning and development.

Engagement and consultation with provincial and federal agencies, LBN, public and stakeholders, has occurred through all stages of the Morrison Project planning. This has included meetings and working sessions, public open houses, and information sessions. Consultations are supported by a variety of information materials and mechanisms to encourage feedback thereby providing all with the opportunity to be fully informed about the Project and to have convenient and accessible means to provide input. Consultation efforts are consistent with meeting the terms of a Section 11 Order under the British Columbia Environmental Assessment Act (BCEAA).

COMMUNITY ENGAGEMENT AND CONSULTATION REQUIREMENTS

The Morrison Project environmental assessment has developed a consultation program consistent with the guidelines derived from the Environmental Assessment Act, the Act's *Public Consultation Policy Regulation* (2002); *the Provincial Policy for Consultation with First Nations* (2002), and the *Supplementary Guide to Proponents: BC Environmental Assessment Process*. Consultations with LBN, communities and public, are being undertaken during the pre-application review phase and will occur also during the application review phase.

Consultation with LBN is required, and interests will be reflected in agreements to address and/or accommodate LBN issues, values, and concerns.

The *Public Consultation Policy Regulation* (2002) is used with respect to public consultation. This regulation sets out guidelines related to the proponent's consultation program, public notice, public comment periods, and if determined to be a reviewable project under the BCEAA, documents to be available through the BC EAO's Project Information Centre (e-PIC).

First Nations

The First Nation consultation program is designed to meet the requirements as set forth by the BC EAO, within the legal context of Section 35 of the Constitution Act (1982), and the BC Provincial Consultation Policy (2002). The consultation process will therefore adhere to legal and policy requirements as they relate to an environmental assessment.

The BC EAO will require consultations with the LBN Government to determine how the LBN wish to be consulted on the Project. PBM and LBN entered into a Capacity Funding agreement on November 6, 2008 which provides LBN with capacity funding to participate in the Environmental Assessment process, improve communications, share information, address specific concerns, and commit to work together to build a long lasting and mutually supportive relationship.

All consultations will be well advertised, well informed, tracked, reported on, and documented for government review agencies.

Consultation Activities

Consultation program deliverables will include as minimum:

- formal confirmation of federal, provincial and LBN governmental consultation requirements
- identification and confirmation of consultation groups
- coordination of three rounds of community consultation meetings
- development of project information materials for distribution
- tracking and monitoring of communication and consultation activities and commitments
- ongoing liaison with the proponent, government regulatory and review agencies, the LBN government, project consulting team, and consultation project manager
- non-aboriginal community leaders and organizations.

18.11.4 ENVIRONMENTAL MANAGEMENT PLANS

OVERVIEW

Development and operation of the mine and associated access roads may affect a range of aquatic and terrestrial habitat types and wildlife species. Mining operations, through plant emissions and the potential for fugitive dust from various operations, may also affect the quality of air at the mine site and surrounding locations.

PBM will develop preliminary mitigation strategies prior to submission of the Environmental Assessment Application. As a minimum, the following management plans will need to be included:

- fish and fish habitat management plan including, if required, habitat impact mitigation and compensation plans that satisfy Section 35(2) of the Fisheries Act
- access road management plan, including traffic management and safety on access road and construction site, and maintenance
- power transmission line management plan
- waste rock and tailings plan
- ML/ARD prediction and prevention management plan
- water management plan
- air emissions and fugitive dust management plan
- noise management plan
- materials handling and management plan
- soil management plan
- erosion control and sediment control plan
- vegetation management plan
- wildlife management plan
- spill contingency and emergency response plan
- domestic and industrial waste management plan
- archaeological and heritage site protection plan and Archaeological Chance Find Recovery Procedure
- construction plan, including provision for environmental supervision.

Detailed mitigation strategies that satisfy regulatory requirements will be developed during the basic engineering and permitting phases.

FISH HABITAT COMPENSATION PLAN

Pending the outcome of the fisheries baseline surveys and effects assessment, a determination will be made by federal Fisheries and Oceans Canada on whether, and the degree to which, fish habitat may be affected by the Project. If unavoidable impacts occur which deteriorate or destroy fish habitat, then a fish habitat compensation plan will need to be defined and implemented.

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

PBM will develop and implement an environmental effects monitoring program (EEMP) that will complement and inform the management plans. The results of the monitoring program will be used to measure the success of the management strategies and to identify where amendments are necessary. The terms and conditions of the final EEMP will be embodied in the permit conditions of the *Mines Act* Permit, Environmental Management Act Permits, and federal authorizations as necessary.

PBM will develop conceptual monitoring programs prior to submission of the Environmental Assessment Application, and these will be refined during the permitting process. As a minimum, the following monitoring programs will be included:

- *Metal Mining Effluent Regulations* environmental effects monitoring plan
- provincial environmental effects monitoring plan, designed to monitor the receiving environment in order to support compliance of the provincial permit requirements
- wildlife effects monitoring plan
- aquatic effects monitoring plan (including water quantity and quality)
- air quality monitoring plan
- access road use monitoring plan.

METAL MINING EFFLUENT REGULATIONS

The *Metal Mining Effluent Regulations* (MMER) require that the owner or operators of metal mines implement Environmental Effects Monitoring studies on the potential effects of effluent on the fish population, on fish tissue, and on the benthic invertebrate community. The requirements of the program are specified in Schedule 5 of the MMER and include effluent characterization and sub-lethal toxicity testing, water quality monitoring, and biological studies on fish and benthic invertebrate communities. PBM will develop a monitoring program and reporting schedule that complies with all aspects of the MMER, should fishery baseline studies assess the potential for this requirement, and the application of the MMER be confirmed by federal authorities.

18.11.5 RECLAMATION AND CLOSURE

The Project will be developed, operated, and closed with the objective of leaving the property in a condition that will mitigate potential environmental impacts and restore the land to a land use and capability as specified in the Mine Permit. Closure and reclamation activities will be carried out concurrent with mine operation wherever possible, and final closure and reclamation measures will be implemented at the time of mine closure.

RECLAMATION UNITS

For the purposes of reclamation planning, the Morrison Project has been broken down into the following key reclamation units:

- open pit
- waste rock dumps
- tailings management facility
- water treatment plant
- mine site facilities
- infrastructure including power transmission line right-of-way
- on site access and haul roads.

Under published guidance in support of the Application Requirements for a Permit Approving the Mine Plan and Reclamation Program Pursuant to the Mines Act R.S.B.C. 1996, C.293, the BC Ministry of Energy and Mines has established key information that is to be provided in the reclamation program component of the Environmental Assessment Application. These requirements are summarized as follows:

- proposed end land use objectives
- land capability or productivity and proposed post-mine capability or productivity objectives for all significant land uses; this information is required to create the property reclamation program and is used as a measure of reclamation success
- plans for characterizing the soils and overburden resource for reclamation purposes
- plans for salvaging, stockpiling, and replacing soils and other suitable growth media
- consideration of future erosion and mass wasting for long-term stability
- treatment of structures and equipment
- reclamation of water courses

- pit lake water quality
- tailings impoundment reclamation
- road reclamation
- pre- and post-mine trace element concentrations in soils and vegetation
- the general composition, size, shape, and location of all consolidated and unconsolidated geological units disturbed by the Project
- prediction of the geochemical performance of the various geological units in the form which they will be exposed, and a determination of the potential for deleterious effects
- determination of disposal and remediation methods, their effectiveness, and quantities by area requirements
- determination of monitoring requirements for extraction, waste handling, and disposal operations
- determination of the time to onset of ML/ARD in materials where there is a delay in the application of remedial measures
- programs for prevention, treatment, and control of acid rock drainage and metal leaching
- chemical disposal
- environmental monitoring
- preliminary characterization of surficial and bedrock materials for geotechnical assessments
- preliminary design of:
  - ore processing facilities
  - tailings management facility
  - waste rock dumps
  - pits
  - access roads
  - other significant transportation or utilities infrastructure.

RECLAMATION OBJECTIVES

Under the *BC Mines Act* and the *Health, Safety, and Reclamation Code for BC*, the primary objective of the reclamation plan will be to return, where practical, all areas disturbed by mining operations to acceptable land use and capability.

The following goals are implicit in achieving this primary objective:

- the long-term preservation of water quality downstream of de-commissioned operations at the compliance point

- the long-term stability of engineered structures, including the waste rock dumps, open pit, and tailings impoundment
- the removal and proper disposal of all access roads, structures, and equipment that will not be required after the end of the mine life
- the long-term stabilization of all exposed erodible materials
- the natural integration of disturbed areas into the surrounding landscape, and the restoration of a natural appearance to the disturbed areas after mining ceases, to the best practical extent
- the establishment of a self-sustaining cover of vegetation that is consistent with existing forestry and wildlife needs.

OPEN PIT

At the end of mine life the open pit will be allowed to fill with water. The final hydrological and hydrogeological modelling will determine the years to lake level equilibrium. More detailed hydrological and hydrogeological modelling will be completed to refine the flooding model for the pit.

The potential for generation of ML/ARD conditions along the exposed pit walls at closure will be examined and a monitoring plan implemented. The potential for groundwater interaction of the flooded open pit and Morrison Lake will be modelled initially, and monitored during mine operations and post-closure.

At the end of mining, all machinery and materials such as mining equipment, piping, pumps, and electrical cables will be removed for resale or disposal at an approved facility. Any suitably inert materials could be left in the pit for disposal. As well, inert non-salvageable building materials from the demolition of the site facilities could be placed in the pit for disposal. The materials would then be compacted and buried under a layer of non-PAG waste rock.

WATER TREATMENT

Existing site data suggests that the quality of open pit water will likely be impacted to some extent. The extent of this impact and whether it would affect the water quality in the surrounding receiving environment (e.g. Morrison Lake) will be assessed once all ML/ARD kinetic data are interpreted and once hydrogeological and water quality modelling are complete. If studies indicate that the creation of a pit lake would prevent the project from meeting water quality objectives at the compliance point, then water treatment measures may be required.

Currently it is not known if water treatment will be required at the Morrison site. This issue will be examined more closely at the detailed design phase.

MINE SITE FACILITIES

Buildings and structures that compose the mine site facilities (mill, camp, power station, administration, maintenance shop, laboratory, site roads, fuel storage, and explosives storage) will be removed at closure. These facilities will be dismantled or demolished. Salvageable materials will be removed from site and sold. Hazardous wastes will be removed from site and disposed of in an approved facility.

The majority of the non-hazardous, inert building materials will be disposed of in the site landfill or placed in the bottom of the open pit and covered with a layer of non-PAG waste rock and concrete footings broken up and covered or disposed. Any metal-contaminated soils will be removed and disposed of in the open pit. If they exist, hydrocarbon-contaminated soils will be excavated and treated on-site in a land farm. Once successfully treated, these soils will be placed in the landfill or the open pit.

Following removal of the facilities and any associated contamination, the disturbed areas will be re-graded, capped with top soil where needed, and fertilized and seeded with native species. Mine site roads will be scarified and seeded, with all stream crossings returned to their pre-mining condition. The site landfill will be closed using best practice methods.

OFFSITE INFRASTRUCTURE

Road access and electric power to the site will be required if a water treatment plant remains in operation. The road surface, security gates, bridges and culverts, electrical power lines, and distribution system will be maintained during this period.

If it is determined that road access is no longer required, then the access road may be reclaimed if deemed appropriate in discussions with other surface land users (e.g. a forest company). Bridges and culverts will be removed, with the stream crossings re-graded to their pre-mining form. Road surfaces will be re-graded to shed water from their surface and then scarified to encourage vegetation growth.

POST-CLOSURE MONITORING

The level of post-closure monitoring will be a function of the environmental performance of the mine site. Monitoring requirements are expected to reduce over time as the potential impacts to the receiving environment decrease. However, under the current scenario, water treatment may be required for a long period, possibly in perpetuity. This will necessitate a post-closure monitoring program of similar length.

Long-term monitoring requirements will be developed in detail during the operational phase of the mine life. During the active closure and reclamation phase, where the mine is being decommissioned and reclaimed, monitoring will continue at the same level as during the operational phase. However, once the major closure and reclamation activities are completed, and the mine moves into the post-closure phase, the monitoring requirements will decrease. Post-closure monitoring will likely consist of the following:

- environmental effects monitoring including studies on water quality, sediment quality, benthos, and fish to assess effects on the aquatic receiving environment
- engineering inspections by qualified persons of major dams and retention ponds, diversion ditches, open pit, and all engineered structures including the effluent treatment plant and landfill.

Water quality monitoring will be done on a regular basis by the on-site staff.

18.11.6 *Regulatory Requirements*

Regulatory Approval Process

Major mining projects in BC are subject to environmental assessment and review prior to certification and issuance of permits to authorize construction and operations. Environmental assessment is a means of ensuring the potential for adverse environmental, social, economic, health, and heritage effects or the potential adverse effects on Aboriginal interests or rights are addressed prior to project approval. There are generally two stages in the environmental assessment:

1. a pre-application phase when studies and consultations are undertaken
2. an application review phase during which the project details and effects on environment and communities are reviewed along with further consultations.

Generally, the scope, procedures, and methods of each assessment are flexible and tailored specifically to the project circumstances. These are defined in an approved Terms of Reference. Depending on the scope of the project, assessment and permitting of major mines in BC may proceed through either:

a. BC Environmental Assessment Process pursuant to the *Environmental Assessment Act*; or
b. Major Mine Review Process pursuant to the *Mines Act*.

It has been determined that the Morrison Project is a reviewable project under the BC Environmental Assessment Process.

Federal government review under the *Canadian Environmental Assessment Act* (CEAA) is independent of provincial review as the federal agencies, deemed responsible authorities (RA), will ascertain if there are federal “triggers” invoked by the project, thereby resulting in an applicable level of federal review (e.g. none – screening level assessment – comprehensive review). The BC EA and CEAA are subject to harmonization agreements to expedite reviews, whereas the Mines Act and CEAA are not yet harmonized.

In general each environmental assessment contains four common main elements (McLaren, 2008):

1. Opportunities for all interested parties, including First Nations and neighbouring jurisdictions, to identify issues and provide input.
2. Technical studies of the relevant environmental, social, economic, heritage, and health effects of the proposed project.
3. Identification of ways to prevent or minimize undesirable effects and enhance desirable effects.
4. Consideration of the input of all interested parties in compiling the assessment findings and making recommendations about project acceptability.

An EA certificate, issued by ministers at the conclusion of the environmental assessment, represents government approval in principle and allows the proponent to seek any other statutory authorization needed to construct and operate the Project.

British Columbia Authorizations, Licenses, and Permits

The Morrison Project will require various provincial and federal authorizations, licenses, and permits to operate the Project.

Table 18.18 shows a preliminary list of the BC authorizations, licenses, and permits that PBM will be required to obtain. The completed technical studies and environmental assessment will form the basis of the applications. The permit requirements will be reviewed and updated as the Project advances through the environmental assessment and permitting process.

Table 18.18 BC Authorizations, Licenses, and Permits That May Be Required for the Morrison Project

BC Government Permits and Licenses	Enabling Legislation
Environmental Assessment Certificate [1]	*BC Environmental Assessment Act*
Permit Approving Work System & Reclamation Program (Mine Site – Initial Development)	*Mines Act*
Amendment to Permit Approving Work System and Reclamation Program (Pre-production)	*Mines Act*
Amendment to Permit Approving Work System and Reclamation Program (Bonding)	*Mines Act*
Amendment to Permit Approving Work System and Reclamation Program (Mine Plan – Production)	*Mines Act*

table continues…

BC Government Permits and Licenses	Enabling Legislation
Permit Approving Work System and Reclamation Program (Gravel Pit/Wash Plant/Rock Borrow Pit)	*Mines Act*
Mining Lease	*Mineral Tenure Act*
Water License – Notice of Intention (Application)	*Water Act*
Water License – Storage and Diversion	*Water Act*
Water License – Use	*Water Act*
Water License – Construction of fences, screens and fish or game guards across streams to conserve fish or wildlife	*Water Act*
Water License – Alteration of Stream or Channel	*Water Act*
Authority to Make a Change In and About a Stream – Notification	*Water Act/Water Regulation*
Authority to Make a Change In and About a Stream – Approval to Make a Change	*Water Act/Water Regulation*
Authority to Make a Change In and About a Stream – Terms and Conditions of Habitat Officer	*Water Act/Water Regulation*
Wildlife Permit – Relocation	*Wildlife Act*
Heritage Inspection Permit – Archaeology	*Heritage Conservation Act*
Occupant License to Cut – Access Road	*Forest Act*
Occupant License to Cut –Mine Site/Tailings Impoundment	*Forest Act*
Occupant License to Cut – Gravel Pits	*Forest Act*
Occupant License to Cut – Borrow Areas	*Forest Act*
Road use Permit (existing Forest Service Road)	*Forest Act*
Special Use Permit – Access Road	*Forest Practices Code of BC Act*
License of Occupation – Staging Areas	*Land Act*
License of Occupation – Pump House/Water Discharge Line	*Land Act*
License of Occupation – Borrow/Gravel Pits	*Land Act*
Surface Lease – Mine Site Facilities	*Land Act*
Waste Management Permit – Effluent (Sediment, Tailings and Sewage)	*Environmental Management Act*
Waste Management Permit – Air (Crushers, Ventilation, Dust)	*Environmental Management Act*
Waste Management Permit – Refuse	*Environmental Management Act*
Special Waste Generator Permit (Waste Oil)	*Environmental Management Act (Special Waste Regulations)*
Sewage Registration	*Environmental Management Act*
Camp Operation Permits (Drinking Water, Sewage Disposal, Sanitation and Food Handling)	*Health Act/Environmental Management Act*
Fuel Storage Approval	*Fire Services Act*
Food Service Permits	*Health Act*

[1] Subject to assessment under the BCEAA, pending reviewability determination.

FEDERAL AUTHORIZATIONS, LICENSES, AND PERMITS

Table 18.19 shows a preliminary list of the required and potential federal authorizations, licenses, and permits required by PBM to operate the Project.

Table 18.19 Federal Authorization, Licenses, and Permits Potentially Required for the Morrison Project

Federal Government Approvals and Licenses	Enabling Legislation
CEAA Approval	*Canadian Environmental Assessment Act*
Metal Mining Effluent Regulations	*Fisheries Act/Environment Canada*
Fish Habitat Compensation Agreement [1]	*Fisheries Act*
Section 35(2) Authorization for harmful alteration, disruption or destruction of fish habitat [1]	*Fisheries Act*
Navigable Water: Stream Crossings Authorization [2]	*Navigable Waters Protection Act*
Explosives Factory License	*Explosives Act*
Explosives Magazine License	*Explosives Act*
Ammonium Nitrate Storage Facilities	*Canada Transportation Act*
Radio Licenses	*Radio Communications Act*
Radioisotope License (Nuclear Density Gauges/X-ray Analyzer)	*Atomic Energy Control Act*

[1] Required if a Fisheries Act harmful alteration deterioration or destruction of fish habitat occurs.
[2] Required if Transport Canada determines navigable waters involved in the Project.
The Project will be subject the MMER enabled by the Fisheries Act. The regulations require PBM to achieve the specified effluent discharge standards, to implement a comprehensive EEMP, and to provide compensation for the harmful alteration of fish habitat, should this occur.

18.11.7 FINANCIAL ASSURANCE

Section 10 of the *BC Mines Act* stipulates that the Chief Inspector of Mines may, as a condition of issuing a permit, require that the mine owner provide monetary security for mine reclamation and to provide for protection of, and mitigation of damage to, watercourses and cultural heritage resources affected by the mine. Security will remain in effect until such time as the Chief Inspector of Mines determines that all reclamation obligations have been met and PBM can be indemnified.

During the mine planning and environmental assessment phase, the MEMPR Reclamation costing spreadsheet will be completed as the basis for initiating reclamation security negotiations with the province. The amount of security required, and the form in which the security is to be provided, will be agreed between PBM and the Chief Inspector of Mines (with input from Ministry of Finance), as part of the permitting process. The predicted capital and long-term operating costs of the mine site water collection and treatment system (if required) will likely be taken into consideration when deciding the amount of security required.

Performance bonds are an acceptable means of providing this security. In addition, enough “hard" security must be posted so that at any point in time, the amount will fully cover the next five-year period of expected post-closure costs related to water treatment and site management and monitoring (BC MEMPR, 2006). Reclamation securities are reviewed periodically during the mine operation and post-closure periods to ensure required levels of security reflect operational circumstances and prevailing financial conditions.

18.12 TAXES

18.12.1 CORPORATE TAXES – FEDERAL

Effective in 2011, a rate of 16.5% will be assessed on taxable income. Accelerated provisions will apply in determining taxable income. These include deductions for:

- exploration and pre-production development expenditures at 100%
- Class 41 – ongoing capital expenditures at 25% declining balance
- Class 41 – initial capital expenditures at 100% and claimed up to income from mine operating profit
- property acquisition cost at 30% declining balance
- loss carry forward provision – 20 years
- capital tax – eliminated effective January 1, 2006
- provincial resource taxes (see Section 18.12.2).

18.12.2 CORPORATION TAXES – PROVINCIAL

The provincial corporate taxable income base is similar to the federal tax base. Similar write-off deductions are applied (excluding resource taxes). A tax rate of 12% is applied.

18.12.3 MINING TAXES – PROVINCIAL

Two taxes are applied:

- net current proceeds – at 2% on net revenue less operating cost
- net revenue tax – at 13% of profit in excess of a normal return on investment over the life of the mine.

18.13 CAPITAL COST ESTIMATE

18.13.1 INTRODUCTION

The capital cost estimate (CAPEX) for the mine, process plant, and infrastructure for the Project has been prepared in accordance with standard industry practices for feasibility-level of studies and to a definition level and intended accuracy of ±15%.

This estimate includes direct and indirect cost estimates, based on current pricing for common items required for projects of this nature, and data from projects that have either concluded recently or are currently underway.

To establish current market pricing, various contractors, freight forwarders, vendors, and service suppliers were consulted to provide pricing information for use in this estimate. This estimate also considers factors such as construction personnel costs, material availability, work methods, areas of risk, as well as anticipated escalation of capital over the construction period.

18.13.2 SUMMARY

The CAPEX consists of four main parts: direct costs, indirect costs, contingency and Owner's costs.

As of February 12, 2009, the CAPEX for the Project is C$516,684,042. The estimate is subject to qualifications, assumptions, and exclusions, all of which are detailed in this report.

The capital cost summary and distribution is shown in Table 18.20.

Table 18.20 Summary of Project Capital Costs

Area	Cost (C$)
Direct Works	
Overall Site	32,587,570
Mining	40,323,935
Crushing	15,686,643
Crushed Ore Stockpile and Reclaim	51,262,825
Grinding and Flotation	105,456,176
Tailings	56,317,451
Site Services and Utilities	7,344,524
Ancillary Buildings	18,434,994
Plant Mobile Equipment	3,309,835
Temporary Services	0
Off-site Infrastructure and Facilities	15,616,575
Direct Works Subtotal	**346,340,527**
Indirects	
Project Indirects	99,279,935
Owner's Costs	11,143,743
Contingencies	59,919,837
Indirects Subtotal	**170,343,515**
Total Project	**516,684,042**

PRICING

None of the pricing for commodities or the design/supply of equipment is based on binding quotations. Budgetary quotations have been obtained from vendors and contractors for major equipment and unit rates. "Budgetary quotations" generally means that indicative pricing has been provided for specified equipment, materials, and productivity but no commitment has been made to provide the equipment or materials at this price at a future date.

TAXES

All taxes, such as PST and GST, are excluded from the CAPEX.

PROJECT CURRENCY, ESTIMATE BASE DATE AND FOREIGN EXCHANGE

All project capital costs are expressed in Canadian dollars with the following provisions:

- Costs submitted in other currencies have been converted to Canadian dollars. Foreign currency exchange rates applied to the CAPEX relative to Canadian dollars are set out in Table 18.21.
- No provision has been made for variations in the currency exchange rates from those indicated in Table 18.21.
- No provision has been made for any taxes or fees applicable to currency exchanges.

Table 18.21 Exchange Rates

Base Currency	Foreign Currency
Cdn$1.00	US$0.87

ACCURACY

The CAPEX, including contingency for the mine, process plant, and infrastructure, has been prepared to a level of ±15%.

PROJECT IMPLEMENTATION

The CAPEX is based on the assumption that PBM will follow the project execution plan described in Section 18.8. Any deviation from this plan may have an impact on both project schedule and costs.

18.13.3 PROJECT AREAS

The areas shown in Table 18.22 are in the scope of work for the cost estimate unless otherwise noted.

Table 18.22 Project Areas

Project Areas		
A	**Overall Site**	
	A0	Overall Site
	A1	Power Supply
	A2	Power Distribution
	A3	Control System
	A4	Communication
	A6	Yard Lighting
	A7	Access Road
	A8	Diversion
B	**Mining**	
	B1	Open Pit
	B2	Open Pit – Mobile Equipment
	B3	Open Pit – Fixed Equipment
	B4	Open Pit – Explosives Storage
	B5	Open Pit – Fuel Storage and Delivery
	B6	Open Pit – Dewatering
	B7	Open Pit – Electrical
	B8	Open Pit – Communication
	B9	Open Pit – Safety
	B10	Open Pit – Engineering Equipment
C	**Crushing**	
	C0	Primary Crushing
D	**Crushed Ore Storage and Reclaim**	
	D0	Crushed Ore Stockpile and Reclaim
	D1	Secondary Crushing
	D2	HPGR
E	**Grinding and Flotation**	
	E0	Mill Building
	E1	Grinding and Classification
	E3	Flotation
	E4	Concentrate Dewatering and Loadout
	E5	Reagents
F	**Tailings**	
	F1	Tailings Disposal and Reclaim
	F2	Tailings Pond (KCBL)
	F3	Low Grade Stockpile & PAG Dump (KCBL)
	F4	Waste Management (KCBL)
G	**Site Services and Utilities**	
	G1	Fresh/Fire Water
	G2	Process Water
	G3	Potable Water

table continues…

Project Areas		
	G4	Gland Water
	G5	Plant And Instrument Air
	G6	Sewage Treatment
J	**Ancillary Buildings**	
	J1	Administration and Mine Dry
	J2	Truckshop and Warehouse
	J3	Assay Laboratory
	J4	Fuel Storage and Distribution
	J5	Cold Storage Warehouse
	J6	Truckwash and Tire Change
	J7	Arctic Corridor (not included)
	J8	Propane Storage
K	**Plant Mobile Fleet**	
	K0	Plant Mobile Fleet
M	**Temporary Services**	
	M1	Construction Camp (not included)
	M2	Temporary Laydown Areas (not required)
N	**Off-Site Infrastructure and Facilities**	
	N1	Off-site Access Roads
	N2	Off-site Overhead Lines
X	**Project Indirects**	
	X1	Construction Indirects
	X2	Spares
	X3	Initial Fills
	X4	Freight and Logistic
	X5	Commissioning and Startup
	X6	EPCM
Y	**Owner's Costs**	
	Y0	Owner's Costs
Z	**Contingencies**	
	Z1	Contingency

18.13.4 ESTIMATE ORGANIZATION

The estimate is assembled and coded with a hierarchical work breakdown structure (WBS) of major area, area, and discipline numbers.

X99	99	99.99
Area	Section	Sequence

The area coding is based on the area numbering system and the section codes are as shown in Table 18.23.

Table 18.23 Section Codes

Code	Description
Direct Works	
2	Mass Earthworks
2.1	Access Road, Waste Dump, Diversion Channel
2.2	Tailing Pond (KCBL estimate)
2.3	Low Grade and Waste Dump (KCBL estimate)
2.4	Water Management (KCBL estimate)
4	Civil (detail excavation, backfill, etc.)
6	Concrete
8	Structural Steel
10	Architectural
11	Platework
12	Mechanical
13	Piping
14	Building Services
15	Coatings and Insulation
17	Instrumentation and Controls
18	Electrical
18.1	Off-site Power Lines
20	Surface Mobile Equipment
40	Mining
42	Mining Mobile Equipment
Project Indirects	
91	Construction Indirects
92	Spares
93	Initial Fills
94	Freight and Logistics
93	Commissioning and Start-up
96	EPCM
98	Owners Costs
99	Contingency

18.13.5 Sources of Costing Information

The CAPEX has been developed using input from Wardrop, KCBL, and PBM.

WARDROP SOURCES

Wardrop costs were developed using the following sources:

- budget quotations for all major equipment
- Wardrop's in-house database
- preliminary material take-offs by discipline
- preliminary instrumentation index
- cost books.

Equipment specifications were prepared and issued for bid to qualified vendors for budgetary quotations. In the case of building services, the enquiries for budget pricing were done with data sheets only. The vendors supplied an equipment price, delivery lead times, freight costs to marshalling yard, and a spares allowance. Where applicable, the vendor provided an estimate of installation hours for the specified equipment.

All equipment and material costs are included as Free Carrier (FCA) or Free on Board (FOB) manufacturer plant and exclusive of spare parts, taxes, duties, freight, and packaging. These costs, if appropriate, are covered in the indirect section of the estimate.

Equipment items valued under $100,000 are priced from in-house data and previous project data, if pricing was recently updated.

KCBL provided capital cost estimates for the following items:

- tailings management facility site preparation, dams, and water management structures
- low grade ore and waste rock dump site preparation and water management structures
- overburden and organic stockpile site preparation and water management structures
- site pond dewatering and sediment excavation and disposal
- tailings management facility access roads, creek crossings, pipeline corridor clearing and grubbing, and emergency tailings backflow ponds
- related construction indirects including instrumentation, contractor mobilization/demobilization and housing, and engineering.

18.13.6 QUANTITY DEVELOPMENT AND PRICING

All quantities were developed from general arrangement drawings, process design criteria, process flow diagrams, and equipment lists. Design allowances are applied to bulk materials based on discussions between the respective discipline and the estimator. Details on the respective discipline quantities are as described in the following sections.

BULK EARTHWORKS INCLUDING SITE PREPARATION

Bulk earthworks quantities are generated from rough grading designs using the Autodesk Land Development Desktop Civil Package. The excavation of topsoil and an allowance for rock excavation are based on the geotechnical information available at the time of the estimate preparation. Structural fill pricing is based on aggregates being produced at site utilizing a portable crushing and screening plant; the price of the aggregate plant is included in the CAPEX. Earthwork quantities do not include an allowance for bulking or compaction of materials; these allowances are included in the unit prices.

In the bulk earthworks estimate, Wardrop has made the following assumptions:

- 100 mm average, to be stripped and stockpiled on site
- 15% of excavated material is deemed to be unsuitable
- 25% of excavated material is deemed to be excavation in rock, of which 50% will be rippable rock and the balance will require drilling and blasting
- surplus excavated material to be stockpiled on site
- all roads will have 200 mm thick surfacing material (minus 50) complete with a 300 mm thick base (minus 300), and a 1,500 mm thick sub-base.

UNDERGROUND SERVICES

Underground services (firewater and sewage) quantities are based on preliminary designs, which identify pipe sizes and route.

CONCRETE

Concrete quantities are based on “neat” line quantities from engineering designs and sketches. For estimating purposes, designers have provided quantities to the estimator with the following breakdown:

- lean concrete
- concrete footings
- concrete grade beams
- concrete columns and pedestals
- concrete walls
- concrete slab on grade and curbs

- concrete elevated slabs
- concrete equipment bases, <1 m^3
- concrete equipment bases, >1 m^3
- concrete sumps
- anchor bolts
- embedded metal
- rock anchors
- grout.

Typically, all concrete is based on 30 MPa with the exception of lean mix levelling concrete, which is 10 MPa. Wardrop has assumed that a batching plant will be available on site and the batching cost to be $350/$m^3$. The supply unit rates for 30 MPa concrete ranges from $460 to $620/$m^3$, dependent on the type of installation and lean mix levelling concrete at $300 m^3.

Unit rates for each type include formwork and reinforcing steel.

STRUCTURAL STEEL

Steel quantities are based on quantities developed from engineering design and sketches. Allowances are included for cut-offs, bolts, and connections. For estimating purposes, designers have provided steel quantities as per the following breakdown:

- light weight steel sections – 0 to 30 kg/m (tonnes)
- medium weight steel sections – 31 to 60 kg/m (tonnes)
- heavy steel sections – 61 to 90 kg/m (tonnes)
- extra heavy steel sections – >90 kg/m (tonnes)
- stairways (m) including platforms
- grating (m^2)
- handrail complete with kickplate (m)
- ladders (m).

The supply unit rates for fabricated steel ranges from $2,460 to $5,717/t depending on the above classification.

Stick build quantities were calculated from layout sketches. Cranage was included for all tonnages at a range from $150 to $200/t depending on steel classification.

PLATEWORK AND LINERS

Preliminary quantities for all platework and metal liners for tanks, launders, pumpboxes, and chutes have been developed from sketches and provided in kilograms of steel. Rubber lining for pumpboxes has been provided on a square metre basis. Abrasion resistant (AR) wear plates are included as appropriate.

PLUMBING AND DRAINAGE

The estimate is based on costs per square metre and is calculated from in-house data, based on building function and site-specific climatic conditions.

HEATING, VENTILATION, AND AIR CONDITIONING

The cost for heating, ventilation, and air conditioning (HVAC) systems in the ancillary building is based on costs per square metre and is calculated from in-house data, based on building function and site-specific climatic conditions.

Building heating and cooling loads were estimated based upon experience from similar projects in similar climates. Quantities for HVAC equipment (fans, heaters, air conditioning units, air handling units, etc.) were selected based upon the estimated heating and cooling loads for each building.

Heating and ventilation equipment was priced by producing technical data sheets and obtaining email budget quotations from vendors.

The installation costs for the heating and ventilation equipment was estimated based upon a cost per unit area and experience with similar projects and similar equipment.

DUST COLLECTION

The dust collection equipment was sized based upon the process flowsheets and good engineering practice. Technical data sheets were prepared for the equipment and budget email quotes were received from equipment vendors.

Dust ducting was sized by normal design methods. The general arrangements were used to design a preliminary dust ducting layout and, based on this arrangement, the weight of dust ducting was calculated. The installed price of the dust ducting was based on dollars per kilogram weight of ducting, established by previous project information.

The capital cost of the dust collection equipment and the dust suppression equipment was sourced and priced by Wardrop. The installation costs for the equipment were based upon previous experience with similar equipment.

DUST SUPPRESSION

A preliminary design of the dust suppression systems was based upon the process flow sheets.

The equipment cost for the dust suppression systems was based upon a recent quotation for a similar project from a dust suppression vendor. The same vendor was asked to confirm that the costs used were still relevant.

The installation costs for the dust suppression systems were estimated based upon experience with similar projects and similar equipment.

PIPING

Piping and fittings quantities are based on detailed quantity take-offs for pipe 3" (75 mm) diameter and over with prices from budgetary quotes. The quantity take-offs are developed from pipe routing drawings that are based on the general arrangement drawings and the piping diagrams, which identify pipe size. Piping is provided as separate line items and sorted by WBS area and pipe specification. Piping under 3" diameter including fittings will be included as a total number of lines per area at an average length of 15 m. Special piping such as stainless steel will be listed separately; flanges and bolt-ups will be included. Allowances will be included for specialty items such as flexible hoses, etc.

Allowances are also included for specialty items (flexible hoses, etc.) supports, painting, and tagging as appropriate.

Pipe supports are included as an allowance.

Wardrop has assumed that some of the small-bore piping will be supported on cable tray.

VALVES

All valves are listed as separate line items in the estimate.

ELECTRICAL

Electrical costs have been developed from the related study deliverables of other disciplines and are based on the single line diagram, project drawings, and sketches and provided based on the project WBS.

The mechanical equipment list was used to estimate plant loading and site power requirements. Some non-mechanical loads were added to the equipment list in order to consolidate all known electrical loads in one document.

The equipment list, in conjunction with the site plan, was used to determine electrical building locations by centralizing electrical infrastructure to minimize cable runs.

A single line diagram was developed which indicates all major electrical equipment including 13.8 kV switchgear, power transformers, 4 kV and 600 V power distribution centres, and motor control centres. Requirements for major medium and low voltage adjustable speed drives (VFDs) were determined by the appropriate discipline and identified on the single line diagram.

Major electrical rooms are located within the large process buildings (process, HPGR) and infrastructure (warehouse/truckshop). For smaller and remote areas, or for areas in which large electrical rooms are impractical, allowances are made for prefabricated electrical buildings to be built off-site and delivered complete. The on-site work will consist of connecting incoming transformer feed and outgoing motor feeders. Any pre-manufactured electrical buildings will be self-contained with all necessary auxiliary equipment.

Requirement specifications were prepared for major electrical equipment and sent to appropriate vendors. Prices were received, evaluated, and included in the electrical portion of the CAPEX to reflect the project at the time prices were received.

Cost estimates were developed using a material and labour approach for:

- major electrical equipment (major equipment quoted)
- electrical infrastructure (based on in-house estimate of quantities)
- motor wiring (based on wire and material take-offs with current material pricing; all derived from items on the equipment list)
- estimates are by area where possible; the remaining equipment was designated as "infrastructure"
- factoring and in-house pricing was used for smaller items, as required.

INSTRUMENTATION

Instrumentation quantities and costs are included as part of the instrumentation engineering database program.

Instrument types, instrument quantities, cable types, and cable quantities are estimated based on the electrical room locations, process area layouts, project instrumentation design criteria, and developed P&IDs.

Field instrumentation costs are derived from in-house pricing data and recent pricing obtained from recent similar projects.

Instrument types, quantities, cost data, and control system input/output requirements are assembled to form the instrument index.

Cable types and bulk quantities have been compiled based on the process area layouts and instrumentation requirements. Bulk quantities were then sent out for pricing quotes.

Plant control system costs are based on the installation of a DCS. Control system architecture drawings were prepared and issued for DCS pricing.

PRE-ENGINEERED BUILDINGS/MODULAR BUILDINGS

Pre-engineered building specifications and architectural designs were prepared and issued for budgetary quotations for the following buildings:

- truckshop and warehouse
- administration building and mine dry
- assay laboratory building
- truckwash and tire change building.

18.13.7 LABOUR COST DEVELOPMENT

LABOUR LOCATION FACTORS

The site-specific labour location factors were developed for the project by the estimator and are based on recently constructed projects in northern British Columbia and from discussions with contractors in the area.

The location factors will exclude labour impact of strikes and other unforeseen major delays.

LABOUR RATES

Labour rates were based on the following parameters:

- include basic rate (based on CLAC, 2009)
- payroll burdens (employment insurance, vacation pay)
- overtime shift premium rates are included; an allowance for incidental overtime will be included in the indirects section (Section 18.13.10)
- any contractor's monthly fee is covered in the hourly rates.

A blended labour rate of $68.00, as presented by PBM will be used throughout the estimate.

18.13.8 Owner's Costs

An allowance $11,143,743 has been included for Owner's costs provided by PBM and include the following items:

- Owner's home office staffing
- Owner's home office travel
- Owner's home office general expense
- project legal costs
- product marketing
- land taxes
- land surveys (including roads and progress payments during construction)
- reclamation bonds
- project funding or financing costs
- environmental base line monitoring (stream gauging)
- environmental permitting
- development or building permits
- relocation costs and assignment costs
- project photographs
- licenses
- sales taxes
- import duties and tariffs
- builders risk insurance
- general liability insurance
- miscellaneous allowances for deductible claims
- business permits and licenses
- miscellaneous outside consultants
- allowance for ferry travel
- allowance for insurance cost
- Owner's field staffing
- Owner's field travel
- Owner's field general expenses -
- training of staff
- trainers and expenses.

VENDOR REPRESENTATIVES

An allowance for the cost of vendor representatives and their expected duration on-site during construction is included in the indirects cost estimate.

18.13.9 CONTINGENCY

WARDROP

A contingency was applied to these cost estimates based on a risk factor for each discipline as indicated in the estimate details. Contingency is an allowance added to the CAPEX to cover costs that will be incurred but cannot be identified at this time because the project is still in its early development phase.

Contingency is not intended to cover:

- project capacity changes
- facility life expectancy
- major changes in environmental regulations
- force majeure events (strikes, acts of God, etc.).

Based on Wardrop's experience, varying amounts of contingency have been applied to reflect the varying degrees of risk of different components of the project.

KCBL

A lump sum contingency has been applied to cover the cost estimate within the KCBL scope.

18.13.10 PROJECT INDIRECTS

Project indirects include, but are not limited to, the following:

- construction indirects
- spares
- initial fills
- freight and logistics
- commissioning and start-up
- engineering, procurement, and construction management.

18.13.11 EXCLUSIONS

The following items are excluded from the CAPEX:

- working or deferred capital
- financing costs
- refundable taxes and duties
- land acquisition
- currency fluctuations
- lost time due to severe weather conditions
- lost time due to force majeure
- additional costs for accelerated or decelerated deliveries of equipment, materials, and services resultant from a change in project schedule
- warehouse inventories other than those supplied in initial fills
- Owners costs, except as provided by the Owner
- any project sunk costs, including this study
- mine reclamation costs
- mine closure costs
- community relations.

18.14 OPERATING COST ESTIMATE

18.14.1 SUMMARY

On-site operating costs are estimated to be Cdn$8.15/t of ore milled including mining, processing, G&A, and plant services. The unit costs are based on an annual ore production of 10.95 Mt/a (30,000 t/d), 365 days of operation, and are summarized in Table 18.24.

Table 18.24 Operating Cost Summary

Area	Unit Cost ($/t milled)
Mining	2.64
Processing	4.66
General and Administrative	0.63
Plant Services	0.22
Total Operating Cost	**8.15**

The following engineering consulting companies and PBM were responsible for different sections of operating cost preparation as follows:

- Wardrop – mining and process, including plant power distribution
- KCBL – tailings, reclaim and fresh water delivery, and site water management
- PBM – G&A, Owner's costs, and labour rates.

Mine operations consist of conventional drilling, blasting, loading and hauling using drill rigs, ANFO/slurry trucks, shovels, and mechanical haul trucks.

Process operations consist of crushing, grinding, and flotation to produce copper and molybdenum concentrates from the ore that is open pit mined on site. The production rate for mining and process will be 30,000 t/d. The concentrates will either be exported to potential customers in Asia or moved to markets in Canada.

The operating cost estimate is based on the following:

- budget quotations for main equipment spares, fuel, lubricants, and explosives
- vendor usage data
- metallurgical test data from SGS and others
- in-house database
- labour surveys data received from PBM.

All quantities were developed from general arrangement drawings, process design criteria, process flowsheets, and equipment lists. Allowances were applied where necessary.

MINING

The operating cost for the mining section of the Project is estimated based on the annual mining production plan and is summarized in Table 18.25.

Table 18.25 Annual Mine Operating Cost Summary

Period	Year	Annual Operating Cost (Cdn$ M)	Unit Cost (Cdn$/t milled)
-1	2010	12,960,843	-
1	2011	30,943,708	3.14
2	2012	34,345,535	3.14
3	2013	31,851,573	2.91
4	2014	31,893,972	2.91
5	2015	32,847,001	3.00
6	2016	32,958,829	3.01
7	2017	33,693,477	3.08
8	2018	29,158,889	2.66
9	2019	29,979,361	2.74
10	2020	30,680,907	2.80
11	2021	32,505,307	2.97
12	2022	32,293,440	2.95
13	2023	33,541,197	3.06
14	2024	34,385,498	3.14
15	2025	35,192,841	3.21
16	2026	26,102,011	2.38
17	2027	24,937,289	2.28
18	2028	23,440,201	2.14
19	2029	10,262,546	0.94
20	2030	5,405,179	0.49
21	2031	3,221,876	0.51

The mining operating personnel requirement is estimated to be 141.

PROCESS, POWER, TAILINGS, AND G&A

The operating cost for the Morrison Project for process, power, tailings, and G&A is estimated to be Cdn$5.51/t ore milled and is summarized in Table 18.26.

Table 18.26 Annual Operating Cost Summary (Excluding Mining)

Description	Labour	Annual Cost (Cdn$)	Unit Cost (Cdn$/t Milled)
Process Labour	53	3,727,000	0.34
Maintenance Labour	29	2,288,000	0.21
Process Power, Propane, and Fuel		12,459,000	1.14
Supplies (Operating and Maintenance)		32,005,000	2.92
Fleet (Maintenance and Fuel)		519,000	0.05
Subtotal	82	50,998,000	4.66
Tailings		2,389,000	0.22
G&A	28	6,922,054	0.63
TOTAL	**110**	**60,309,054**	**5.51**

18.14.2 Basis of Estimate

The accuracy of the estimate is ±15%, which is suitable for feasibility level. Sources used for establishing labour rates included Western Mining Engineering's published figures, recent projects in BC, and labour rates at similar mining operations in BC.

Introduction

The operating cost estimate includes all recurring costs for payroll, service contractors, camp operations, maintenance parts and supplies, reagents, consumables, supplies, freight, personnel transportation, etc. to operate all facilities as described in this study. Operating expense is defined as any recurring expenditure that can be expensed in the tax year in which it occurs.

The mine and plant operating schedule is summarized as follows:

- two 12-hour shifts daily
- two weeks on/two weeks off
- 2 crew basis to provide 24 hour coverage
- salaried staff will be paid for 2,080 annual hours including vacation time
- hourly personnel will work approximately 2,008 h/a excluding vacation time.

Operating expenses commence with the introduction of feed to the process plant in the first quarter of 2012.

The estimates are summarized as follows:

- mining
- process
- power
- tailings
- G&A.

Scope

The recurring annual operating expense estimate includes all personnel, parts, supplies, services, logistical, life support, and personnel turnaround costs to mine, process, and service the operation for a nominal 30,000 t/d operation. It includes all costs to be incurred by the PBM management organization. It also includes all activities from the start of mining operations through to product transfer to the participants. The estimate excludes all marketing activity, contingency, and escalation.

COST BASIS

General

All costs are presented on yearly basis in the year in which they are incurred. All costs are expressed in constant fourth quarter 2008 Canadian funds.

The following general criteria were used in the preparation of the mine operating cost estimate:

- mining cost estimates for labour, freight, fuel, and power
- mining equipment supplies and consumable costs have been based on North American budget pricing
- supplies and consumable costs for pit operation and pit service equipment includes items such as fuel, oil, lubricants, tires, undercarriage repair and replacement, other replacement and repair parts, and ground-engaging tools
- replacement of parts due to normal wear and equipment breakdown was considered part of the operating cost
- major mining equipment costs were based on budget quotes obtained from the equipment suppliers; equipment operating costs such as ongoing repairs, tyres, tracks, lubricants, wear parts and major overhauls are based on vendor supplied information, and Wardrop and PBM experience.

G&A Functions

Payroll salaries and burdens are based on a personnel list and corresponding salary scales provided by PBM. Insurance premium costs, site leasing costs, annual permitting costs, and other similar items of cost were also provided by PBM.

Currency

The operating cost estimate was prepared with Canadian dollars as the base currency. Foreign exchange rates, as noted in Table 18.27, are supplied as required.

Table 18.27 Operating Cost Currency

Base Currency	Foreign Currency
Cdn$1.00	US$0.87
Cdn$1.00	€0.65

Material Pricing

The operating cost estimate makes use of pricing obtained from the capital cost estimate wherever practical.

Fuel Cost

The fuel cost includes the selling price at source plus taxes, and transportation cost to site is Cdn$1.00/L.

MINING

Unit mining costs have been developed for the annual tonnages mined. The distribution of costs has been identified as direct mining (drilling, blasting, loading, hauling, and road maintenance) and general mine expense (supervision, engineering, geology, pit dewatering, and mine electrical and mechanical services).

The calculated mine operating costs per tonne of material mined averages approximately $1.49/t excluding any contingency allowances.

PROCESS

The process operating cost estimate was prepared from data provided by suppliers and reconciled with mining operations of similar size. Process operating supply costs are based on new test results and budgetary prices from vendors of consumables and reagents. Based on the current study, the process operating cost per tonne is Cdn$4.66. The mill has been sized to process 30,000 t/d with an availability of 92%.

Processing costs include the costs of direct process operations, labour, consumables and reagents, and maintenance and operating supplies.

Labour wage rates were calculated reflecting two weeks on/two weeks off crew schedules and hours of work. The main labour sources will be in Smithers, BC. A load salary factor has been used to cover the costs of benefits (i.e. CPP, WCB, EI, life and long-term disabilities, pension plan, and statutory holidays).

Process operating supply costs are based on budgetary prices from vendors for the key consumables and reagents. Reagent and consumable consumption rates are based on the metallurgical test results from SGS and comminution test results from Polysius. The prices for liners and balls in crushing and grinding sections are based on vendor data, the Feasibility Study, and industry standards.

Process maintenance supply costs are factored from equipment costs.

A process operating cost summary is provided in Table 18.28.

Table 18.28 Process Operating Cost Summary

Description	Labour	Annual Cost (Cdn$)	Unit Cost (Cdn$/t Ore)
Labour			
Mill Labour	53	3,727,000	0.34
Mine Labour (Costed in Mine Operating)	141	0	0.00
Maintenance Labour	29	2,288,000	0.21
Subtotal Staff	**223**	**6,015,000**	**0.55**
Utility			
Power		10,240,000	0.94
Propane		1,671,000	0.15
Fuel – Surface Fleet		548,000	0.05
Subtotal Costs		**12,459,000**	**1.14**
Consumables			
Operating Supplies		26,889,000	2.46
Maintenance Supplies		5,134,000	0.47
Subtotal Supplies		**32,023,000**	**2.92**
Fleet			
Maintenance		81,000	0.01
Fuel		438,000	0.04
Subtotal Fleet		**519,000**	**0.05**
Total Operating Cost		**51,016,000**	**4.66**

POWER

The power supply estimate is provided by PBM and based on the use of power from BC Hydro. The operating load estimate has been developed based on process equipment sized from the Feasibility Study. The power supply cost was based on the BC Hydro cost for electrical energy, which was Cdn$0.03804/kWh. Prices for fuel and lube oil were received from PBM and used for power operating cost calculations.

The total plant site power operating and maintenance cost is Cdn$0.03804/kWh or $0.93/t milled based on mill and miscellaneous power.

Fuel

The cost of fuel was calculated using a landed site cost of Cdn$1.00/L.

OPERATING AND MAINTENANCE PERSONNEL

Management, supervision, and planning are provided by a power plant superintendent and a mechanical supervisor working on cross shifts. The senior electrical person (general electrical foreman) on the mill maintenance rotation will also be on the opposite shift to the power plant superintendent. Operational personnel will consist of one power plant operator and one labourer (serving as helper, trainee, and clean-up person) per shift per rotation.

The mine and mill staff requirements and associated costs are presented in Table 18.29 and Table 18.30.

Table 18.29 Mine Staff Requirements

	Labour	Hourly Base Rate (Cdn$/h)	Base Salary (Cdn$)	Annual Salary (Cdn$)	Loaded Salary (Cdn$)	Annual Cost (Cdn$)
Mine Staff						
Basis Hours			*1,880 h*		*2,080 h*	
Mine Superintendent	1	50.00	94,000	104,000	120,000	120,000
Mine Supervisor	1	40.00	75,200	83,200	98,000	98,000
Clerk	2	24.00	45,100	49,900	61,000	122,000
Geologist	1	42.00	79,000	87,400	102,000	102,000
Chief Engineer	1	38.00	71,400	79,000	93,000	93,000
Mine Engineer	2	37.00	69,600	77,000	91,000	182,000
Basis Hours			*2,008 h*		*2,080 h*	
Geology/ Grade Control	2	24.00	48,200	51,200	63,000	126,000
Surveyor	2	33.00	66,200	70,300	84,000	168,000
Survey Helper	2	24.00	48,200	51,200	63,000	126,000
Subtotal Mine Staff	**14**					**1,137,000**
Mine Operations						
Basis Hours			*2,008*		*2,080 h*	
Mine Shift Supervisor	4	33.00	66,200	70,300	84,000	336,000
Drill & Blast Engineer	2	28.00	56,200	59,700	72,000	144,000
Lube/Fuel Operators and Helper	4	23.50	47,200	50,100	61,000	244,000
Equipment operator	53	30.00	60,200	63,900	77,000	4,081,000
Driller	8	28.00	56,200	59,700	72,000	576,000
Drill Helper	8	22.00	44,200	46,900	58,000	464,000
Blaster	2	28.00	56,200	59,700	72,000	144,000
Blaster Helper	4	23.50	47,200	50,100	61,000	244,000
Subtotal Operations	**85**					**6,233,000**

table continues…

	Labour	Hourly Base Rate (Cdn$/h)	Base Salary (Cdn$)	Annual Salary (Cdn$)	Loaded Salary (Cdn$)	Annual Cost (Cdn$)
Mine Maintenance						
Basis Hours			*2,008*		*2,080 h*	
Mine Maintenance Supervisor	1	40.00	75,200	83,200	98,000	98,000
Mine Maintenance Planner	1	31.00	58,300	64,500	77,000	77,000
Mine Maintenance Shift Supervisor	2	33.00	66,200	70,300	84,000	168,000
Light Vehicle Mechanic	2	31.00	62,200	66,000	79,000	158,000
Mine Maintenance Mechanic	16	31.00	62,200	66,000	79,000	1,264,000
Mine Maintenance Welder	8	31.00	62,200	66,000	79,000	632,000
Mine Maintenance Helper	12	22.00	44,200	46,900	58,000	696,000
Small Projects Tradesmen	0	33.00	66,200	70,300	84,000	0
Subtotal Maintenance	**42**					**3,093,000**
Total Mine Labour	**141**					**10,463,000**

Table 18.30 Mill Maintenance Staff Requirements

	Labour	Hourly Base Rate (Cdn$/h)	Base Salary (Cdn$)	Annual Salary (Cdn$)	Loaded Salary (Cdn$)	Annual Cost (Cdn$)
Maintenance Staff						
Basis Hours			*1,880*		*2,080*	
Plant Maintenance Supervisor	1	40.00	75,200	83,200	98,000	98,000
Maintenance Planner	1	30.00	56,400	62,400	75,000	75,000
Maintenance Clerk	1	20.00	37,600	41,600	51,000	51,000
Subtotal Mill Staff	**3**					**224,000**
Plant Maintenance						
Basis Hours			*2,008*		*2,080*	
Plant Maintenance Shift Supervisor	2	33.00	66,200	70,300	84,000	168,000
Electrician	4	31.00	62,200	66,000	79,000	316,000
Instrument Technician	4	31.00	62,200	66,000	79,000	316,000
Millwright	12	31.00	62,200	66,000	79,000	948,000
Plumber	2	31.00	62,200	66,000	79,000	158,000
Welder	2	31.00	62,200	66,000	79,000	158,000
Subtotal Plant Maintenance	**26**					**2,064,000**
Total Mill Maintenance	**29**					**2,288,000**

TAILINGS MANAGEMENT FACILITY

The tailings management facility operating costs were developed and provided by KCBL. The estimated operating costs include:

- consumable parts for routine maintenance and servicing of tailings delivery, water reclaim, and fresh water pumps
- processed fill required for earthworks maintenance of tailings management facility access roads.

The estimated operating costs exclude labour and mobile equipment. Sustaining capital costs for annual tailings dam raising and associated works are not included in the operating costs; as well, closure costs are not included.

G&A AND OWNER'S COSTS

G&A costs were developed by Wardrop and PBM and include the personnel costs for management and administrative support functions and loss control. The Owner's costs include insurance, head office expenses, external assays, legal services, recruitment, camp catering and maintenance, and personnel rotation transportation costs. The transportation services include crew shift rotations, staff flights, management transport to Vancouver, other flights, and bus services.

Information that is required for the costing and design of environmental aspects (i.e. environment testing and ongoing studies) is considered. Owner's costs were developed PBM at the time of this estimate. Table 18.31 summarizes the annual G&A costs.

Table 18.31 G&A Operating Cost Summary

G&A	Annual Cost (Cdn$)	Unit Cost (Cdn$/t Milled)
Labour	2,051,000	0.19
Fleet Maintenance	145,000	0.01
Fleet Fuel	548,000	0.05
G&A Expenses	4,178,054	0.38
TOTAL G&A	**6,922,054**	**0.63**

18.14.3 ESTIMATE EXCLUSIONS

The following items are not included in the operating cost estimate:

- management or pre-production costs prior to introduction of feed in the first quarter of 2012

- environmental and ecological considerations beyond those addressed in the Feasibility Study
- all initial and ongoing capital costs
- first fills to support process plant to start-up
- all costs for mine close-out
- all royalties
- ongoing exploration
- all Owner's costs including branch and head office operations, joint venture charges, and assessments for the Morrison Project
- escalation
- federal government goods and services tax
- impact benefit agreement costs.

18.15 FINANCIAL ANALYSIS

18.15.1 *INTRODUCTION*

The data presented in this study was used to construct an economic model of the project in order to assess the economic parameters including the net present value (NPV) and internal rate of return (IRR).

The project economic model is based in part on the mine and mill production schedules, recoveries, capital and operating cost estimates, metal deductions, and treatment terms as set out in this report. Therefore, it should be assumed that the exclusions and assumptions relating to the cost estimates and other listed parameters also relate to the economic analysis (i.e. the occurrence of any of the risk factors identified in related sections might have a material impact on the accuracy of this economic analysis).

18.15.2 *METAL PRICE AND EXCHANGE RATE SCENARIOS*

Wardrop adopted historical four-year average metal prices for the base case. Backward averaging of historical prices was calculated as of January 12, 2009.

Wardrop utilized the Energy & Metals Consensus Forecasts (EMCF) quarterly reports (The Consensus Economics Inc.) in calculating the Wardrop/EMCF prices. The Wardrop/EMCF metal prices are derived by averaging the long term prices from previous July, October, and January quarterly reports.

The four-year prices (base case), Wardrop/EMCF prices, and current prices (as of January 12, 2009) based on the rolling historical average prices from the LME are summarized in Table 18.32.

Table 18.32 Summary of Pre-tax Metal Price and Exchange Rate Scenarios

Scenario	Copper (US$/lb)	Gold (US$/oz)	Moly (US$/oz)	FXR (US$:Cdn$)
4-Year Average (Base Case)	2.75	658.32	29.23	0.892
Wardrop/EMCF Prices	1.91	681	12.51	0.870
Current Prices (January 12, 2009)	1.44	827.00	9.78	0.828

Fixed exchange rates (FXR), as shown in Table 18.32, are for financial modeling purposes only. A constant exchange rate of US$0.87:Cdn$1.00 has been used in the development of the capital cost estimate.

Wardrop can offer no comment on future metal prices, exchange rates, or inflation. Readers are encouraged to draw their own conclusions about the possible range of economic outcomes, assisted by the sensitivity charts presented in Figure 18.14 and Figure 18.15.

18.15.3 ECONOMIC RESULTS

The pre-tax financial model was established on a 100% equity basis, excluding debt financing, and loan interest charges. The financial outcomes have been tabulated for NPV, IRR, and payback of capital. A discount rate of 8% was applied to all cases identified by metal price scenarios.

The current prices and the Wardrop/EMCF prices were applied to the same base case financial model. The results of all three scenarios as described for the 21-year mine life are presented in Table 18.33.

Table 18.33 Summary of Pre-tax, NPV, IRR, and Payback by Metal Price Scenario

Scenario	NPV at 8% Discount Rate (Cdn$ M)	IRR (%)	Payback (Years)
4-Year Average (Base Case)	495.9	20.05	4.2
Wardrop/EMCF Prices	(118.0)	4.33	13.1
Current Prices (January 12, 2009)	(342.3)	n/a	n/a

Figure 18.14 NPV Sensitivity Analysis for Variations in Cost, Price, Exchange Rate, and Copper Head Grade

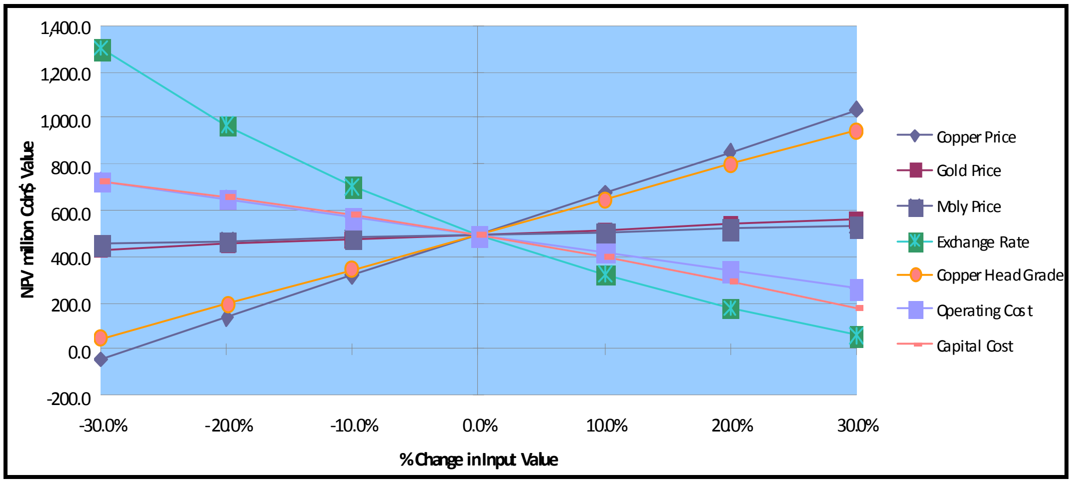
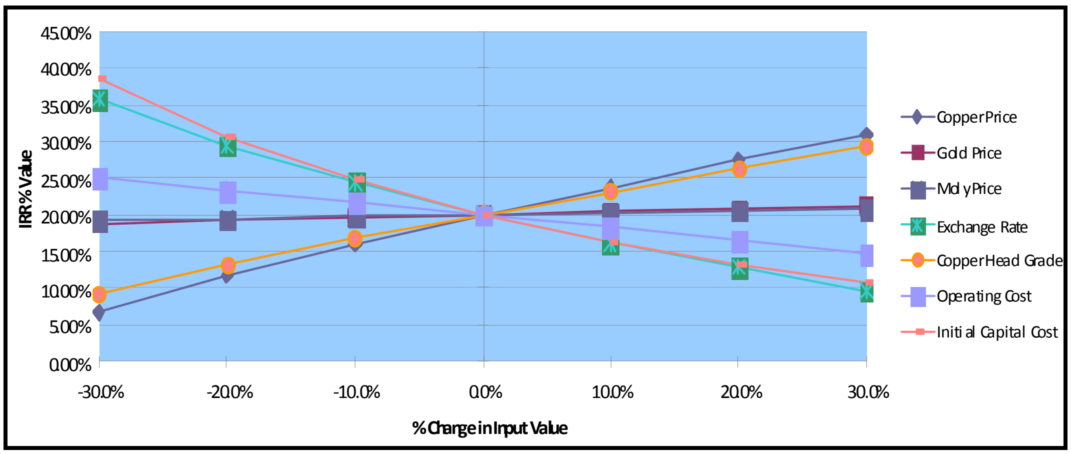


Figure 18.15 IRR Sensitivity Analysis for Variations in Cost, Price, Exchange Rate, and Copper Head Grade



18.15.4 MARKETS AND CONTRACTS

Butterfield was commissioned by PBM to provide a Marketing Report for an estimation of the following:

- concentrate sale ability
- contract structure and duration
- treatment and refining terms from receiving smelters
- port locations
- shipment lot sizes and ocean freight rates.

Copper Concentrate

Marketability

The Morrison Copper/Gold Project is strategically located for delivery of concentrate to Asian custom smelters and the concentrate analysis is low in deleterious impurities such as arsenic, antimony, mercury, bismuth, chlorine, and fluorine. The presence of significant gold and payable silver values will be welcomed by custom smelters and will be a positive factor when negotiating sales contracts.

Most, but not all, copper concentrate producers in BC find that Asian smelters provide the highest freight on board mine return. This is especially true for those who produce concentrate containing a significant gold content since Asian smelters pay for a higher percentage of gold than North American or European smelters.

There are now at least five important receiving markets in Asia which could be candidates to receive Morrison copper concentrate, namely Japan, Korea, China, India, and the Philippines. Of these five, the best receivers are considered to be in Japan and Korea because they are closer and are already receiving considerable tonnages from Canada's west coast, thus providing cheaper ocean freight and more frequent availability of suitable vessels departing for appropriate smelter ports.

Smelter Terms

In the absence of letters of interest or letters of intent from potential smelters or buyers of concentrate, Butterfield has provided smelter terms for delivery of copper-gold concentrate to a specified Japanese or Korean port and smelter.

Contracts will generally include payment terms as follows:

- Copper – pay 100% of content less 1.0 unit at the London Metal Exchange (LME) price for Grade A copper less a refining charge of US$0.085/accountable lb. The refining charge will be increased or decreased by 10% for any departure in the copper price from a fix of US$1.50/lb (i.e. this means that if the price is $1.60, the refining charge is increased to US$0.095/accountable lb and if the price is US$1.40 the refining charge is reduced to US$0.075/accountable lb)
- Treatment Charge – US$85/dmt of concentrate delivered.
- Gold – pay 96.5% on the gold content less a refining charge of $7/accountable troy ounce

Concentrate Transport Logistics

Concentrate from the mine site will be truck transported to the Port of Stewart. Transportation charges prepared by Chrisita Consulting for truck, and by Wardrop for ocean freight, have been based on a concentrate tonnage of 155,000 dmt/a are shown below:

- truck transport to Port of Stewart – Cdn$54.43/wmt
- stevedoring (port storage and handling) – Cdn$13.00/wmt
- ocean transport to Asian port – US$48.00/wmt
- moisture content – 8%.

Concentrate Transport Insurance

An insurance rate of 0.15% will be applied to the provisional Invoice Value of the concentrate to cover land-based and ocean transport from the mine site to the smelter.

Owners Representation

For a 10,000 wmt shipment lot, a charge of US$5,000 would be applied for services provided by the owner's representative. Duties would include attendance during vessel unloading at the smelter port, supervising the taking of samples for assaying, and determining moisture content.

Concentrate Losses

Concentrate losses are estimated at 0.05% per handling during shipment from the mine to smelter. For deliveries to Asia, an overall loss of 0.25% should be applied to the provisional invoice value for five handlings as illustrated below.

1. loading truck at mine
2. offloading truck at port storage shed
3. loading vessel
4. offloading vessel into truck transport to smelter
5. offloading truck into smelter storage bins.

MOLYBDENUM CONCENTRATE

Morrison will produce molybdenum sulphide concentrates in range of one to two million pounds per year as a by-product. Many by-product producers sell their molybdenum concentrates to traders who normally will buy ex-mine gate. Such contracts usually provide for a deduction from the price to include all losses, roasting charges freight early payment, etc.

Commercial Considerations

Grade

The grade target should be a minimum of 50% molybdenum and a maximum of 0.5% copper. Most by-product producers are in the range of 47% to 50% Mo and 0.6% to 2.0% copper. The Morrison Copper/Gold Project molybdenum concentrate will be 53.6% Mo and 0.83% copper.

Roasting Terms

The fixed price discount (roasting charge) is most often fixed at a percentage of the Dealer Oxide price and includes an allowance for the roasting losses. Often there is a minimum and a maximum to protect the roaster when prices are low but allows for some participation when prices are high. This system is used almost exclusively in the industry.

Typically the discount in the last two years has been 13% to 15% with a minimum of $1.50 and a maximum of $4.50 per pound. Contracts may contain a clause allowing the producer the option to open up discussions if the price were to fall below $10.00 per pound of contained Mo.

Quality and Penalty Elements

Specifications may vary from roaster to roaster but the above is typical in the industry. Concentrates with over 0.5% (or indeed 1% or more) copper are saleable but they may be subject to a penalty, depending on the market and the roaster blend. However, roasters will often accept concentrate with up to 1% copper content with no penalty.

Return to Mine

The return to the mine will depend on a number of factors:

- concentrates have to be moved to the market and this is a deduction from the price
- concentrates need to be roasted
- there is a conversion loss
- payment timing
- quotation period.

The total offsite cost will, as indicated, vary with a variety of factors, but generally will be in a range of 13% to 15% of the price, but with dollar maximums and minimums. For purposes of evaluation, it is suggested that it is assumed the mine will receive

87% of the price, with a minimum deduction of $1.50 and a maximum of $4.50 with the buyer taking delivery at the mine.

19.0 INTERPRETATION AND CONCLUSIONS

The Morrison Copper/Gold Project is an open pit mine which will require the removal of 15 Mt of overburden, together with 169 Mt of waste and 224 Mt of ore over a period of 21 years.

The deposit remains open at depth and a mineralized intercept by hole MO-01-24 on the hanging wall side of the West Fault indicates a potential extension of the Central Zone to the northwest below the 700 m level.

Metallurgical tests were conducted by various laboratories and showed that conventional froth flotation is the optimum process for the recovery of copper/gold/silver. The average metal recoveries in copper concentrate are 84% for copper, 59% for gold, and 56% for silver.

While not all ore samples tested contained significant amounts of molybdenum, when present, it recovered well into a bulk cleaner concentrate. Limited molybdenum flotation testing on bulk cleaner concentrate demonstrated that Mo concentrates in excess of 50% Mo could be achieved with reasonably high stage recovery.

A trade-off study to evaluate potential economic and technical benefits of using HPGR in place of conventional SAG milling was completed and showed a significant savings in power and consumable costs. HPGR pilot tests results confirmed that HPGR is suitable for the Morrison material.

Consultation is fundamental to major project environmental assessment review. Engagement and consultation with provincial and federal agencies, LBN, public, and stakeholders has occurred through all stages of the Morrison Project planning. Consultations are being undertaken during the pre-application review phase and will occur also during the application review phase. Consultation with LBN is required, and interests will be reflected in agreements to address and/or accommodate LBN issues, values, and concerns.

20.0 RECOMMENDATIONS

20.1 GEOLOGY

Geological recommendations are as follows:

- The surface topography should be updated and elevations tied into the claim and drill hole collar surveys.
- The drill core from the geotechnical drill program over the main Morrison deposit should be split and assayed.
- Future exploration of development drilling should include analyses for molybdenum.

20.2 PROCESSING

The following process recommendations are made based on the findings of this Technical Report:

- The potential benefit of the application of flash flotation in the primary grinding/cycloning circuit should be investigated in further studies to determine the possibility of recovering coarse copper and molybdenum bearing minerals prior to the rougher flotation feed, and the impact of these findings in the overall copper and molybdenum recovery.
- In reference to the mineralogical characterization results from the rougher/scavenger tailings study, a plant trial test of a contact cell installation on the tailings line is recommended during plant operation. This test would be focused on recovering a small percentage of tailings product containing middlings and insufficient floatable sulphides using either a flash flotation or a continuous centrifugal gravity concentrator. The product can be recycled for further grinding to improve mineral liberation prior to re-floating. This can have a positive impact on the overall plant recovery.
- The potential use of an IsaMill or Stirred Media Detritor mill in regrinding stages with an objective to reduce both capital and operating costs and improving Cu grade and recovery should be considered in further studies.
- Perform a detailed hazard and operability analysis review during the early phase of detailed engineering.

20.3 MINING

The current mine plan calls for pit expansion into areas peripheral to the well drilled areas above the mineralized zone. In these areas the overburden thickness is not well modelled. It is recommended that geophysical methods such as seismic or ground penetrating radar be evaluated for use in better defining the overburden thickness and the hard rock – overburden interface location.

Overburden removal has been scheduled on an as required basis to release ore for processing. It is recommended that consideration be given to contracting overburden removal ahead of drilling and blasting on production benches.

Economic considerations, equipment requirements, and logistics with respect to seasonal operation and start-up are all factors to be considered at the "basic engineering" stage.

Blast optimization should be undertaken to minimize costs and to establish wall control operational practices. It is recommended that blasting practices be part of a process of continuous improvement.

20.4 ENVIRONMENTAL

Environmental recommendations are as follows:

- Continue to conduct environmental monitoring of surface and groundwater quantity and quality to inform detailed engineering design.
- Complete 3D groundwater modelling to develop groundwater inflow estimates at all four phases of pit development and post-mining.
- Improve the resolution of overburden thickness along the northeast perimeter of the proposed pit by conducting resistivity surveys or overburden drilling.
- Consider groundwater well pump testing to ascertain the hydraulic behaviour of the main fault transecting the orebody.

21.0 REFERENCES

Allnorth Consultants Ltd., “Morrison Project – Haul Route Option Analysis”, April 2008.

Beacon Hill Consultants Ltd., “Morrison Hearn Hill Project Preliminary Assessment”, August 2004.

Chrisita Enterprises Ltd., “Morrison Project – Haul Route Study”, August 2008.

Geosim Services Inc., “Mineral Resource Update Morrison Project, Omineca Mining Division”, May 2007.

International Metallurgical and Environmental Inc., “Laboratory Flotation Tests of Drill Core Samples from the Morrison Lake Property”, June 2002.

Kaehne Consulting Ltd., “Electrical Power Supply – Report and Cost Estimate”, December 2008.

Klohn Crippen Berger Ltd., “Morrison Copper/Gold Project – Geotechnical Feasibility Study”, December 2008a.

Klohn Crippen Berger Ltd., “Morrison Copper/Gold Project – Plantsite Foundation Report”, December 2008b.

Klohn Crippen Berger Ltd., “Morrison Copper/Gold Project – Tailings, Reclaim, and Associated Pumping Systems”, December 2008c.

Knight Piésold Consulting, “Geotechnical Site investigation report for Morrison Project (REF. NO. VA101-102/7-1)”, July 2006.

Neil S. Seldon & Associates Ltd., “Comments on Long Term Smelter Charges Preparared for Pacific Booker Minerals Inc.”, April 2007.

Nilsson Mine Services Ltd., “Morrison Pit Optimization and Production Schedule”, October 2007.

Omineca Mining Division, “Geological and Manual Resource Estimation Report on Morison Copper/Gold Porphyry Deposit at Morrison Lake”, February 2003.

Pacific Booker Minerals Inc., “Draft Terms of Reference for an Application for an Environmental Assessment Certificate under the British Columbia Environmental Assessment Act SBC 2002”, Chapter 43, 62 p., February 2009.

Polysius, ”High Pressure Grinding Tests on Copper/Gold/Molybdenum Ore from the Morrison Project for Pacific Booker Minerals inc. at the Polysius Research Center”, December 2007.

Process Research Associates Ltd.,” Flotation Optimization and Variability Testing on Composites from the Morrison Project”, October 2005.

Rescan Environmental Services Ltd., “Morrison Copper/Gold Project Baseline Environmental Studies”, 24 various studies, 2009.

SGS Minerals Services Ltd., “Ore Grindability Characterization and Feasibility Grinding Circuit Design for the Morrison Project.”, August 2007.

SGS Minerals Services Ltd., “The Flotation Response of HPGR-prepared versus Conventionally Crushed Flotation Feed from Morrison Deposit”, January 2008.

SGS Minerals Services Ltd., “The Grindability Characterization of Samples from the Morrison Deposit Prepared for Pacific Booker Minerals Inc.”, May 2007.

SGS Minerals Services Ltd., “The Recovery of Copper, Gold and Molybdenum from Ore from the Morrison Copper Project”, October 2007.

SGS Minerals Services Ltd., “Metallurgical Variability in the Morrison Deposit Prepared for Pacific Booker Minerals Inc.”, November, 2007.

SGS Minerals Services, “Morrison Project Flotation Testwork Report as a Part of the Feasibility Study prepared for Pacific Booker Minerals Inc.”, December 2007.

SGS Minerals Services, “Tailings Characterization for Morrison Project Prepared for Pacific Booker Minerals Inc.”, November, 2007.

SNC-Lavalin Engineering, “Technical Report on the Morrison Porphyry Copper/Gold Project”, June 2002.

Wardrop Engineering Inc., “Morrison Copper/Gold Project – Volume 1 Process Plant, Mining, and Infrastructure”, January 2009.

Wardrop Engineering Inc., “Morrison Copper/Gold Project – Volume 2 Project Execution Plan”, January 2009.

Wardrop Engineering Inc., “Morrison Copper/Gold Project – Volume 3 Capital Cost Estimate”, January 2009.

Wardrop Engineering Inc., “Morrison Copper/Gold Project – Volume 4 Operating Cost Estimate”, January 2009.

Wardrop Engineering Inc., “Morrison Copper/Gold Project – Volume 5 Financial Analysis”, January 2009.

22.0 CERTIFICATES OF QUALIFIED PERSONS

I, Hassan Ghaffari, of Vancouver, British Columbia, do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am Manager of Metallurgy with Wardrop Engineering Inc. with a business address at #800 – 555 W. Hastings St., Vancouver, BC, V6E 1M1.
- I am a graduate of the University of Tehran with a M.A.Sc. in Mining Engineering (1988) and the University of British Columbia with a M.A.Sc. in Mineral Process Engineering (2004).
- I am a member in good standing of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (#30408).
- I have practiced my profession continuously since graduation.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to mineral process engineering includes 21 years experience in mining and plant operation, project studies, management, and engineering.
- I am responsible for the preparation of Sections 1.0, 2.0, 3.0, 16.0, 18.2, and costing for matters related to process in Sections 18.13 and 18.14 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. In addition, I visited the Property on September 25, 2006.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed by Hassan Ghaffari, P.Eng."

Hassan Ghaffari, P.Eng.
Manager of Metallurgy
Wardrop Engineering Inc.

CERTIFICATE OF QUALIFIED PERSON

I, Ronald G. Simpson , of Vancouver, British Columbia, do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am a president of GeoSim Services Inc. with a business address at 1975 Stephens St., Vancouver British Columbia, V6K 4M7.
- I graduated with an Honours Degree of Bachelor of Science in Geology from the University of British Columbia in 1975.
- I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (License # 19513).
- I have practiced my profession continuously since graduation.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to the project includes extensive fieldwork on similar porphyry copper deposits since 1976 and specialization in computer modeling and resource estimation for the past 20 years.
- I am responsible for the preparation of Section(s) 4-15 and 17 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. In addition, I visited the Property on September 25, 2006 and October 16, 2008.
- I have had prior involvement with the property that is the subject of the Technical Report. The nature of my prior involvement consists of a Technical Report prepared for Pacific Booker Minerals entitled "Mineral Resource Update, Morrison Project, Omineca Mining Division, British Columbia" dated May 4, 2007.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed by Ronald G. Simpson, P.Geo."

Ronald G. Simpson, P.Geo.
President
GeoSim Services inc.

CERTIFICATE OF QUALIFIED PERSON

I, Paul R. Franklin, of Saskatoon, Saskatchewan, do hereby certify that as the co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am the Manager of Mining (Saskatoon) with Wardrop Engineering Inc. with a business address at #1400 – 410 22nd Street East, Saskatoon, Saskatchewan*.*
- I am a graduate of the University of Saskatchewan (Bachelor of Engineering, 1974).
- I am a member in good standing of the Association of Professional Engineers and Geoscientists of Saskatchewan (License #4998).
- I have practiced my profession for 28 years.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to mine engineering includes 28 years experience in mine operation, project studies, management, and engineering.
- I am responsible for the preparation of Sections 18.1.1, 18.1.2, 18.1.7 through 18.1.14, and costs associated with mining in Sections 18.13 and 18.14 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Saskatoon, Saskatchewan

"Original document signed and sealed by
Paul R. Franklin, P.Eng., P.Mgr."

Paul R. Franklin, P.Eng., P.Mgr.
Manager of Mining (Saskatoon)
Wardrop Engineering Inc.

CERTIFICATE OF QUALIFIED PERSON

I, John Nilsson (P.Eng.), do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am President of Nilsson Mine Services Ltd. with a business address at 20263 Mountain Place, Pitt Meadows, British Columbia, V3Y 2T9.
- I graduated with a Bachelors degree in Geology from the Queen's University in 1977. In addition, I have obtained a Masters degree in Mining Engineering from the Queen's University in 1990.
- I am a member of the Association of Professional Engineers of British Columbia.
- I have worked as a geologist and mining engineer for a total of 30 years since my graduation from university.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association to be a "qualified person" for the purpose of NI 43-101.
- I am responsible for the preparation of Sections 18.1.3, 18.1.4, and 18.1.5 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. In addition, I visited the Property on September 25-26, 2006.
- I have had limited prior involvement with the project that is the subject of the Technical Report, visiting the property in 1990 while working for Noranda.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Pitt Meadows, British Columbia

"Original document signed and sealed by John Nilsson, P.Eng."

John Nilsson, P.Eng.
President
Nilsson Mine Services Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Peter Wells, of Vancouver, British Columbia, do hereby certify that as the author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am the Director of Technical Services with Wardrop Engineering Inc. with a business address at #800 – 555 West Hastings St., Vancouver, BC, V6B 1M1.
- I am a graduate of Technicon Witwatersrand (NDT, 1978) and University of South Africa (B.Comm, 1991).
- I am a Fellow in good standing with the South African Institute of Mining and Metallurgy (#703616).
- I have practiced my profession continuously since graduation.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to infrastructure and capital cost estimates includes 30 years of operations and consulting experience.
- I am responsible for the preparation of Sections 18.3, 18.8, and 18.13 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. In addition, I visited the Property on September 25, 2006.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed by
Peter Wells, SAIMM (Fellow)"

Peter Wells, SAIMM (Fellow)
Director of Technical Services
Wardrop Engineering Inc.

CERTIFICATE OF QUALIFIED PERSON

I, Harvey N. McLeod (P.Eng., P.Geo), of Vancouver, British Columbia, do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am a Principal and Vice President Strategic Planning with Klohn Crippen Berger Ltd. with a business address at 500-2955 Virtual Way, Vancouver, BC, V7M 4X6*.*
- I am a graduate of the University of British Columbia with a Bachelors Degree in Applied Science (1973). I have a Master in Science in Soil Mechanics from the University of London, D.I.C., Imperial College of Science and Technology.
- I am registered in the Province of British Columbia as a P.Eng. and P.Geo. (License #10432).
- I have worked in the mining and mine waste management fields for 35 years.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience for the purpose of this report includes 32 years experience with Klohn Leonoff, Klohn Crippen Consultants, and Klohn Crippen Berger Ltd. engaged in the evaluation and development of mine waste facilities, and involvement in the design and construction of several major mine tailings dams.
- I am responsible for the preparation of Sections 18.5 and 18.6 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009, and for supplying costs to Wardrop Engineering Ltd. relating to the following areas:
  - tailings management facility, waste rock dump, and temporary stockpile capital costs
  - water management ditches, sumps, and pump capital costs related to the above facilities
  - tailings, reclaim, and fresh water pumping and piping capital costs
  - tailings, reclaim, and fresh water pumping and piping operating costs for routine maintenance excluding labour and mobile equipment.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed
by Harvey N. McLeod, P.Eng., P.Geo."

Harvey N. McLeod, P.Eng., P.Geo.
Principal and Vice President Strategic Planning
Klohn Crippen Berger Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Terence K. Jibiki (P.Eng.), of Vancouver, British Columbia, do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am a Geotechnical Engineer with Klohn Crippen Berger Ltd. with a business address at #500 – 2955 Virtual Way, Vancouver, BC, V7M 4X6.
- I am a graduate of the University of British Columbia with a Bachelors Degree in Applied Science (2000) and a Masters Degree in Engineering (2005).
- I am registered in the Province of British Columbia as a P.Eng. (Registration #31489).
- I have worked in the mining and mine waste management fields for 8 years.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience for the purpose of this report includes 8 years experience with Klohn Crippen and Klohn Crippen Berger Ltd. engaged in the evaluation and development of mine waste facilities and involvement in the design and construction of several major mine tailings dams.
- I am responsible for the preparation of Section 18.7 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. In addition, I visited the Property on November 21, 2006, and from November 10-13, 2008.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed by Terence K. Jibiki, P.Eng."

Terence K. Jibiki, P.Eng.
Geotechnical Engineer
Klohn Crippen Berger Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Rolf Schmitt, of Victoria, British Columbia, do hereby certify that as a co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am a Senior Project Manager with Rescan Environmental Services Ltd. with a business address at 1111 West Hastings Street, 6th Floor, Vancouver, BC, V6E 2J3.
- I am a graduate of the University of British Columbia (B.Sc. Honours Geology [1977], M.Sc. Regional Planning [1985]) and the University of Ottawa (M.Sc. Geology [1993]).
- I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (License #19824).
- I have practiced my profession continuously since graduation.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to the Morrison Project includes direct supervision of all aspects of environmental and socio-economic baseline studies, assessments, modelling, and First Nations traditional studies, environmental program costing, and incorporation of environmental features into conceptual project design.
- I am responsible for the preparation of Sections 4.3 and 18.11 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009. I directly supervised field scientists and engineers in conducting environmental baseline studies on the Property during the period May 2006 to November 2008.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and the Technical Report has been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed by Rolf Schmitt, M.Sc., P.Geo."

Rolf Schmitt, M.Sc., P.Geo.
Senior Project Manager
Rescan Environmental Services Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Miloje Vicentijevic, of Vancouver, British Columbia, do hereby certify that as the co-author of this **MORRISON COPPER/GOLD PROJECT – FEASIBILITY STUDY NI 43-101 TECHNICAL REPORT**, dated March 12, 2009, I hereby make the following statements:

- I am the Manager of Mining (Vancouver) for Wardrop Engineering Inc. with a business address at #800 – 555 West Hastings St., Vancouver, BC, V6B 1M1.
- I am a graduate of the University of Belgrade (B.Sc. in Mining Engineering, 1990) and University of Alberta (M.Eng. in Engineering Management, 2003).
- I am a member in good standing of the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (#75678).
- I have practiced my profession continuously since graduation.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI 43-101.
- My relevant experience with respect to financial analysis includes 17 years of mining operations and consulting experience.
- I am responsible for the preparation of Section 18.15.1, Section 18.15.2, and Section 18.15.3 of this technical report titled "Morrison Copper/Gold Project – Feasibility Study NI 43-101 Technical Report", dated March 12, 2009.
- I have no prior involvement with the Property that is the subject of the Technical Report.
- As of the date of this Certificate, to my knowledge, information, and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.
- I am independent of the Issuer as defined by Section 1.4 of the Instrument.
- I have read National Instrument 43-101 and Section 18.15.1, Section 18.15.2, and Section 18.15.3 of the Technical Report have been prepared in compliance with National Instrument 43-101 and Form 43-101F1.

Signed and dated this 12th day of March, 2009 at Vancouver, British Columbia

"Original document signed and sealed by Miloje Vicentijevic, P.Eng., M.Eng."

Miloje Vicentijevic, P.Eng., M.Eng.
Manager of Mining (Vancouver)
Wardrop Engineering Inc.