

MAX Molybdenum Project

**British Columbia Small Mine Application for
An Underground Mine and On-site Concentrator**

**Revelstoke Mining Division
British Columbia, Canada**

Submitted By:



FortyTwo Metals Inc.

(a wholly-owned subsidiary of Roca Mines Inc.)

**Suite 500 – 1045 Howe Street
Vancouver, BC**

Project No: 0327-003-01

Date: July 2005



FortyTwo Metals Inc. / Roca Mines Inc.
500-1045 Howe Street
Vancouver, BC
V6Z 2A9
604.684.2900 (T): 604.684.2902 (F)

July 29, 2005

Project No. 0327-003-01

Mr. Bruce Reid
Inspector of Mines
Ministry of Energy and Mines
2nd Floor, 42-8th Ave South
Cranbrook, BC
V1C 2K3
(250)426-1655

Dear Mr. Reid:

RE: **British Columbia Small Mine Application for an Underground Mine and On-site Concentrator – MAX Molybdenum Project**

Please find attached fourteen copies of our above referenced Application dated July 2005.

Should you have any questions or comments, please do not hesitate to contact me at the number listed above.

Yours sincerely,
FortyTwo Metals Inc.

Scott E. Broughton, P.Eng.
President

Enc.

MEMi/ph

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF APPENDICES	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIMITATIONS OF REPORT	vii
1.0 INTRODUCTION	1
2.0 Baseline Information	3
2.1 Location and Site Access	3
2.2 Climate and Air Quality	3
2.3 Geology and Description of the Deposit	5
2.3.1 Regional Geology	5
2.3.2 Deposit Geology	6
2.4 Topography and Surface Drainage Features	9
2.4.1 Stream Flow	10
2.5 Water Quality	13
2.5.1 Surface Water Quality	13
2.5.2 Groundwater Quality	19
2.6 Sediment Quality	19
2.7 Fisheries and Aquatic Resources	21
2.8 Surficial Geology, Terrain and Soils Mapping	24
2.8.1 Surficial Geology and Terrain Mapping	24
2.8.2 Soil Survey and Soil Characterization for Reclamation.....	25
2.9 Vegetation	26
2.10 Wildlife	27
2.11 Land Status	28
2.11.1 Ownership	28
2.11.2 Land Capability and Use	31
3.0 Mine Plan	33
3.1 Mine Plan Overview	33
3.2 Description of Existing Surface and Underground Development	34
3.3 Details of Planned Surface and Underground Development	35
3.4 Development Schedule	37
3.5 Access and Transportation	37
3.6 Mine Site Infrastructure	38
4.0 Metallurgical and Processing Facilities	41
4.1 Review of Metallurgical Testwork	41
4.2 Metallurgical and Processing Facilities Overview	41

4.3	Process Flowsheet	42
4.4	Process Plant Description	42
4.4.1	Run-of-Mine Stockpiles.....	42
4.4.2	Crushing Plant	43
4.4.3	Primary Mill	43
4.4.4	Primary Flotation Circuit	43
4.4.5	Regrind Mill and Cleaner Flotation.....	44
4.4.6	Concentrate Filtration.....	44
4.4.7	Tailings	45
4.5	Water Management	46
4.5.1	Surface Water Management	46
4.5.2	Water Supply.....	47
4.5.3	Water Consumption	47
4.5.4	Site Drainage.....	47
4.5.5	Site Water Balance.....	48
4.6	Reagents, Consumables and Materials Handling	48
4.7	Fuel and Lubricants Consumption and Handling	49
4.8	Landfill	49
4.9	Process Plant Development Schedule	50
5.0	Waste Management	51
5.1	Tailings	51
5.1.1	Tailings Management Overview	51
5.1.2	Tailings Facility	52
5.1.3	Tailings Characterization	54
5.2	Low-Grade Ore and Waste Rock	55
5.3	Soil	56
6.0	Environmental Management Program	57
6.1	Metal Leaching & Acid Rock Drainage Considerations	57
6.1.1	Acid Rock Drainage Potential	57
6.1.2	Metal Leaching	58
6.1.3	Mitigation	58
6.1.4	Monitoring Program	59
6.2	Watercourse and Water Quality Protection	60
6.2.1	Site Drainage.....	60
6.2.2	Environmental Monitoring and Surveillance Programs.....	61
6.3	Air Quality Management	62
7.0	RECLAMATION PROGRAM	63
7.1	Soil Handling Plan	64
7.2	Environmental Monitoring and Surveillance	65
7.3	Erosion Control and Sediment Retention Plan	65

7.4	Conceptual Final Reclamation Plan	68
7.4.1	End Land Use Objectives	69
7.4.2	Productivity or Capability Objectives.....	69
7.4.3	Long-term Stability	70
7.4.4	Treatment of Structures and Equipment.....	71
7.4.5	Waste Pile and Low Grade Ore Stockpile Reclamation	71
7.4.6	Tailings Area Reclamation	72
7.4.7	Portal Closure and Underground Reclamation	73
7.4.8	Watercourse Reclamation	74
7.4.9	Road Reclamation	75
7.4.10	Trace Elements in Soil and Uptake in Vegetation.....	75
7.4.11	Disposal of Toxic Chemicals	76
7.4.12	Post-Closure Monitoring.....	76
7.5	Detailed Five Year Mine Plan	78
7.6	Detailed Five Year Reclamation Plan.....	78
8.0	Reclamation Cost Estimates.....	79
8.1	Overview	79
8.2	Costing Details and Assumptions	80
8.2.1	Overview.....	80
8.2.2	Site Preparation.....	80
8.3	Breakdown of Individual Reclamation Activities	82
8.3.1	Area Disturbance	82
8.3.2	Lump Sum Items	84
8.3.3	Post-Closure Costs	86
	REFERENCES	87

LIST OF APPENDICES

Appendix I	Site Hydrology Characterization	Vol. 1
Appendix II	Streamflow Data	Vol. 1
Appendix III	Surface Water Quality Data	Vol. 1
Appendix IV	1980 Aquatic Assessment	Vol. 1
Appendix V	Environmental Studies in the Trout Lake Area, 1981	Vol. 1
Appendix VI	Surficial Materials, Max Molybdenum Project Area	Vol. 1
Appendix VII	1980 Vegetation Assessment	Vol. 1
Appendix VIII	1980 Wildlife Assessment	Vol. 1
Appendix IX	Technical Report on the Max Molybdenum Property	Vol. 1
Appendix X	Ore and Waste Development Schedule	Vol. 2
Appendix XI	Design Criteria for a 500 t/day Processing Facility	Vol. 2
Appendix XII	Tailings Scoping Study	Vol. 2
Appendix XIII	Review of Acid Rock Drainage and Metal Leaching Potential	Vol. 2
Appendix XIV	Water Quality Impact Assessment.....	Vol. 2
Appendix XV	Reclamation Cost Estimate	Vol. 2
Appendix XVI	Selected Site Photographs	Vol. 2
Appendix XVII	Site Profile.....	Vol. 2

LIST OF TABLES

Table 2.2-1	Lardeau Creek Galena Lodge Monthly Temperatures (1989-2002)
Table 2.2-2	Ambient Dustfall Data (mg/dm ² /day)
Table 2.3-1	Summary of Diamond Drilling
Table 2.4-1	Stream Flow Monitoring Locations
Table 2.4-2	Regional Streamflow Data
Table 2.4-3	Wilkie Creek Catchment Average Monthly Flows
Table 2.4-4	Monthly Average Adit Flow Rates from 1980-2002
Table 2.5-1	Historical Water Quality Sampling Stations
Table 2.5-2	Recent Water Quality Sampling Locations
Table 2.5-3	Selected Canadian and B.C. Water Quality Guidelines for the Protection of Freshwater Aquatic Life
Table 2.6-1	Sediment Sample Analysis, 27 October 1981
Table 2.7-1	Trace Metal Analyses on Muscle Tissue Excised from Fish, Wilkie Creek, 1981
Table 2.11-1	MAX Property Claims
Table 3.1-1	MAX Resource Estimate at >0.10% MoS ₂ Cutoff Grades
Table 3.4-1	Production Summary
Table 4.4-1	Tailings Supernatant Quality
Table 4.6-1	Projected Reagent Consumption
Table 4.7-1	Projected Lubricant and Solvent Consumption
Table 7.3-1	Hydroseed Mix Used at Max Molybdenum Project Site
Table 7.4-1	Water Quality Sampling Sites
Table 8.1-1	Summary of Reclamation Costs
Table 8.2-1	Reclamation Equipment Costs

LIST OF FIGURES

- Figure 1.1-1 Location Map
- Figure 2.2-1 Lardeau Creek Galena Lodge Average Monthly Precipitation (1989-2002)
- Figure 2.3-1 Regional Geology
- Figure 2.3-2 Property Geology
- Figure 2.3-3 960 m Level Plan Geology
- Figure 2.3-4 Geology Section A-B
- Figure 2.4-1 Pre-mine Topography and Surface Drainage Features
- Figure 2.5-1 Flow and Water Quality Sampling Stations
- Figure 2.7-1 Fish Sampling Locations in the Trout Lake Headwaters, 1980 and 1981
- Figure 2.7-2 1980 Aquatic Habitat Description and Fish Sampling Locations
- Figure 2.7-3 Benthic Sediment and Fish Sampling for Heavy Metals Analysis, 1981
- Figure 2.8-1 Surficial Materials
- Figure 2.8-2 Major Soil Associations
- Figure 2.11-1 MAX Claims
- Figure 2.11-2 Surface Rights
- Figure 3.2-1 Plan View of Existing and Proposed Underground Development
- Figure 3.3-1 Plan View of Existing and Proposed Underground Development
- Figure 3.3-2 Proposed Small Mine U/G Development Section Looking SE
- Figure 3.3-3 Isometric View of Existing and Proposed U/G Development Looking NE
- Figure 3.3-4 Proposed Small Mine U/G Development Looking North
- Figure 3.6-1 General Mine Site Layout
- Figure 4.3-1 Process Flowsheet
- Figure 4.5-1 Surface Water Management
- Figure 5.1-1 Tailings Facility
- Figure 5.1-2 Typical Dam Cross Section
- Figure 7.1 Areas of Proposed Development

LIMITATIONS OF REPORT

FortyTwo Metals Inc. (FortyTwo), a wholly owned subsidiary of Roca Mines Inc., prepared this report in support of their application for a 72,000 tonne per year mine and mill for their MAX Molybdenum Project. The material in it reflects the judgement of FortyTwo staff and its consultants in light of the information available to them at the time of report preparation.

1.0 INTRODUCTION

This British Columbia Small Mine Application is for a 72,000 tonne per year molybdenite mine and concentrator at FortyTwo Metals Inc.'s (FortyTwo) MAX Molybdenum Project. FortyTwo is a wholly owned subsidiary of Roca Mines Inc. (Roca). The project is located near the Village of Trout Lake in southeastern British Columbia, approximately 60 km southeast of the town of Revelstoke in the Trout Lake Valley (see Figure 1.1-1). Trout Lake has been the centre of mining and mineral exploration dating back to the 1890's. Known as the hub of the Lardeau mining boom, Trout Lake itself had five hotels and numerous services. The Windsor hotel remains as a working hotel, much of the rest of the town was abandoned around 1940. Currently 20 to 25 permanent, year-round residents live in Trout Lake.

The MAX property (formerly known as the Trout Lake property) has previously supported advanced exploration and pre-feasibility work. In the late 1970's and early 1980's, Newmont Exploration of Canada Limited (Newmont), in a joint venture with Esso Minerals Canada (Esso), conducted an advanced exploration program on the MAX property. An underground development adit was driven to gain access to the mineralized deposit for underground diamond drilling, bulk sampling and metallurgical testwork. The exploration adit, approximately 2000 m in total length, was developed through the centre of the deposit on the 960 m level.

During the bulk sampling program (1980 – 81), targeted mineralized material was mined, processed through a crusher and sample tower on site, with each of 189 blast rounds being placed in an individual stockpile. The majority of the ore piles were placed on top of a storage pad, constructed of overburden and adit development material that extended from the portal entrance. Advanced exploration facilities also included a 30-man exploration camp, core shed, core logging cabin and generator shed. Collection of baseline data was undertaken and deemed suitable for a Stage I Report for a 10,000 tonne/day mine and mill operation.

The joint venture between Newmont and Esso was terminated in 1989. Newmont purchased Esso's interest to bring their ownership in the project to 100%. Claims for portions of the site eventually lapsed in 1997, and were immediately staked by Emerald Gold Mines Inc. (Emerald). A program of reclamation was carried out by Newmont in 2003 and 2004 and approved by the B.C. Ministry of Energy and Mines (MEM, 2004b). The ministry noted that reclamation works were "substantial and of exemplary quality with self sustaining vegetation and all drainage systems functioning as per the design." The remaining obligations for the site have been assumed by Roca via permit MX-5-534.

Roca currently holds a valid Mines Act Permit (MX-5-534, amended March 10, 2005) for

advanced exploration at the site which allows for opening and securing of the old portal; underground rehabilitation; diamond drilling; and discharge of a final effluent not exceeding 25 mg/L total suspended solids (MEM, 2005). The operation proposed by FortyTwo in this application will essentially make use of the now re-established road access, portal and portal infrastructure that existed prior to the 2003/4 reclamation. A 500 tonne per day (tpd) concentrator will be constructed in close proximity to the portal adjacent to the existing reclaimed storage pad, with a small tailings storage facility located lower on the hill side. The mine and concentrator will operate on a campaign basis, alternatively developing and mining, with milling commencing once 2 to 3 months worth of ore has been readied for extraction. The intent of the mine development schedule is to produce and store ore in open stopes with minimal surface storage requirements. The concentrator will consist of a conventional grinding and flotation circuit that will operate for a total of approximately 6 months each year (180 days), at a nominal average of 400 tpd (500 tpd design with 80% availability) such that the annual throughput will be approximately 72,000 tonnes each year. Production of waste rock will be limited, as adit development has previously been completed. Approximately 104,000 tonnes of waste rock and/or low grade ore will be produced from declines and crosscuts excavated to access the lower parts of the proposed mine plan. These materials will be contained in two new waste rock storage areas located on surface, near the concentrator building.

The small mine plan advances development and production from a part of the deposit known as the "High-Grade" zone, defined by Mr. T.N. Macauley, P. Eng. This proposed plan does not limit or preclude expansion of the mine in the future.

This application has been compiled by FortyTwo, and consolidates earlier Newmont data with recent work conducted by FortyTwo's various consultants, including:

Climate and Hydrology	.....	Clearwater Consultants Ltd. (CCL)
Geology and Resources	.....	T.N. Macauley, P. Eng.
Metallurgy	.....	International Metallurgical and Environmental Inc. (IME)
Tailings Facility	.....	BGC Engineering Inc. (BGC)
ARD Geochemistry/Water Quality	.....	Mehling Environmental Management Inc. (MEMi)

Detailed information is provided in the individual reports found in the Appendices that form a part of this Small Mine Application.

2.0 BASELINE INFORMATION

2.1 Location and Site Access

The MAX property is located in southeastern British Columbia, approximately 60 km southeast of the town of Revelstoke in the Trout Lake Valley. The property lies in the Revelstoke Mining Division at longitude 117° 36' W and latitude 50° 38' N (National Topographic System map sheet 82K/12E; mineral title reference maps 082K052, 53, 62, 63, 72 and 73) as shown on Figure 1.1-1. The proposed mine surface facilities and concentrator building are situated at about 970 m elevation. The entire MAX claim area covers approximately 45 square kilometres (27 square miles).

Access to the MAX property is via Highway 23, then Highway 31 from the town of Revelstoke (on Trans Canada Highway and CPR mainline), with a driving distance of 80 kilometres (km) to the village of Trout Lake, followed by 6 km of logging roads to the mine site. The site can also be accessed from Nakusp to the south on Highway 23 and 31. Outside of the village of Trout Lake, the Trout Lake valley is sparsely populated and little infrastructure exists beyond roads, single phase residential power, telephone line and minor accommodation.

2.2 Climate and Air Quality

The property is located within the Columbia Mountains & Southern Rockies climate zone. This region has marked contrasts in climate. Valley bottom localities are semi-arid with warm summers and cold winters, like those found in the Grand Forks or Cranbrook areas. Upslope, and on the windward slopes of the Monashee, Selkirk, Purcell and Rocky Mountains, much higher precipitation and cooler temperatures are evident, like those found in the Revelstoke area.

A preliminary evaluation of hydrologic parameters applicable to the MAX project has been developed based on data from regional climate stations (Clearwater Consultants Ltd., 2005). Details of the climate evaluation are provided in Appendix I. Based on the proximity to the MAX site and the similarity in elevation, information from the regional climate station located 14 km east-northeast of the property at the Lardeau Creek Galena Lodge should be representative of localized site conditions. Monthly rainfall, snowfall and total precipitation for the period 1989 to 2002 gathered at the Lardeau Creek Galena Lodge station is shown in Figure 2.2-1.

Based on this regional data, it is expected that the MAX project area will receive an average of 1284 mm total precipitation per year consisting of approximately 56% snowfall and 44%

rainfall depending on local elevations. Snowfall occurs predominantly from November through March, with the area expected to receive an annual average of 718 mm rainfall equivalent as snow. Rainfall will dominate from May to September with the area expected to receive an average of 566 mm of rainfall per year. April and October will be transitional months that typically experience both rainfall and snowfall.

Annual lake evaporation at the MAX site area is estimated to be in the range of 350 mm to 400 mm per year, with maximum rates of about 100 mm per month in July/August. Potential evapotranspiration losses from vegetated areas may be equal to lake evaporation rates. Actual evaporative losses from disturbed ground are likely to range from 30% to 60% of lake evaporation rates.

Mean annual daily temperatures of 3.9 °C are expected at that the MAX site. The coldest month is typically December with a mean daily temperature of -7.7 °C and the warmest month is typically July with a mean daily temperature of 15.4 °C. Freezing temperatures have been recorded for all months of the year except July. Table 2.2-1 summarizes average monthly temperatures recorded at the Lardeau Creek Galena Lodge station from 1989 to 2002.

Table 2.2-1 – Lardeau Creek Galena Lodge Monthly Temperatures (1989 – 2002)

Month	Temperatures (°C)		
	Mean Daily	Mean Daily Maximum	Mean Daily Minimum
January	-7.0	-4.5	-9.5
February	-4.2	-0.8	-7.7
March	-0.4	4.3	-5.2
April	4.0	9.2	-1.2
May	8.4	14.8	1.9
June	11.9	18.5	5.5
July	15.4	22.7	8.0
August	15.2	22.6	7.8
September	10.7	17.3	4.0
October	3.5	7.3	-0.4
November	-2.6	-0.3	-4.8
December	-7.7	-5.4	-10.0
Annual	3.9	8.8	-1.0

Air quality baseline data was collected in 1980 (Beak, 1981) and 1981 (Beak, 1982), and focused on ambient dustfall information as no other significant contaminant sources were anticipated. Background dustfall analyses are shown on Table 2.2-2. Because of excessive

algae growth in the sampling equipment, the April 23 to May 21, 1980 data was considered unreliable, as were most of the 1981 data, and the samples were not considered analyzable. It was unknown why one high value of 4.62 mg/dm²/day was obtained, since the trend did not continue. Higher dustfall levels were noted during the summer months, and were likely a result of fugitive dust from vehicular traffic on gravel roads in the area.

Table 2.2-2 – Ambient Dustfall Data (mg/dm²/day)

Location	Above Portal	Wilkie Cr. Upstream road crossing	½ km west of Wilkie Cr. Mouth
23 April 1980 to 21 May 1980	2.02	0.70	1.78
14 August 1980 to 23 Sept. 1980	0.24	0.25	0.18
9 Dec. 1980 to 14 Jan. 1981	-	0.07	-
14 Jan. 1981 to 13 Feb. 1981	0.04	0.04	4.62
13 Feb. 1981 to 7 May 1981	0.08	0.12	0.09
4 June 1981 to 15 August 1981	0.27	0.12	0.28

(Modified from Beak 1981, 1982)

Beak (1981) noted that the air quality is believed to be pristine, typical of remote forested areas. Ambient levels of sulphur dioxide, nitrogen oxides, suspended particulate and dustfall were expected to be within Provincial and Federal ambient air quality objectives. The only air pollution of any consequence at the time was associated with slash burning after logging in the immediate vicinity of the exploration site.

2.3 Geology and Description of the Deposit

2.3.1 Regional Geology

The MAX property lies near the north end of the Kootenay Arc (Figure 2.3-1), a belt of highly deformed, heterogeneous sedimentary rocks arched around the eastern margin of the Nelson and Kuskanax batholiths, at the south end of the Lower Jurassic Shuswap metamorphic terrace (Boyle & Leitch, 1983).

According to Boyle and Leitch (1983), the oldest rocks in the district are from the Lower Cambrian—Middle Devonian aged Lardeau Group. This group consists primarily of schists, phyllites, and quartzites, with minor greenstone. These units have been tightly folded and strongly sheared in northwest-trending folds, which are broken into panels by northwest and north-trending faults. Unconformably overlying these rocks are conglomerate, limestone, and sandstone units of the Upper Mississippian aged Milford Group. Intrusives consist of the Jurassic aged Kuskanax Batholith, a monzonite dated at 178 Ma, which lies 5 km south of the property. In addition, a series of Jurassic to Cretaceous aged (150-74 Ma) calc-alkaline

stocks are also seen in the area and includes one on the property, which has been dated by K/Ar on biotite at 76.7 ± 2.9 Ma. Molybdenite (molybdenum disulphide or MoS_2) is associated with several of these stocks in the Kootenay – Upper Arrow Lake area.

Regional metamorphic grade increases from northeast to southwest approaching the Kuskanax Batholith. A 1.2 by 2 km contact metamorphic aureole about the stock has been recognised, exemplified by biotite hornfels in the pelitic rocks and an assemblage of muscovite – chlorite – tremolite – clinozoisite – plagioclase – K feldspar – quartz in the calc-silicates.

2.3.2 Deposit Geology

According to Macauley (1992 and 2004; Appendix IX), the Lardeau Group rocks in the vicinity of the deposit are silicified chlorite sericite biotite schists, and lesser argillite, slate, quartzite and hornfels. In general, the host meta-sediments strike northwest and dip $60\text{-}90^\circ$ northeast and are tightly folded with axes horizontal to moderately plunging.

Carbonate units interbedded with the clastics to the north and south of the deposit are limestone, dolostone, calc-silicate schist and skarn as shown on Figure 2.3-2. The latter includes a variety of rocks from calc-silicate hornfels to diopside garnet skarn, frequently with pyrrhotite and occasionally scheelite.

Intruding the Lardeau Group is the Trout Lake stock that is associated with the mineralizing fluids. The stock forms a network of intersecting dykes and irregular masses which appear to have been intruded in as many as four intrusive phases, with the earliest porphyritic granodiorite making up the bulk of the stock, followed by aplite dyking, and three varieties of granodiorite and quartz diorite. The dykes are inter-mineral, as they both cut off and are cut by mineralized quartz veins.

The stock measures about 50 to 100 m wide by 300 m long at surface; it has been traced by drilling to a depth of 1000 m where it broadens considerably, but its overall form is unknown.

Hydrothermal alteration studies around the deposit show a strong silica-potassic zone with molybdenite present at the centre, outward to a quartz-sericite-pyrite (phyllic) zone, and possibly an outermost zone where ankerite and chlorite are more prevalent. Molybdenite is strongly associated with alkali feldspars, but in detail is associated with incipient muscovite replacement of albite and K feldspar; veins that lack feldspars are typically barren of molybdenite (Boyle & Leitch (1983); Linnen et al (1995)).

Structural controls played a critical role in the emplacement of intrusions and mineralization at MAX. There is a strong, north-trending, vertical "Z" Fault, which bounds the stock on its east side and appears to have exerted a control on the location of the stock and subsequent mineralization. A post-mineral, east side downward movement is also indicated and other northwest-southeast faults have been mapped or interpreted. Many small conjugate and splay faults cut the deposit underground, but displacements are generally less than 10 m.

The deposit is a near vertical, pipe-like, quartz vein stockwork that extends from surface on the mountain ridge to a depth of at least 1,000 metres. Host rocks are siliceous schist, granodiorite dykes and the margins of a small granodiorite stock. To date, the deposit has been outlined by diamond drilling as summarized in Table 2.3-1.

Table 2.3-1 – Summary of Diamond Drilling

Year	Operator	Holes	No.	Length (m)
1970	Cascade Moly Mines	TL-1 to TL-6	6	992
1976	Newmont-Esso	76-1 to 76-7	7	2,772
1977	Newmont-Esso	77-1 to 77-3	3	1,712
1978	Newmont-Esso	78-1 to 78-5B	7	4,280
1979	Newmont-Esso	79-1 to 79-15	15	6,983
1980-81	Newmont-Esso (underground)	80-5, 80-6, 81-1 to 81-85	87	22,151
2004	Roca Mines	MM04-01 to 02	2	1,134
2005	Roca Mines (underground)	MU05-01 to 21	21	3,101
TOTAL			148	43,125

The deposit belongs to the most common type of porphyry copper and/or molybdenum deposits, where mineralization is related to a granitic or granodioritic intrusives that may be either a distinct stock or a phase of a larger batholith. In this type of deposit, mineralization is broadly dispersed in the form of disseminations or fracture filling veinlets, with sulphide mineral content seldom exceeding several percent. Ground preparation in the form of fracturing, faulting and brecciation to allow access by mineralizing fluids is important as stated above. The mineralization of interest may be confined to the intrusive body or largely present in the country rock adjacent to the intrusive. Dyking of the country rock by contemporaneous or later phases of the intrusive may be common. Mineralized quartz veins are common in molybdenum deposits, and where prevalent enough in a criss-crossing network the deposit is termed a stockwork (see Linnen et al. (1995); and Westra & Keith (1981)).

Dyke and quartz vein orientation at MAX follow this model and form conjugate patterns, with

northeast and northwest sets as well as north-south sets (see Figure 2.3-3) and lesser flat-dipping veins. Veining increases toward several centres associated with the intrusive apophyses (or large offshoots). Flat-dipping veins also become more prevalent in conjunction with randomly oriented veins to form a true stockwork (Boyle & Leitch, 1983).

Molybdenite mineralization has been intersected in drilling from surface to a depth of over 1000 m at the MAX property. As shown on Figure 2.3-4, the 0.10% MoS₂ contour defines the zone of mineralization and reveals a zoned form as described by:

- A smaller upper A Zone that occurs along the west side of the Z Fault for a length of 250 m, tapering inward in width to a depth of 300 m at the 1100 m elevation.
- Separated from the A Zone by about 70 m of weak mineralization, B Zone extends from 1200 m down to 600 m elevation with a lateral extent of 200 m by 300 m at the adit level (960 m elevation).
- Adjoining B Zone at the southeast side, C Zone comprises the mineralization lying on the east side of the Z Fault. Below the adit level, the B Zone assumes a steep southwesterly plunge and links with the D Zone.
- Within the B Zone and accessible by the existing adit is what is defined as the HG (or High Grade) Zone. This zone is defined as mineralization that could produce head grades in excess of 0.5% MoS₂ and is the target for this project.
- The D Zone has been traced by drilling for a length of 270 m and extends from 840 m down to 500 m elevation.
- Further southwest beyond the D Zone, two holes have intersected the F Zone (not shown on Figure 2.3-4).
- Mineralization is not delineated at depth, and the few holes reaching the 500 m elevation have shown widespread lower grade mineralization with occasional better grade intercepts.

Molybdenite is the only mineral of economic importance in the MAX deposit. Some of its yellow oxidation product (ferrimolybdite [Fe₂(MoO₄)₈H₂O]) is seen in surface trenches, but does not persist downward to the drill intercepts. Minor pyrite and pyrrhotite accompany the molybdenite, with pyrite predominating on the margins of the deposit and pyrrhotite more abundant in the centre. Total sulphide content averages about 1 to 2% and runs as high as 10 to 15% in the higher grade zones. Very minor chalcopyrite and rare traces of sphalerite, galena and scheelite have been noted in the mineralized zones, and have received exploration attention in the past where they occur in veins or skarns outside the molybdenite deposit.

Molybdenite occurs as fine to medium flakes and rosettes and is accompanied by pyrite/pyrrhotite, mainly along the margins of veins in a quartz stockwork. In the HG Zone (>0.5% MoS₂), it is strongly disseminated in microfractured intrusive bodies accompanied by

large (>10 cm) quartz veins and intense quartz flooding. The vein stockwork is best developed in and around the margins of the intrusive and its dyke-like apophyses (offshoots). Thus the major control on mineralization is the location of the schist-intrusive contact; a lesser control is exerted by pre-mineral faults. The centre of the large granodiorite mass is virtually devoid of veining and mineralization. Post mineral faults have been observed in core to cut off good grade mineralization, but in underground exposure the displacements are seen to be only minor adjustments between blocks. The inter-relationships of cross-cutting, veining and faulting show a suitably complex style of repeated opening of fractures and regeneration of mineralizing fluids as an intrusive differentiated at depth (Boyle & Leitch, 1983).

With regard to continuity of mineralization, the 0.10% MoS₂ grade contour was used to outline the deposit on plan and sections. As can be appreciated in this type of deposit, material below this grade can occur within that contour and some isolated drill intersections at a higher grade can occur beyond the 0.10% shell. Within the 0.10% outline, grade contours were developed at the 0.20, 0.25 and 0.50% MoS₂ levels. Where drill hole density was sufficient, the better grade material generally showed reasonably good continuity. Above the 0.50% cutoff level the extent is less certain, with the important exception of the HG Zone that is exposed near the southwest end of the adit and establishes the current mining resource for the MAX project.

2.4 Topography and Surface Drainage Features

The MAX site is located on the moderately sloping northeast side of Trout Mountain, a peak in the Selkirk Range of southern British Columbia about 4 km west of Trout Lake. The upland areas of the Selkirk Mountains are strongly sculpted by alpine glaciation, and bedrock is frequently exposed at elevations above 1067 m (3500 feet). Below this elevation, outcrops are sporadic and appear to be located on steep slopes of deeply incised creek valleys or on spurs of resistant rock.

The property extends from the Trout Lake valley, at elevation 760 metres (m) (2500 feet) on the north, for 8 km south to the peak of Trout Mountain at elevation 2700 m (8800 feet). Slopes are moderate in the northeast portion of the property where the bulk of exploration has been focussed to date, but steep on the west side and the higher ground to the south. Topography of the area is shown in Figure 2.4-1 (also see Macauley, 2004; Appendix IX).

To the north of the MAX property lies a broad, northwesterly trending valley flanked on the northeast by the steep mountains of the Badshot Range, and on the southwest by the the Lardeau Range. The valley is occupied by Armstrong, Staubert and Trout Lakes, and is drained to the northwest by Beaton Creek and to the southeast by Wilkie Creek.

Beaton and Wilkie Creeks drain in opposite directions dividing the Trout Lake valley between these two drainage basins. Beaton Creek flows into the Upper Arrow Lake, while Wilkie Creek flows into Trout Lake. The low divide that separates these drainage basins is approximately 4 km northwest of the mine adit. Because the elevation difference in the valley between these drainages is not great, a swampy area occupies most of the 1 km length in the headwater zone between the two creeks.

Drainage patterns adjacent to and along the Trout Lake valley appear to be controlled by the regional bedrock structure. Trout Lake valley runs along the regional structural trend of folded meta-sedimentary bedrock. Tributary valleys containing the headwaters of Wilkie and Beaton Creeks as well as numerous other creeks, feed into the valley in a direction normal to the regional strike. It is possible that the tributaries are controlled by a dominant joint set (Klohn Leonoff, 1981).

The largest stream in the vicinity of the mine is Wilkie Creek. Other tributaries that drain into the north end of Trout Lake include Lardeau Creek, Asher Creek and Humphries Creek (confluence with Wilkie Creek immediately upstream of mouth at Trout Lake). Trout Lake drains in a southerly direction via the Lardeau River into the Duncan Lake/Kootenay Lake system, which joins the Columbia River near Castelgar, B.C. These surface drainage features are shown in Figure 2.4-1.

2.4.1 Stream Flow

In conjunction with Newmont's exploration and development of the Trout Lake property in the 1980's, a monitoring program at the site was established to measure stream flow. Three locations were monitored at Wilkie Creek, Humphries Creek and the Adit outflow (see Table 2.4-1). The locations of the streamflow monitoring points are shown on Figure 2.5-1. Flow measurement hydrographs for Wilkie Creek (between 1980 and 1981) and flow measurements collected at Humphries Creek (between Nov. 21, 1980 to Oct. 20, 1981) are provided in Appendix II. Regional stream flow data are also available from the Water Survey of Canada as summarized in Table 2.4-2.

The average monthly distribution of flow during the year and estimated average monthly flows at four locations in the Wilkie Creek catchment area were based on the site monitoring data from the early 1980's and regional data provided below. These estimated values are provided in Table 2.4-3. The highest proportion of the annual flow (over half of the annual flow) in the Wilkie Creek catchment occurs from May through July/August with the other months of the year having relatively similar estimated flows.

Table 2.4-1 – Stream Flow Monitoring Locations

Station	Frequency of Data	Period of Record	Flow Rates
			Average (Range) m ³ /s
Wilkie Creek	Continuous	May 30/80 - Nov. 21/80	(0.6 to 11)
	Weekly	Nov. 21/80 - May 15/81	
	Continuous	May 15/81 - Oct. 19/81	
Humphries Creek	Weekly	Jul. 16/80 - Oct. 20/81	0.42 (0.06 to 1.13)
Adit Outflow	Daily	Mar. 11/80 - Jun. 16/82	0.11 (0.07 to 0.16)

(from Klohn Leonoff, 1982)

Table 2.4-2 - Regional Stream Flow Data

Station Name	Station Number	Catchment Area km ²	Period of Record	Average Annual		
				Flow m ³ /s	Flow L/s	Runoff Depth mm
Keen Creek below Kyawats Creek	08NH132	92.2	1973-93	3.29	3,290	1125
Carney Creek below Pambrun Creek	08NH131	118	1973-93	4.50	4,500	1203
Fry Creek below Carney Creek	08NH130	461	1973-93	18.9	18,900	1293
Lardeau River at Marblehead	08NH007	1620	1917-93	56.7	56,700	1104

Table 2.4-3 – Wilkie Creek Catchment Average Monthly Flows

Month	% of Annual Flow	Estimated Average Monthly Flows L/s			
		Wilkie Creek Inlet D	Inlet D at Wilkie Creek	Wilkie Ck above Inlet D	Wilkie Creek at Mouth
Jan	3.6%	130	160	1,520	1,650
Feb	2.4%	90	120	1,120	1,220
Mar	2.3%	80	100	970	1,060
Apr	4.3%	160	200	1,880	2,040
May	18.0%	640	810	7,620	8,270
Jun	28.0%	1,020	1,300	12,200	3,300
Jul	19.0%	670	850	8,040	8,730
Aug	7.1%	250	320	3,000	3,260
Sep	4.0%	150	190	1,750	1,900
Oct	3.9%	140	170	1,650	1,790
Nov	3.8%	140	180	1,660	1,800
Dec	3.6%	130	160	1,520	1,650
YEAR	100%	300	380	3,590	3,900
Catchment Area km ²		8.7	11.0	104	113

The adit outflow (or portal flow) has also been monitored over different periods of time from the early 1980's during Newmont's exploration work through to 2002 during reclamation of their exploration activities. Table 2.4-4 represents the monthly average portal water flow

rates for those time periods on record. Flow rates have gradually changed since the adit was developed, with the highest value measured in October 1980 (2120 gpm or 160 L/s). The lowest measured flow rate was in August 2002 at 436 gpm (33 L/s). In the late 1990's, a beaver constructed a dam in the settling pond immediately outside the portal. As a result, the September 1997 and May 1998 flow rates were estimated based on the overflow from the beaver dam at the portal. The volume of portal flow has decreased since the advanced exploration program in 1980 as a result of the reduction in hydrostatic pressure as the adit was developed (Rescan, 2003a). It is expected that the flow rates have since stabilized and will remain around 450 to 500 gpm (34 to 38 L/s) on an ongoing basis. This represents less than 1% of the flow in Wilkie Creek (based on 1981 Wilkie Creek hydrographs, Appendix II).

Table 2.4-4 – Monthly Average Adit Flow Rates from 1980-2002

Year	Month	Monthly average adit water flow rate (gpm) ¹	Monthly average adit water flow rate (L/s)
1980	September	1984	150.4
	October	2120	160.7
	November	1898	143.9
	December	1700	128.9
1981	January	1562	118.4
	February	1464	111.0
	March	1333	101.0
	April	1356	102.8
	May	1885	142.9
	June	1757	133.2
	July	1539	116.7
	August	1432	108.5
	September	1398	106.0
	October	1243	94.2
	November	1125	85.3
	December	1037	78.6
1982	January	1000	75.8
	February	1000	75.8
	March	948	71.9
	April	950	72.0
	May	1550	117.5
1997	September	400 ^a	30.3
1998	May	500 ^a	37.9
2002	May	450*	34.1
	August	436	33.0
2004	September	395*	29.9

¹ - values from Rescan, February 2003 (2003a)

* - values from Rescan, October 2004 (2004b)

^a - Estimated values based on the overflow at the beaver dam at the portal

2.5 Water Quality

2.5.1 Surface Water Quality

Surface water quality data is available from several different time periods as a result of past exploration and reclamation activities on the site and current efforts by the proponent. The earliest available data was collected by Newmont from 1978 to 1982 from 13 sampling stations on creek tributaries to the north end of Trout Lake as described in Table 2.5-1 and shown on Figure 2.5-1.

Table 2.5-1 – Historical Water Quality Sampling Stations

Station Number	Description
1	Tributary to Upper Wilkie Creek
2	Wilkie Creek - upstream of road crossing
3	Upper catchment of Edward Creek (tributary to Wilkie Inlet D)
4	Minnie Creek at road crossing (tributary to Wilkie Inlet D)
5	Wilkie Inlet D - above confluence with Wikie Creek
6	Wilkie Creek - upstream of confluence with Wilkie Inlet D (tributary draining the mine portal)
7	Mouth of Wilkie Creek at Trout Lake – downstream of confluence with Wilkie Inlet D
8	Lardeau River at Gerrard
9	Mouth of Lardeau Creek at Trout Lake
10	Lardeau Creek
11	Beaton Creek
12	Mine Portal Discharge
13	Settling Pond Discharge

Subsequent to Newmont’s activities, Rescan conducted water quality sampling in 1997, 1998, 2002 and 2004 as part of Newmont’s reclamation activities. Data collected during these sampling events was attained from 3 sites as summarized in Table 2.5-2 (i.e. discharge from the portal area and 2 background sites). While sampling locations utilized by Newmont and Rescan do not correlate, they provide important snapshots of data in the area over the past 27 years. The most recent dataset used to evaluate baseline surface water quality for the MAX Molybdenum Project consists of results from 6 sampling locations collected by MEMi on May 22, 2005. The sampling locations in this program were selected to correspond to areas of interest with respect to the proposed infrastructure for the MAX project (also shown on Figure 2.5-1 and described in Table 2.5-2).

The results of the above surface water sampling programs are compiled in Appendix III. Analyses of the samples from the various programs were undertaken at different laboratories and, in some instances, for different suites of parameters and with different detection limits

as indicated in the appendix. Water quality was analyzed by B.C. Research from 1978 to 1980 and by Beak Consultants Ltd. from 1980 to 1982. Recent analyses were conducted at ALS Environmental.

Table 2.5-2 – Recent Water Quality Sampling Locations

A. Samples collected by Rescan as part of Newmont's reclamation activities.		
Sample	Date	Description
TL-1	Sept, 1997	Portal discharge
TL-2	Sept, 1997	Portal discharge 5 m from entrance
TL-3	Sept, 1997	Portal discharge near ore pile
TL-4	Sept, 1997	Portal discharge adjacent to metal drums of ore
TL-5	Sept, 1997	Portal discharge at outlet of beaver dam
BG	Sept, 1997	Background water sample from stream approximately 1 km down access road
BG-2	Sept, 1997	Background water sample from stream approximately 2 km down access road
WS 1	May, 1998	Overburden rock pad seep
WS 2	May, 1998	Portal discharge
Trout Lake #1	Aug, 2002	N/A
	Aug, 2002	Inlet to Sedimentation Pond
	Aug, 2002	Discharge from Sedimentation Pond
RMO1	Sept, 2004	Portal discharge pipe at the manhole sampling point
RMO2	Sept, 2004	Water discharge through the french drain
RMO3	Sept, 2004	200m down slope from the french drain towards Wilkie Creek
B. Samples collected by MEMi as part of 2005 baseline studies (see Fig. 2.5-1)		
Sample	Date	Description
A	May, 2005	In creek at NW end of proposed tailings facility (UTM 0459255, 5611391)
B	May, 2005	In Wilkie Inlet D, down gradient from proposed mine site location, above old road crossing (UTM 0459515, 5610631)
C	May, 2005	In Wilkie Inlet D, below confluence with 'creek'/bog at SE end of proposed tailings facility and seepage pond (UTM 0460052, 5610503)
D	May, 2005	Portal settling pond discharge (UTM 0458421, 5610642, ~Historic station 13)
E	May, 2005	In Minnie Creek upstream of site access road above confluence with proposed mine site drainage (UTM 0459540, 5610269, ~Historic station 4)
F	May, 2005	Mouth of Wilkie Creek at bridge crossing, downstream of confluence with Wilkie Inlet D (UTM 0461486, 5609753, ~Historic station 7)

In general, the water quality in the MAX area can be defined as Ca-Mg-HCO₃ type, pH neutral to slightly alkaline water with low conductivity. Certain locations report marginally elevated concentrations of sulphate and molybdenum, as well as total iron, and concentrations vary somewhat over time as a result of different activities being undertaken at the site during the different sampling time periods. The results have been compared to

the Canadian Council of Ministers of the Environment (CCME, 1999) and Ministry of Water, Land and Air Protection (BC MELP, 1998a and b) water quality guidelines for the protection of freshwater aquatic life to assess the water quality in the area over the past 27 years. The guidelines used for comparison are summarized in Table 2.5-3 below.

Table 2.5-3 – Selected Canadian and B.C. Water Quality Guidelines for the Protection of Freshwater Aquatic Life

Parameters	CCME Guidelines ^a	BC Guidelines ^b
pH	6.5 - 9.0	6.5 - 9.0
Total Alkalinity	None	at 50 mg/L* and 120 mg/L**, low sensitivity to acid inputs
Sulphate	None	100 mg/L (maximum level)
Dissolved Aluminum	0.005 mg/L at pH <6.5 0.10 mg/L at pH ≥ 6.5	value is pH dependent at pH < 6.5 ^c 0.1 mg/L at pH ≥ 6.5
Total Arsenic	0.005 mg/L	0.005 mg/L
Total Cadmium	0.000017 mg/L	0.00002 mg/L at 50 mg/L* [CaCO ₃] 0.00004 mg/L at 120 mg/L** [CaCO ₃]
Total Chromium	0.001 mg/L Cr(VI) 0.0089 mg/L Cr(III)	0.001 mg/L Cr(VI) 0.009 mg/L Cr(III)
Total Copper	0.002 mg/L at 0-120 mg/L [CaCO ₃]	0.007 mg/L at 50 mg/L* [CaCO ₃] 0.013 mg/L at 120 mg/L** [CaCO ₃]
Total Fluoride	None	0.2 mg/L at <50 mg/L* [CaCO ₃] 0.3 mg/L at ≥ 50 mg/L [CaCO ₃]
Total Iron	0.3 mg/L	0.3 mg/L
Total Lead	0.001 to 0.007 mg/L	0.034 mg/L at 50 mg/L* [CaCO ₃] 0.10 mg/L at 120 mg/L** [CaCO ₃]
Total Manganese	None	1.1 mg/L at 50 mg/L* [CaCO ₃] 1.9 mg/L at 120 mg/L** [CaCO ₃]
Total Molybdenum	0.073 mg/L	2 mg/L
Total Nickel	0.025 – 0.15 mg/L	0.025 mg/L at 50 mg/L* [CaCO ₃] 0.065 mg/L at 120 mg/L** [CaCO ₃]
Total Selenium	0.001 mg/L	0.002 mg/L
Total Zinc	0.03 mg/L	0.033 mg/L at 50 mg/L* [CaCO ₃] 0.056 mg/L at 120 mg/L** [CaCO ₃]

Notes:

a Canadian Council of Ministers for the Environment (CCME) Canadian Environmental Quality Guidelines (CCME, 1999, with Summary Table December 2003)

b Compilation of Approved (BC MELP, 1998a) and Working (BC MELP, 1998b) Water Quality Guidelines for British Columbia

c when pH <6.5, dissolved Al = $e^{(1.209 - 2.426(\text{pH}) + 0.286(\text{K}))}$ where K = pH²

* Hardness of 50 mg/L [CaCO₃] typical of Wilkie Creek (receiving water environment)

** Hardness of 120 mg/L [CaCO₃] typical of portal mine water

Immediately before and during Newmont's exploration activities at the site (1978-1982), water quality results indicate that the creeks in the Max area had a normal pH of 7.8 to 8.0, typical of natural waters containing some hardness and bicarbonate alkalinity. Exceptions

were sample station 2 (Wilkie Creek – upstream road crossing), station 6 (Wilkie Creek - upstream of confluence with Wilkie Inlet D) and station 7 (mouth of Wilkie Creek at Trout Lake – downstream of confluence with Wilkie Inlet D) that had a slightly lower pH although still neutral (pH range from 7.0 to 8.1) that could be due to the effect of natural organic acids, and/or the effect of accumulations of snow-melt water. In general, the waters have low to moderate hardness, typically about 40 to 70 mg/L CaCO₃, with a range from 20 to 120 mg/L. The historic portal water (station 12) and sedimentation pond water (station 13) had slightly higher hardness in the range of 103 to 138 mg/L CaCO₃.

Total metals were not analysed in this dataset (1978-1982), so the dissolved metal concentrations have been used as a preliminary comparison of the historical data to the guidelines above. In general, the water quality in the area during this period met CCME and BC MWLAP guidelines with a few minor exceptions (see Appendix III). Specifically, these exceptions consisted of marginally elevated concentrations of iron at stations 7 and 2 (Wilkie Creek – downstream of confluence with Wilkie Inlet D and Wilkie Creek – upstream road crossing) and zinc at station 4 (Minnie Creek at road crossing). These exceedances, however, were rare in the dataset. Of note was that most of the stations monitored during this phase showed marginally elevated dissolved zinc levels (although below guidelines) for the period from July 1980 through to 1982 (i.e. during advanced exploration activities) compared to the levels for the two years previous. It would not appear that this was an effect of mine water drainage per se as the mine water analyses over the same period demonstrated low zinc levels. It also does not appear that these marginally elevated zinc levels were an effect of associated activities on site since over the same period, increased zinc levels were also noted in Edward Creek (station 3) and Minnie Creek (station 4), both tributaries to Wilkie Inlet D that are not influenced by mine water. The higher zinc concentrations may be a result of a switch in laboratory analyses from B.C. Research to Beak Consultants in mid-1980. Many elements were below the detection limits used by the laboratories during this period, including dissolved arsenic, cadmium and mercury. A few lead analyses were reported just above the detection limit and marginally exceeded the CCME guideline of 0.001 to 0.007 mg/L, however these exceedances are questionable due to the comparatively high detection limits used (up to 0.01 mg/L).

The mine portal water (station 12) during this phase (1978-1982) reported marginally elevated sulphate concentrations (ranging from 29-55 mg/L) compared to the creek and tributary stations monitored in the area (typically <15 mg/L). Molybdenum in the mine water slightly exceeded the CCME guideline of 0.073 mg/L on 3 occasions in 1981 (0.08, 0.14 and 0.08 mg/L Mo), however it did not exceed the BC criteria of 2 mg/L. Although mine water was occasionally elevated in molybdenum, this appeared to have very little impact on the water quality of Wilkie Inlet D, the creek draining the mine portal, as molybdenum values in Wilkie Inlet D downstream of the mine portal (station 5) were similar

to values in Edward Creek (station 3), considered a background monitoring station. Iron concentrations, which were consistently higher at station 5 (Wilkie Inlet D) compared to station 3 (Edward Creek), indicates there may have been some minor influence of mine water on Wilkie Inlet D. However, even though the iron concentrations were higher in Wilkie Inlet D, values were below the CCME and BC criteria of 0.3 mg/L total iron. Overall, Wilkie Inlet D did not appear to be significantly influenced by drainage from the mine portal.

Similarly, Wilkie Creek did not appear to be influenced by portal drainage from Wilkie Inlet D, as water quality in Wilkie Creek was comparable upstream (station 6) and downstream (station 7) of its confluence with Wilkie Inlet D. One exception was iron that was slightly higher at station 7 than at station 6; however, iron values were still predominantly below CCME and BC criteria of 0.3 mg/L total iron.

In association with the reclamation studies, but prior to reclamation activities commencing, water quality data was again collected from the portal area (in 1997, 1998 and 2002). At this time the portal water still reported slightly elevated total molybdenum (0.071 to 0.203 mg/L) and occasionally elevated total iron (maximum 7.04 mg/L) in the portal discharge. Molybdenum values exceeded the CCME criteria of 0.073 mg/L but did not exceed the BC total molybdenum criteria of 2 mg/L. The iron exceedances were above both the CCME and BC criteria of 0.3 mg/L total iron. On one sampling occasion (1998), total arsenic was also somewhat elevated in the portal sample (0.0082 mg/L). This is likely to have been in association with the higher total iron and suspended solids in the same sample. The corresponding dissolved concentrations of iron and arsenic were low. Water samples (BG and BG-2), collected in 1997 downstream of the portal met all CCME criteria except for the iron concentration at BG (0.35 mg/L) indicating that portal water quality did not have a significant impact on creeks downstream of the portal.

Seepage from the storage pad, where bulk sample round rock piles were stored on surface for 20 years, was also sampled in 1998 prior to reclamation. Seepage was reported as pH neutral (pH 7.8) with total metals below water quality criteria with the exception of molybdenum at 0.172 mg/L (above CCME but below BC criteria). This suggests that molybdenite oxidation did occur over time from the exposed materials thereby releasing molybdenum (note molybdenum is mobile in neutral pH conditions).

In 2003, the site was reclaimed by Newmont and met the requirements outlined by the Ministry of Energy and Mines, thereby allowing permit MX-5-55 held by Newmont to be closed. The portal reclamation consisted of backfilling, sealing, recontouring and revegetating. This included the installation of a drainage collection pipe for the continuing portal flow that ended at a french drain (Rescan, 2003b). The year following reclamation activities (i.e. 2004), the portal water, the discharge from the french drain and water 200m

down slope from the french drain all met the CCME and BC criteria for all parameters, including molybdenum and iron.

The most recent sampling campaign, in May of 2005, was conducted to provide baseline information at locations specific to the MAX project's proposed infrastructure, although underground exploration was active at the time. The results indicated that water quality in the area is similar to that identified in previous studies and below the appropriate guidelines, with the exception of the sample collected down gradient of the (reconstructed) settling pond at the portal exit (Sample D) as well as the next sample downstream (Sample B). Sample locations are shown on Figure 2.5-1. Sample D reported values marginally under the guidelines for total As, and above the guidelines for total Cd, Cr (if present as Cr(VI), but speciation analyses were not done), Cu, Fe, and Mo (CCME criteria, but not BC MELP). For all these parameters except Mo, the dissolved concentrations were less by at least an order of magnitude and in most cases were below detection limits indicative of the influence of suspended solids on the water chemistry. Molybdenum values however were substantially present in the dissolved phase. Sample B, in Wilkie Inlet D downstream of the portal, reported relatively good water quality with the exception of total Fe and total and dissolved Mo concentrations that were reported just at the CCME guidelines for these parameters. Further downstream in this tributary (i.e at Wilkie Inlet D), values were below the guidelines for all parameters.

The area proposed for tailings storage is represented by two samples (Samples A and C) which both demonstrate good water quality that meets the appropriate CCME and BC MELP guidelines for all parameters. Although Mo concentrations in Sample C are elevated somewhat (0.06 mg/L), they are still below the CCME guideline and well below the BC MELP guideline. This sample was collected below the confluence with the tributary draining the proposed mine site area and is likely a result of the elevated Mo concentrations seen at the reconstructed settling pond (Sample D) rather than a localized source.

Based on all data sets available, the surface water quality in the MAX area has been demonstrated to be of relatively good water quality. Other than occasional exceedances above guidelines of certain parameters (notably Mo and Fe) during times of activity (1980-1981) and ore bulk sample exposure on the site (up to 2003), the water quality of the portal and immediately surrounding areas has historically met water quality criteria protective of aquatic life in the receiving environment. Samples collected following reclamation activities suggest these potential exceedances were localized to the sampling stations immediately down gradient of the portal discharge (and reconstructed settling pond). Concurrent sampling in Wilkie Inlet D downstream of these areas has consistently shown good water quality, as have the samples collected immediately to the NW and SE of the proposed tailings facility.

2.5.2 Groundwater Quality

Relatively little information is available about the hydrogeology and hydrogeochemistry in the MAX area. The groundwater system has generally been described to follow topography, flowing downgradient into the unconsolidated floor deposits of the Trout Lake valley. The outwash sands and gravels, as well as alluvial fans, in the valley may provide relatively large aquifers. Such aquifers would be recharged by runoff from the adjacent mountain slopes, and in turn would discharge to topographic depressions, stream channels and lakes along the valley (Klohn Leonoff, 1980).

To date, although considerable surface water quality data is available, no groundwater quality data has been collected in the project area. Perhaps the only analogous water quality data on record for groundwater would be the water draining out of the portal, sourced primarily from the Z fault as previously described. While technically this is surface water when discharged at the portal, it has been used here to approximate the groundwater quality associated with the MAX deposit. As described in Section 2.5.1, during exploration activities in the 80's water quality from the portal was marginally elevated above general guidelines with respect to certain parameters as would be expected. Recent analyses of this water would describe it as pH neutral water Ca-Mg-SO₄-HCO₃ type water generally with low metals. Most metals are below detection and those that are measurable are within applicable guidelines for the protection of aquatic fish with the exception of total iron and molybdenum that report marginally elevated concentrations that are attenuated or diluted to appropriate standards before the confluence to Wilkie Inlet D. In considering this water monitoring as potentially representative of groundwater, it should be noted that if the groundwater redox conditions are reducing, as may be expected, the mobility of Mo in particular would be much less than in an oxidized discharge. Similarly, it is likely that the total iron concentrations are a reflection of inputs to the discharge between the Z fault and the portal exit and may not be indicative of total iron in the groundwater itself.

At this time, the groundwater in the immediate vicinity of the deposit is assumed to be similar to, or better than the current portal discharge water quality.

2.6 Sediment Quality

Sediment analyses were conducted in 1981 to provide baseline data on the concentrations of heavy metals in creek sediments (Beak Consultants, 1982). This consisted of sediment samples at 3 stations in the Trout Lake study area corresponding to Newmont's water quality sampling Stations 5, 6 and 7 (see Section 2.5.1).

Station 5 (Wilkie Inlet D), the station that receives the water draining from the exploration

adit, showed no appreciable difference in the content of heavy metals in comparison to stations both upstream (station 6) and downstream (station 7) of the confluence of this inlet with Wilkie Creek (see results tabulated in Table 2.6-1) with the notable exception of molybdenum. Molybdenum at station 5 was 12 µg/g (dry wt. basis) while at stations 6 and 7 molybdenum values were low (1.0 and 0.55 µg/g dry wt. basis, respectively). Arsenic and lead were also slightly higher at station 5 (Wilkie Inlet D) than the Wilkie Creek sediments (stations 6 and 7), whereas iron was slightly higher in the upstream Wilkie Creek sediment (station 6) at 32,000 µg/g (dry wt. basis) than at stations 5 and 7 at 20,000 µg/g and 21,000 µg/g (dry wt. basis), respectively. The levels of cadmium, copper, zinc and silver reported at station 5 in Wilkie Inlet D were similar to those recorded at stations 6 and 7 in the upstream and receiving Wilkie Creek sediments (Table 2.6-1).

These sediment results were compared to the CCME Interim Sediment Quality Guidelines for Freshwater Sediment (dry wt. basis) (CCME, 1999) to assess the baseline quality of the sediments in the area. As shown in Table 2.6-1, cadmium levels in sediment at stations 5, 6 and 7 (1.0, 1.1 and 0.74 µg/g) were slightly elevated exceeding the cadmium sediment guideline of 0.6 µg/g. Arsenic was also elevated at stations 5 and 6 (8.7 and 6.2 µg/g) compared to the corresponding guideline of 5.9 µg/g. No guideline has been established for the concentration of molybdenum in freshwater sediment. The cadmium and arsenic exceedences were only marginally elevated above guidelines and given the date of collection (1981) and the fact that these parameters were elevated in all stations, including that upstream of the Wilkie Inlet D, are assumed to be an indication of naturally elevated concentrations in a mineralized area.

Table 2.6-1 – Sediment Sample Analysis, 27 October 1981

Parameter	Station 5 *		Station 6		Station 7		CCME Sediment Quality Guideline**
	Wet Wt. Basis	Dry Wt. Basis	Wet Wt. Basis	Dry Wt. Basis	Wet Wt. Basis	Dry Wt. Basis	
Total Arsenic	4.4	8.7	3.6	6.2	2.8	3.9	5.9
Total Cadmium	0.51	1.0	0.67	1.1	0.56	0.74	0.6
Total Copper	8.5	17	14	22	13	17	35.7
Total Iron	10,000	20,000	20,000	32,000	16,000	21,000	-
Total Lead	9.8	20	8.7	14	7.8	10	35
Total Mercury	<0.012	<0.024	<0.011	<0.018	<0.011	<0.014	0.17
Total Molybdenum	6.1	12	0.63	1.0	0.42	0.55	-
Total Silver	<0.70	<1.4	0.58	0.95	0.74	0.96	-
Total Zinc	29	58	48	78	42	56	123
% Moisture	50	-	39	-	24	-	-

Notes: All metal values expressed in µg/g

(Modified from Beak, 1982)

Bold values exceed CCME Sediment Quality Guideline

* Station numbers correspond to water quality stations

** CCME Interim Sediment Quality Guideline (ISQG) for Freshwater Sediment, Dec. '03 Summary Table (Dry Wt. Basis)

2.7 Fisheries and Aquatic Resources

Fisheries and aquatic resources in the region were evaluated on behalf of Newmont in 1980 and 1981 by Beak Consultants Ltd to provide the baseline data on fish utilization of creeks tributary to the north end of Trout Lake (Beak Consultants, 1981 and 1982). These results built on earlier government work (Burns, 1978) identifying the lower section (Reach 2) of Wilkie Creek as providing important spawning and rearing habitat, Wilkie Creek being the only tributary to Trout Lake that exhibits extensive gentle gradients.

Trout Lake itself is an extremely oligotrophic type lake (i.e. with low concentrations of nutrients), and has been generally classified as deep, cold and unproductive; with shallow shoreline zones (less than 10 m depth) comprising only 2.88% of the total surface area (Larkin, 1951). It is located in the headwaters of the Kootenay River system and drains into Kootenay Lake via the Lardeau River outlet at the south end. Tributaries on the south end of the lake mostly consist of small tributaries that have very steep gradients immediately upstream of their mouths and as a result, are generally unsuitable as fish habitat. The tributaries located at the north end of the lake, however, are utilized by fish. These fish bearing inlets include: Wilkie, Asher, Humphries and Lardeau Creeks which are all shown on Figure 2.4-1.

The studies undertaken for Newmont were designed to evaluate the relative abundance of fish in Wilkie Creek and other headwater inlets, and to provide information on rearing juveniles, spawner distributions, run timing and aquatic habitat. The aquatic fields program consisted of five components:

1. In-stream surveys – to monitor the relative and seasonal abundance of fish species in the Trout Lake headwater inlet streams, their life history characteristics and distribution, and relate the data to aquatic habitat (1980 and 1981).
2. Spawning surveys – to monitor the numbers, timing and distribution of spawning fish in the Trout Lake headwaters (1980 and 1981)
3. Seine survey – to investigate the presence of rearing salmonoid fish on the Trout Lake shoreline at the northwest end of the Lake (1981).
4. Heavy metals analysis in fish tissue collected from Wilkie Creek (1981)
5. Aquatic invertebrate inventory – to provide baseline benthic invertebrate data for Wilkie Creek and the Wilkie Inlet D, the tributary draining the portal (1981)

Fish sampling locations in the Trout Lake Headwaters for 1980 and 1981 are provided in Figure 2.7-1. Detailed results of the 1980 and 1981 aquatic assessments are attached in Appendices IV and V respectively (Beak Consultants Ltd., 1981 and 1982). These studies showed that the north end of Trout Lake valley contains populations of Dolly Varden Char,

Kokanee and Rainbow Trout. Of the streams in the Trout Lake valley, Wilkie Creek contains the most important fish habitat, as it is the only drainage in the immediate area that contains extensive gentle gradient sections.

For Newmont's assessment, Wilkie Creek was divided into six distinct reaches as shown on Figure 2.7-2. Aquatic habitat descriptions and fish sampling locations in the Wilkie Creek drainage are also shown on this figure. The study suggested that the most important habitats in Wilkie Creek are located in Reach 2, defined as the Wilkie Creek lowlands, located approximately 2 km to 10 km upstream of its mouth and upstream of the confluence with Wilkie Inlet D that will drain the proposed mine and tailings area. This reach contains the gravels required by Kokanee and Rainbow Trout for reproduction. Dolly Varden were also found in Wilkie Creek, distributed evenly over its entire length. This species is also reported to be widespread in other Trout Lake headwater tributaries including Asher, Lardeau and Humphries Creeks.

Wilkie Inlet D enters Wilkie Creek at the break between Reach 1 and 2. Its downstream portion flows unconsolidated through a willow bog and breaks into many channels at its mouth at Wilkie Creek. Approximately 1 km from the confluence, the gradient increases and the creek flows through a series of beaver dams. The creek was initially considered barren as spring 1980 surveys did not result in fish capture. However, during low flows in the summer of 1980 and 1981, salmonids were taken by electroshocker near the mouth of this creek (Beak Consultants Inc., 1981 and 1982, and Figure 2.7-2). No fish were detected at the upper station in Wilkie Inlet D established in 1981 (station 3, Figure 2.7-1).

Fish sampling for heavy metals analysis was also conducted at this time. Locations are shown in Figure 2.7-3 and summarized in Table 2.7-1. The reported results indicated higher copper levels in two fish samples from Wilkie Creek when compared to other samples. These samples had copper concentrations of 230 mg/g and 120 mg/g (wet wt. basis) for a homogenate of 6 slimy sculpins from Reach 1 and a Dolly Varden from Reach 2, respectively. Lead and zinc concentrations were also higher in Wilkie Reach 1 slimy sculpins at 12 mg/g and 150 mg/g (wet wt. basis), respectively, compared to other samples. Arsenic levels were low in all samples. The highest metal concentrations were in the sample from Wilkie Creek Reach 1 at the mouth of Wilkie Creek at Trout Lake.

Fish analyzed from the lower portions of Wilkie "Inlet D", the tributary that receives water draining from the portal, did not contain metal concentrations in excess of those contained by fish from background sites located in upstream Wilkie Creek. Mercury, the only metal for which there is a standard Health Canada tissue consumption guideline for humans (0.45 µg/g total mercury), was not exceeded in any of the fish tissue results reported.

Benthic invertebrate studies were also conducted (Beak Consultants, 1981). Their sampling locations are shown on Figure 2.7-3 and detailed results of the 1981 benthic invertebrate inventory are provided in Appendix V. Benthic community statistics indicated that the Wilkie Inlet D upstream sample (i.e. closest to the portal) supported the richest community of benthic invertebrates in terms of numbers of taxa collected compared to the number of individuals captured. Biological indices (equitability, dominance and overall diversity indices) for the 3 benthic sampling stations were relatively comparable with minimal differences between the Wilkie Inlet D upstream and downstream stations and the Wilkie Creek station. Recorded differences were considered likely due to inherent differences in habitat diversity created by variations in flow characteristics and composition of substrate materials. The upstream sampling site in Wilkie Inlet D was considered healthy and not affected by advanced exploration activities in the 1980s (Beak Consultants, 1982).

More recent published studies in the area appear limited to a one-day fish inventory survey conducted in Wilkie Creek (Wild Stone Resources Ltd., 1995), and a culvert inspection addressing fish (primarily Bull trout) passage (Landmark Forest Management Ltd., 2000). The September 29, 1995 fish inventory recorded fish species (Bull trout and whitefish), individual age and length in seven reaches along Wilkie Creek, indicating that Bull trout are present throughout the mainstem of Wilkie Creek. The 2000 culvert inspection noted that many roads on the south side of the valley had been deactivated and their culverts removed, including many of the roads used by Newmont to access water sampling stations during the early 1980s. Wilkie Creek was identified as hosting Bull trout (*Salvelinus confluentus*), Rainbow trout (*Oncorhynchus mykiss*), Kokanee (*Oncorhynchus nerka*), Eastern brook trout (*Salvelinus fontinalis*), Mountain whitefish (*Prosopium williamsoni*), Burbot (*Lota lota*), and Sculpin (*Cottus* sp.).

**Table 2.7-1 – Trace Metal Analyses on Muscle Tissue Excised from Fish,
 Wilkie Creek, 1981**

	Reach 1	Reach 3	Reach 4 ₁	Reach 4 ₂	Inlet D ₁	Inlet D ₂	Inlet D ₃
Species**	1	2	2	2	1	3	2
No. Fish	6	2	2	2	8	5	1
% Moisture	79	80	85	80	73	78	77
Total Metals (wet. wt)							
Arsenic	<0.29	<0.24	<0.26	<0.25	<0.23	<0.20	<0.24
Cadmium	<1.5	<1.2	<1.3	<1.3	<1.2	<1.0	<1.2
Copper	230	34	43	120	37	4.9	1.2
Iron	12	<2.4	5.6	6.0	8.6	4.2	<2.4
Lead	12	1.2	3.1	7.3	2.8	<2.0	<2.4
Mercury	<0.041	<0.029	<0.036	<0.036	<0.044	<0.040	<0.039
Molybdenum	<0.15	<0.12	0.23	0.20	<0.12	<0.10	<0.12
Silver	<2.9	<2.4	<2.6	<2.5	<2.3	<2.0	<2.4
Zinc	150	25	34	72	31	11	7.0

(from Beak, 1982)

Notes:

* All metal results expressed in µg/g

** Fish species: 1 – Cottus cognatus (Sculpin)
 2 – Salvelinus confluentus (Bull trout)
 3 – S. fontinalis (Eastern brook trout)

2.8 Surficial Geology, Terrain and Soils Mapping

2.8.1 Surficial Geology and Terrain Mapping

Surficial geology in the vicinity of the MAX Molybdenum Project and proposed tailings facility was mapped using approximately 1:15,000 scale aerial photographs (Figure 2.8-1; Appendix VI & XII). Terrain mapping conventions followed RIC standards (1997) and APEGBC (2003).

The Trout Lake valley and adjacent mountain slopes are mantled by unconsolidated deposits of glacial till. At higher elevations the terrain consists of weathered bedrock and bedrock outcrops. These areas were also glaciated and probably contain patches of thin till and other glacial deposits. In lower elevations, glacial deposits modified by fluvial processes or recent fluvial deposits predominate. The MAX project is situated at about 970 m elevation on a broad, gentle slope on the south side of the Trout Lake valley. The area surrounding the MAX mine site consists of weathered bedrock and discontinuous moraine.

The proposed tailings facility and settling/seepage recovery pond are located in an area of exposed bedrock or shallow bedrock covered by a thin blanket of till on the valley slopes. The valley appears to have been formed as part of a short lived glacial meltwater channel,

which was cut parallel to the side of the main Trout River valley. Some terraces appear to have been cut along the sides of the valley proposed for the tailings containment facility, and these appear to be glaciofluvial in origin. Thin deposits of granular soils with limited areal extent appear to be present in the valley bottom. Areas of organic material also exist in poorly drained locations along the bottom of the valley.

The glacial till or morainal deposits mantling the mountain slopes above the terraces for the most part lack distinctive landform features. They are considered to be mainly till and are not likely to exceed 3 to 6 m in thickness. Similar deposits mixed with colluvium appear to mantel steeper and higher alpine slopes, including the upper valley walls of Wilkie and Beaton Creeks. Bedrock outcrops also occur at higher elevations, and on anomalous ridges on the south valley wall west of the Trout Lake townsite.

The fluvial and glaciofluvial deposits of the Trout Lake valley downstream and below the proposed facility occur in a variety of land forms: as alluvial fans developed at the lower end of tributary creeks where they enter the main valley, as valley trains deposited by glacial meltwater during deglaciation, and as bouldery gravel kames situated at about 1000 m on the valley slopes.

Major terraces are developed on both sides of the Trout lake valley at an elevation of about 760m. The terrace on the north side of the valley is partially overlain by a coalescing alluvial fan. Well developed alluvial fans also occur at the mouths of other creeks flowing into the main valley, notably Beaton and Wilkie Creeks.

Organic deposits occur in several local depressions along the Trout Lake valley. These may represent an ancient extension of present day lakes. The notable organic deposit and depression situated in the drainage divide areas between Beaton and Wilkie Creeks appears to have been isolated by alluvial fan development where these creeks flow into the main valley.

2.8.2 Soil Survey and Soil Characterization for Reclamation

Soils in the area were described by Beak Consultants (1981) and are defined largely as Gleysols and Podzols. The Gleysols are poorly or very poorly drained soils of recent fluvial origin that occur on the valley bottom areas. Excess soil water in such lowland areas during portions of the year can cause poor aeration, mottling and reducing conditions in the gleysolic soils. Podzols, on the other hand, arise from the weathering and leaching of surface soil layers, resulting in a fairly acidic soil and an obvious colour contrast between the ashy, leached surface horizons and the reddish-brown B horizons formed as a result of iron oxidation. Organic compounds of the surface layer tend to be translocated from the surface

to the B horizons.

The specific soil associations in the area were classified by Wittneben (1980), as shown on Figure 2.8-2. Each map delineation is identified by a map symbol that is composed of two parts. The upper part (numerator) indicates the soil association component either singly or in combination. The lower part (denominator) identifies the soil parent material, landform (surface expression) and slope gradient. Symbols are shown in the legend following Figure 2.8-2. The soil associations are summarized as follows:

- The lowland Wilkie Creek area is dominated by the Avis soil association. The predominant soil subgroup within this association is the Orthic Humic Gleysol, which is poorly or very poorly drained; frequent flooding is a characteristic of this area. The parent material is a medium to relatively coarsely textured alluvium.
- The lower to middle slopes within the study area are composed of the Kuskanax, Stubbs and Cataract soil associations (Figure 2.8-2). These are all orthic humo-ferric podzols.
- The Kuskanax association occurs primarily on the rolling, lower slopes. The parent materials are primarily glaciofluvial sands and gravels, consequently the permeability and depth of these deposits is variable. The seepage phase of this association, found on the slope below the mine site, is imperfectly drained. These soils are strongly acidic and have well developed Ae and Bf horizons.
- The Stubbs association is similar to the Kuskanax association; however it is usually found on moderate to steep slopes. The parent material is generally a medium textured, stony glacial till, which is well drained. As in the Kuskanax association, the soils are strongly acidic and found on seepage sites.
- The Cataract soils have developed on relatively coarse textured, deep colluvium on middle and lower slopes. Colluvium is soil material, which has accumulated at the base of steep slopes as a result of gravitational action. The seepage phase of this association occurs in the study area and supports a dense mixed coniferous forest. This association is imperfectly drained and is moderately to slightly acidic.

2.9 Vegetation

Vegetation resources in the project area were assessed in 1980 (Beak Consultants, 1981) in support of Newmont's exploration program. Detailed results of the vegetation study at that time are provided in Appendix VII. The study identified a number of vegetation communities

in the area including marshes, shrub communities, red cedar and western hemlock forests. Marshes occurred in the Wilkie Creek lowlands as well as in small localized areas on the slopes. The shrub community occurred throughout the Wilkie Creek lowlands both along the edge of the creek and in areas where beaver dams had raised water levels. Red cedar and western hemlock forest was present on the lower to middle upland slopes, below about 1800 m (6000 feet) elevation, and on drier sites within the lowlands.

Overall, the Wilkie Creek lowlands form a mosaic of open water areas interspersed by marsh, shrub communities and occasional stands of black cottonwood. Since the 1970s, the bulk of red cedar and western hemlock forest in the mine area has been logged and is presently in a state of regeneration. With the majority of forest in the area logged, the proposed MAX mine, mill and tailings footprint will have a minimal incremental impact on vegetation in the area.

2.10 Wildlife

A baseline survey of wildlife in the area was conducted in 1980 and 1981 as part of the Environmental Assessment conducted by Beak Consultants (Beak Consultants, 1981; Appendix VIII and Beak Consultants, 1982; Appendix V). Their assessment reported that the Trout Lake area supports a variety of wildlife species in low to moderate numbers. These include woodland caribou, mule and whitetail deer, mountain goat, grizzly and black bear, wolf and coyote. A variety of furbearers also inhabit the Wilkie Creek lowlands and the surrounding forests including the beaver.

Local woodland caribou can be considered of regional significance due to the fact that the Lardeau Range is near the southern extent of their range in North America. However, a March 2004 census (Hamilton, 2004) concluded that very few caribou are present in the area and that the Lardeau Range is not used to any extent by caribou, as was observed in 1980, 1981, 1996 and 2002.

The Trout Lake area also hosts a wide variety of bird species that utilize the area at various times of the year. However, the Trout Lake area does not support any major aggregations of breeding birds. Waterfowl breeding potential is estimated to be generally low, although some broods were noted on the beaver ponds in the Wilkie Creek lowlands. A number of waterfowl species utilize the area during migration. A wide variety of passerine birds are present primarily during the summer and a number breed in the area.

Overall, the most valuable wildlife habitat in the Trout Lake Area is found in the Wilkie Creek lowlands. Given the small size of the proposed MAX project, it is anticipated that proposed operations will have a minimal impact on wildlife habitat in the area.

2.11 Land Status

2.11.1 Ownership

FortyTwo (as a wholly owned subsidiary of Roca Mines Inc.) has acquired an option to earn a 100% interest in mineral claims in southeastern British Columbia that contains the MAX molybdenum deposit. Adjacent claims, crown grants and a mining lease have been staked and purchased, such that Roca has now consolidated the area of interest (Macauley, 2004).

The MAX property consists of 64 mineral titles covering an area approximately 45 km², the particulars of which are listed in Table 2.11-1, and shown on Figure 2.11-1. The claims are contiguous. The five Crown Granted claims and one Mining Lease have been legally surveyed, and carry surface rights when used for mining purposes. They are maintained by paying the land tax and lease payment annually. The others are located mineral claims carrying mineral rights only and will be kept in good standing by filing evidence of having done the required assessment work or paying cash in lieu thereof. Although not legally surveyed, their location shown on Figure 2.11-1 is believed to be accurate.

Referring to Figure 2.11-1, it should be noted that the mineral deposit is centrally located within the property on claims CCM #1, CCM #2, CCM3, and CCM4, and the proposed mine/plant site and tailings storage area lie just downslope from the adit portal on claims CCM5 to CMM8 and portions of MAX 2 and 5.

Emerald Gold Mines Inc. (Emerald) a private company qualified to do business in British Columbia, has granted Roca an option to acquire a 100% interest in the Emerald Property comprising several claims listed in Table 2.11-1, by:

- a) paying Emerald \$200,000 in stages on or before January 1, 2007 (\$100,000 paid), and
- b) issuing to Emerald 400,000 shares in annual payments of 100,000 shares on or before January 16, 2007 (200,000 issued).

Roca has assumed the future liability of Newmont on the claims it has purchased from them, and also the ground formerly controlled by Newmont now held as the CCM and MAX claims. Roca has indemnified Newmont against third party claims of property damage or injury or death arising out of activities on the purchased claims subsequent to date of purchase, and on the Emerald ground whether arising prior to or subsequent to the purchase date.

Previous disturbance associated with earlier exploration efforts was reclaimed by Newmont to the satisfaction of the Ministry of Energy and Mines in 2004 (MEM, 2004b). Roca currently holds a valid Mines Act Permit (MX-5-534, amended March 10, 2005) for advanced exploration at the site which allows for opening and securing of the old portal; underground

rehabilitation; diamond drilling; and discharge of a final effluent not exceeding 25 mg/L total suspended solids (MEM, 2005).

Table 2.11-1 Max Property Claims

Part 1 – The Emerald Property: Optioned from Emerald Gold Mines Inc.

Claim Name	Tenure No.	No. of Units	In Good Standing Until
CCM #1	356593	1	2006.01.12
CCM #2	356594	1	2006.01.12
CCM3	357834	1	2006.01.12
CCM4	357833	1	2006.01.12
CCM5	387144	1	2006.01.12
CCM6	387145	1	2006.01.12
CCM7	387146	1	2007.01.12
CCM8	387147	1	2007.01.12

Part 2 – The Newmont Property: Purchased from Newmont Mines Limited

Claim Name	Tenure No.	No. of Units	In Good Standing Until
TL 6	247720	15	2006.01.12
TL 7	247721	4	2006.01.12
TL 8	247722	2	2006.01.12
TL 9	247723	4	2006.01.12
TL 12	247726	4	2006.01.12
TL 13	247727	20	2006.01.12
TL 14	247728	6	2006.01.12
TL 15	247729	6	2006.01.12
TL 17	247774	8	2006.01.12
TL 18	247778	8	2006.01.12
Fog 4	247763	2	2006.01.12
Fog 5	247764	2	2006.01.12
Snow #1 Fr	247775	1	2006.01.12
Mining Lease (Horseshoe, Lot 5342)	248470	1	N/A
Crown Grants	Lots 4741-4745,5423	6	N/A

Table 2.11-1 – Max Property Claims (continued)

Part 3 – Claims staked by Roca Mines Inc.

Claim Name	Tenure No.	No. of Units	In Good Standing Until
MAX 1	407706	16	2006.01.12
MAX 2	407707	12	2006.01.12
MAX 3	407708	20	2006.01.12
MAX 4	407709	15	2006.01.12
MAX 5	407710	18	2006.01.12
MAX 6	407738	1	2006.01.12
MAX 7	407739	1	2006.01.12
MAX 8	407740	1	2006.01.12
MAX 9	407741	1	2006.01.12
MAX 10	407711	1	2006.01.12
MAX 11	407712	1	2006.01.12
MAX 12	407713	1	2006.01.12
MAX 13	407714	1	2006.01.12
MAX 14	407715	1	2006.01.12
MAX 15	407716	1	2006.01.12
MAX 16	407717	1	2006.01.12
MAX 17	407728	1	2006.01.12
MAX 18	407729	1	2006.01.12
MAX 19	407730	1	2006.01.12
MAX 20	407731	1	2006.01.12
MAX 21	407732	1	2006.01.12
MAX 22	407733	1	2006.01.12
MAX 23	407734	1	2006.01.12
MAX 24	407735	1	2006.01.12
MAX 25	407736	1	2006.01.12
MAX 26	407737	1	2006.01.12
MAX 27	407718	1	2006.01.12
MAX 28	407719	1	2006.01.12
MAX 29	407720	1	2006.01.12
MAX 30	407721	1	2006.01.12
MAX 31	407722	1	2006.01.12
MAX 32	407723	1	2006.01.12
MAX 33	407724	1	2006.01.12
MAX 34	407725	1	2006.01.12
MAX 35	407726	1	2006.01.12
MAX 36	407727	1	2006.01.12

The proposed MAX project does not interfere with currently held surface rights except where a portion of the proposed tailings storage facility would cover a portion of District lot 772 (Figure 2.11-2). This lot is owned by Pope & Talbot Ltd., P.O. Box 39, Grand Forks, BC, V0H 1H0. The hillside associated with the MAX property is the subject of Tree Farm Licence No. 23, which is operated by Pope and Talbot Ltd. The area currently contains negligible timber values, as the area was previously logged, and is in the early stages of third growth.

FortyTwo is in the process of negotiating an operating agreement with Pope & Talbot Ltd. to use a portion of DL 772 and maintain access to the area.

2.11.2 Land Capability and Use

Land capability and land use in the general area consists of logging, mineral exploration and other human activities in the valley such as farming (a few very small farms), and recreation, for instance hiking, water sports, snowmobile sports and skiing.

The project area falls within the asserted traditional territory of the Ktunaxa Nation. In December 1993, the Ktunaxa Kinbasket Tribal Council submitted the Ktunaxa Nation's Statement of Intent to negotiate a Treaty with the governments of Canada and British Columbia. The Ktunaxa Nation is currently in the process of negotiating an Agreement in Principle which will lay the foundation for Final Treaty Agreement negotiations (Ktunaxa Nation, 2005; <http://www.ktunaxa.org/treaty/negotiations.html>).

It is recognized that, in the absence of treaty settlement, First Nations in British Columbia have constitutionally protected rights. It is considered that the proposed MAX Molybdenum Project does not have the capacity to negatively affect or constitute an infringement of Aboriginal interests from the following perspective:

- the project is not near any historic or modern-day Aboriginal settlements;
- the project is proposed for an area that has been previously extensively disturbed by mining;
- the project does not have the capacity to significantly and permanently affect air quality, water quality, plants, fish or wildlife, and consequently First Nations' health and cultural or sustenance resources; and
- exploration in the area has not encountered any archaeological or cultural sites thus concluding that the project area has low potential to contain such sites. Should any archaeological or cultural sites be discovered during the course of development, work will halt while the provisions of prevailing legislation and regulations are followed.

FortyTwo has reviewed the direction contained in the British Columbia Provincial Policy for

Consultation with First Nations (B.C. Government, 2002) and the Memorandum of Understanding between the Ktunaxa Nation, represented by the Ktunaxa / Kinbasket Tribal Council ("K/KTC") and the B.C. Ministry of Energy and Mines (K/KTC, 2005) in context with this BC Small Mines Permit application. It is our view that this proposed project has no impact on the Ktunaxa Nation and as such, FortyTwo does not propose a formal consultation process with the K/KTC. FortyTwo recognizes that the Ktunaxa Nation is a stakeholder and therefore will receive a copy of this application during the review process. As part of this review, FortyTwo encourages comments and dialogue with regards to the project proposal from all stakeholders.

3.0 MINE PLAN

3.1 Mine Plan Overview

Historically, as discussed above, the property has been extensively explored (Macauley, 2004; Appendix IX). The proposed mine plan is largely based on the resource model defined from past exploration with infill drilling conducted by Roca (total of 17,873m of surface diamond drilling and 25,252m of underground diamond drilling). The existing adit and underground development (~2,000 m of adit, crosscuts and drift development) provides immediate access to the top of the high grade zone. In addition, the information provided by Newmont’s bulk sampling program (through the 960m Level) provides a high level of confidence with respect to grades, processing and potential recoveries.

Based on the past and recent resource information, a National Instrument (“NI”) 43-101 compliant resource estimate outlined a global ‘measured’ and ‘indicated’ resource of approximately 42.94 million tonnes of 0.20% MoS₂ at a 0.10% MoS₂ cut-off. In addition, a further 8.9 million tonnes averaging 0.16% MoS₂ is categorized as ‘inferred’ at the 0.10% MoS₂ cut-off grade (Macauley, 2004).

Furthermore, resource estimates utilizing higher cut-off grades have also been developed, yielding smaller, well defined and continuous tonnages within the known deposit. The resulting higher-grade resource estimates are summarized in Table 3.1-1.

Table 3.1-1 MAX Resource Estimate at >0.10% MoS₂ Cut-off Grades

MEASURED			INDICATED		MEASURED & INDICATED	
Cutoff % MoS ₂	Tonnes	Grade % MoS ₂	Tonnes	Grade % MoS ₂	Tonnes	Grade % MoS ₂
0.20	9,340,000	0.35	2,010,000	0.41	11,350,000	0.36
0.50	1,010,000	1.01	370,000	0.77	1,380,000	0.94
1.00	260,000	1.95	20,000	1.87	280,000	1.95

(After T.N. Macauley, P.Eng, 2004)

Using the high grade cut-off resource estimate, an independent ‘preliminary economic assessment’ (scoping-level engineering) was completed for the project to assess project economics (Hatch, 2005). Because of continued uncertainty for the future price of molybdenum products, the study evaluated mining scenarios at a 0.50% MoS₂ cut-off as well as at a 0.20% MoS₂ cutoff. The resulting difference in total resource estimates required the assessment of small and large throughput rates.

Two throughput rates have been evaluated that both consider the development of a 'continuously' operated mine and concentrator (meaning no campaign mining and development); Case A, a 500 tonne per day operation that would mine an estimated 1.38 million tonnes at an undiluted grade of 1.01% MoS₂ and Case B, a 2,500 tonne per day operation that would mine an estimated 11.35 million tonnes at an undiluted grade of 0.36% MoS₂.

The results of the studies indicated that the project is very sensitive to commodity prices and that the economics of both cases requires sustained prices above historic levels to develop and advance a full-scale continuously operated mine (Hatch, 2005).

The mine plan proposed in this application differs substantially from what was contemplated for the deposit in the early 1980's and consists of a refined Case A from the scoping studies. Specifically, it consists of a 500 tonnes per day mine operated as a small-scale 'campaigned' development and mining operation. The campaigned approach can deliver a robust project by minimizing initial development and capital and, importantly, lead-time to production. By focusing on only providing the required underground development to ensure an initial campaign of approximately 184,000 tonnes, the operation can produce and deliver concentrates in a short time frame. Subsequent development campaigns would provide access to stoping areas that would be the source for the next year's small-scale production. In addition, the proposed small-scale mining operation does not impair or significantly reduce the opportunity to expand the mine to provide production from other parts of the deposit in the future, should commodity prices and permitting allow.

3.2 Description of Existing Surface and Underground Development

The existing surface and underground development consists substantially of the work done by Newmont from 1979 to 1981. This consists of:

- Approximately 2,000 m of adit, crosscuts and drift development on the 960 m Level, approximately 500 m below the surface outcrop;
- An estimated 110,000 tonnes of development rock stored below the portal area (indicated on most figures as 'existing reclaimed area');
- Underground diamond drilling of 25,252 m in 108 holes detailing the mineralization and explored the adjacent areas; and,
- Bulk samples from 189 drift and crosscut blast rounds over a total length of 687 m processed through a crushing plant and sampling tower on site.

The adit was driven in a southwest direction for 1,276 m to the edge of the area of interest (see Figure 3.2-1). It was excavated to a size of 3.7 x 4.6 m (12 x 15 feet) to allow for future use as a haulage way and as such is larger than typical exploration adits. Beyond that

point the adit profile was reduced to 3.0 x 3.7 m (10 x 12 feet), and continued as a crosscut through the known deposit. Four drifts were driven to provide diamond drill stations; two of them through the deposit were also bulk sampled. The total length of adit and drifts is approximately 2000 m (6,560 feet).

Reported mining conditions during development contrasted strongly between the approach to the deposit and the drifting within it. Prior to reaching the Z Fault on the east side of the deposit (as shown on Figure 3.2-1), progress was impeded by numerous water bearing fracture zones. Ground support was required at a total of 13 locations, but outside those zones rock was reported as competent and stood up well. West of the Z Fault in the mineralization and adjacent areas, water inflow was minimal and backs needed no support (Macauley, 2004). At the conclusion of Newmont's exploration program, the rail, water and air lines, and ventilation ducting were left installed.

Roca's program, initiated in May 2005 under Mines Act Permit MX-5-534, has recently re-opened and re-habilitated the 960 m Level portal and adit to the deposit area for further infill diamond drilling. The rail and vent duct have been rehabilitated and are operational. Ventilation of the workings is currently carried out by a 150 hp portal fan and a pressurized 42" flexible vent ducting suspended from a messenger cable in the centre of the back of the adit.

3.3 Details of Planned Surface and Underground Development

The proposed development plan for a small mine is estimated to be capable of campaigned production at a rate of approximately 72,000 tonnes per year of molybdenite mill feed. A concentrator will be developed at the site that would be operated at a similar rate on an annualized basis. The estimated throughput is based on the small mine schedule discussed in Section 3.4 below and balanced with an estimated plant throughput rate of 500 tpd operating for 180 days at an estimated 80% availability.

Based on this approach, the mine plan will be tightly focused on the delivery of high grade mill feed from stopes that require minimal lead time to develop and can be accessed by the existing 960m Level adit. Initial operations will require all access and ventilation delivered through the large-sized existing adit and portal. A planned ventilation raise will be developed when production from lower levels requires the use of additional mining equipment, anticipated to occur after Year 3 of operations.

Mining in the working areas will be achieved by diesel powered trackless equipment including load-haul-dump (LHD) and truck equipment operating in development headings and by remote LHD mucking operation in open stopes. The trackless equipment will deliver muck

from the working stopes to a transfer station located at the 965m Level where it will be transferred to 4 m³ ore cars on the existing 36" gauge rail. A battery powered locomotive will be used to haul loaded cars to surface and return empty cars to the transfer station.

The working area is approximately 1,400 m from the portal and ventilation will be provided by a hanging vent ducting from the back of the adit. The system would be capable of being reversed such that it can provide direct ventilation to, or exhaust from, the workings.

Four self contained refuge stations located approximately every 300-400m will be established along the main access adit. During all production times, materials and equipment that could present a fire hazard will not be allowed in the main adit access during normal production periods. Diesel powered equipment will operate captively in the working area, except for their initial placement in the mine and ultimate removal, and will be serviced and fuelled in an underground repair shop, away from the haulage way or work area.

The proposed schedule presented in Section 3.4 has been developed based on industry standard estimates for advance rates in various size openings for declines and level workings using trackless equipment. Similar estimates for conventional ladder equipped raises will provide flow through ventilation to working areas during production. These manways also provide secondary egress ways from the working area directly to escapeways accessing the haulage way and refuge stations. Fan sizing requirements will change over time and in general will increase over time as production requires longer haulage and more diesel equipment to be present in the mine.

Development of the small mine includes the excavation of a 4.5 x 4.5m decline from the main level (now referred to as the 965 m Level due to the incline of the main adit). The decline will provide access at a maximum grade of 15% and allow for the development of Levels at 950 m, 925 m, 900 m, 885 m, 860 m, and 835 m. Open stopes will be developed with most of the level development being in higher grade material and stockpiled according to the development schedule (see Figure 3.3-1). A sill pillar is planned between 885 m and 900 m since upper stopes (A-925, A-926, A-900, and A-901) are not planned for backfilling at this time. Similarly, a pillar is planned between stopes occurring on the same level. Future backfilling, either with uncemented waste rock or cemented sand and gravel or pastefill could be achieved to facilitate pillar extraction should the price of molybdenum products allow.

A number of refuge stations, remuck stations, sumps and other development are planned and identified in the proposed development schedule (Appendix X).

An expanded development plan that includes a truck dump and chutes is shown on Figures

3.3-2 to 4. The truck dump workings are not included in the schedule at present, however could be developed should mine planning expand on the workings described in this application. Its development would also be predicated on molybdenum prices since it also facilitates possible production of lower grade material from above that area.

At peak production, the mine is estimated to require up to 10,000 kg per month of explosives. A 2.4m x 3.7m (8 ft x 12 ft) explosives magazine capable of storing up to 5000 kg (200 cases) of explosives will be established 600 m east of the portal. A second magazine 1.8m x 2.4m (6 ft x 8 ft) will be located an additional 30 m past the explosives magazine to store detonators. Both magazines will be provided by an explosives supplier in Revelstoke and will be compliant with new Federal storage regulations (coming in effect in May 2006).

The explosives supplier in Revelstoke operates an explosives depot, and will deliver blasting supplies as required on a 'next-day' delivery basis, subject to transportation restriction to the site, specifically sailing restrictions for hazardous materials on the Galena Bay ferry.

3.4 Development Schedule

The mill feed and waste development schedule is provided in Appendix X and summarized in Table 3.4-1. Based on this schedule, all high grade mill feed (and waste) development will be completed by the end of the first quarter in Year 2 of operations. The mill will be campaigned to operate in roughly 3-month timeframes with approximately 2-month shut down periods in between campaigns. The total mine life will be roughly 28 months with a cumulative mill production of just under 184,000 tonnes. As mentioned in the above section, this schedule could be expanded should commodity prices allow.

3.5 Access and Transportation

The MAX Project access road is located at the westerly extension of the Trout Lake Village road, and is paved from Trout Lake to the access road turn off. Access to the mine portal and plant site from this road is made along the existing forestry and exploration road. That road was upgraded by the proponent in 2004.

Highway trucks and trailer will be required to haul bagged molybdenite concentrate from the mine to market, probably via the Galena Bay ferry and Revelstoke. At peak production periods an estimated 200 tonnes of concentrates per month will be shipped, requiring a total of approximately 2 to 3 truck loads per week from the site.

3.6 Mine Site Infrastructure

The proposed mine site layout is shown in Figure 3.6-1. The layout deliberately avoids disturbance of the previously reclaimed areas as much as possible, by working around the perimeter of the reclaimed area. The proposed mine site layout includes a generator set and fuel storage outside the portal beside the current exploration camp, tent frame, lunchroom and storage area. The truck shop will be located along the primary access road on the upper portion of the existing reclaimed area, with a parking area located further east of there, at the end of the primary access road. The office buildings, concentrator building and thickener will be located below (to the North of) the existing reclaimed area. The tailings discharge line and water reclaim line will run from the thickener to the tailings storage facility.

Mill feed and waste will be hauled out of the portal on track extending around the northern perimeter of the existing reclaimed area. A low grade stockpile (~ 25,000 t) will be located behind the office buildings near the concentrator building and a waste rock dump (~ 75,000 t) will be located to the east of the existing reclaimed area and southeast of the concentrator building above the new access road. The footprint of the waste dump will be limited to a 50m buffer distance from the adjacent creek.

Surface water collection ditches will be located such that all plant site runoff is collected and transported to the tailings storage facility, via the tailings pump box. Un-impacted surface water from uphill of the mine area will be diverted away from site facilities and into existing streams. A settling pond has been reconstructed and will remain during operations immediately outside the portal to allow for suspended solids to settle from mine water prior to discharge.

Table 3.4-1 Production Summary

Name	PrePro	Year 1 (Monthly Production Estimates)											
		1	2	3	4	5	6	7	8	9	10	11	12
Mine Development Schedule													
Development Metres	69 m	105 m	231 m	132 m	177 m	159 m	156 m	122 m	91 m	105 m	99 m	103 m	84 m
Waste Tonnes	2,952 t	4,775 t	13,978 t	7,975 t	10,713 t	9,662 t	9,757 t	7,541 t	5,737 t	6,357 t	5,974 t	6,259 t	5,244 t
Raise Metres	-	22 m	9 m	4 m	-	-	43 m	19 m	38 m	17 m	-	-	40 m
Dev't Ore Tonnes	-	147 t	5,519 t	1,615 t	3,081 t	3,115 t	3,085 t	2,674 t	844 t	2,019 t	2,550 t	2,671 t	2,115 t
Diluted Stope Tonnes	-	-	-	4,295 t	1,424 t	-	-	1,352 t	10,066 t	-	16,885 t	12,136 t	4,001 t
All Ore Tonnes	-	147 t	5,519 t	5,910 t	4,505 t	3,115 t	3,085 t	4,027 t	10,910 t	2,019 t	19,435 t	14,808 t	6,116 t
Diluted MoS2	-	1.72 %	1.13 %	1.15 %	1.47 %	1.77 %	1.95 %	2.01 %	2.04 %	1.74 %	1.74 %	1.96 %	1.93 %
Concetrator Schedule													
Cumm ORE Tonnes	-	147 t	5,666 t	11,576 t	4,505 t	3,115 t	6,200 t	10,227 t	10,910 t	2,019 t	21,454 t	24,261 t	18,378 t
Operating Periods				Mill Trials				Start Mill			Start Mill		End Year 1
Mill Production (12,000 max)	0	0	0	11576	4505	0	0	10227	10910	0	12000	12000	11000
Cumm Mill Production				11576	16081	16081	16081	26308	37218	37218	49218	61218	72218
ORE Developed in Stopes	0	147	5666	0	0	3115	6200	0	0	2019	9454	12261	7378

Cumm Total **72,218**

Name	Year 2 (Monthly Production Estimates)											
	1	2	3	4	5	6	7	8	9	10	11	12
Mine Development Schedule												
Development Metres	50 m	54 m	2 m	-	-	-	-	-	-	-	-	-
Waste Tonnes	3,325 t	3,303 t	299 t	38 t	-	-	-	-	-	-	-	-
Raise Metres	36 m	1 m	35 m	4 m	10 m	6 m	10 m	6 m	-	-	-	-
Dev't Ore Tonnes	2,059 t	2,255 t	68 t	-	-	-	-	-	-	-	-	-
Diluted Stope Tonnes	639 t	13,250 t	11,154 t	11,000 t	12,449 t	11,500 t	13,986 t	7,334 t	7,134 t	10,000 t	1,550 t	-
All Ore Tonnes	2,697 t	15,505 t	11,222 t	11,000 t	12,449 t	11,500 t	13,986 t	7,334 t	7,134 t	10,000 t	1,550 t	-
Diluted MoS2	1.57 %	1.94 %	1.76 %	1.72 %	1.23 %	0.86 %	1.42 %	1.77 %	1.95 %	1.95 %	1.95 %	-
Concetrator Schedule												
Cumm ORE Tonnes	10,075 t	25,580 t	24,802 t	23,802 t	24,251 t	35,752 t	49,738 t	45,072 t	40,206 t	38,206 t	39,756 t	39,756 t
Operating Periods		Start Mill				Start Mill				End Year 2		
Mill Production (12,000 max)	0	12000	12000	12000	0	0	12000	12000	12000	0	0	0
Cumm Mill Production	0	12000	24000	36000	36000	36000	48000	60000	72000	72000	72000	72000
ORE Developed in Stopes	10075	13580	12802	11802	24251	35752	37738	33072	28206	38206	39756	39756

Cumm Total **144,218**

Table 3.4-1 (Continued) Production Summary

Name	Year 3 (Monthly Production Estimates)			
	1	2	3	4
Mine Development Schedule				
Development Metres	-	-	-	-
Waste Tonnes	-	-	-	-
Raise Metres	-	-	-	-
Dev't Ore Tonnes	-	-	-	-
Diluted Stope Tonnes	-	-	-	-
All Ore Tonnes	-	-	-	-
Diluted MoS2	-	-	-	-
Concentrator Schedule				
Cumm ORE Tonnes	39,756 t	27,756 t	15,756 t	3,756 t
Operating Periods	Start Mill			
Mill Production (12,000 max)	12000	12000	12000	3756
Cumm Mill Production	12000	24000	36000	39756
ORE Developed in Stopes	27756	15756	3756	0
Cumm Total				183,974

4.0 METALLURGICAL AND PROCESSING FACILITIES

4.1 Review of Metallurgical Testwork

The current process design for the MAX mill has been based on metallurgical testwork conducted by Newmont in the early 1980's. Metallurgical testwork conducted at that time included flotation and grindability testing on drill core samples of various rock types. Flotation testing of the drill core samples of granodiorite, quartz diorite and quartz veining rock types indicated that approximately 90% of the molybdenite could be recovered as a flotation concentrate containing 90 - 92% MoS₂. Samples of silicified schist rock types gave comparable molybdenum recoveries, however the concentrate grade was somewhat lower at approximately 85 - 87% MoS₂. This was attributed to fine coatings of molybdenite on the gangue minerals (Nabbs, 1982). It is anticipated that similar recoveries will be achievable from all MAX material.

Additional testwork on higher grade feed is currently underway to confirm recoveries and generate tailings material for additional environmental testing and characterization.

4.2 Metallurgical and Processing Facilities Overview

The proposed metallurgical and processing facilities have been scoped for the mine plan and schedule outlined in Section 3. Specifically, this will include the construction and operation of a 500 tonne per day mineral processing plant on site (refer to Figure 3.3-1 for locations). The mill process will consist of a conventional crushing, grinding and flotation circuit to produce a high-grade molybdenum sulphide concentrate with tailings sent to the proposed tailings storage facility (discussed in Section 5.1).

The design criteria for the 500 tonnes per day ball and regrind mills are given in Appendix XI (International Metallurgical and Environmental Inc., 2004). The concentrator and thickener facilities will require:

- A 270 horsepower primary grinding mill approximately 2.5 m in diameter and 3.5 m in length,
- Four rougher and scavenger cells (Outokumpu OK1.5TC), each with a cell volume of 5 m³ and supplied at a feed flowrate of 57 m³/hr,
- A 15 horsepower regrind mill of 0.9 m diameter (1.83 m length),
- A series of 4 cleaner cells (OK1.5-TC), each with a volume of 1.5 m³ and the final cleaner cell (column) with a volume of 2.0 m³,
- Concentrate filtration using a Shriver 800x800mm filter, and
- A tailings thickener with an area of 65 m² (i.e. diameter of ~ 9.1 m).

The power to the plant will be supplied by 2 portable diesel-powered generators. No additional infrastructure will be required to supply the needed power. Total power requirements for the site are estimated to be 1.5 to 2 MW, which will cover crushing and grinding, concentrator processes, lighting, mine power and ventilation.

4.3 Process Flowsheet

The metallurgical flowsheet will consist of primary grinding, rougher and scavenger flotation, regrind of rougher concentrate, up to five stages of flotation cleaners, and dewatering to produce a high-grade molybdenum sulphide concentrate that will be marketed to molybdenum buyers and traders. Head grade have been estimated in the order of 0.8 to 2.0 % MoS₂ (see Figure 4.3-1 and Appendix XI).

The mining and crushing operations will supply a crushed product, of minus 12.7mm sizing, being supplied to a storage facility ahead of the primary ball mill. The ball mill, grinding minus 12.7mm crushed product to approximately 80 percent passing 106µm, will operate in closed circuit with a hydrocyclone pump, and the cyclone overflow product will gravitate to the rougher and scavenger flotation cells, operated in series. The rougher flotation concentrate will undergo further grinding in a secondary regrind ball mill followed by a series of five cleaning and re-cleaning flotation stages to produce a final molybdenite concentrate. The regrind mill will produce a product size of 80% passing 45µm (325 mesh size). The final flotation concentrate will be filtered (dewatered) prior to direct dispatch (International Metallurgical and Environmental Inc., 2004; Appendix XI).

The flotation tailings will be pumped to a thickener prior to being discharged into the tailings storage facility, with the thickener overflow water being recycled for use within the process plant. Water will also be recycled from the tailings storage to a process water tank. Makeup water will be supplied from the portal/adit water, where drillholes and faults remote from the proposed production areas will likely continue producing water at a steady rate of approximately ~35 L/s.

4.4 Process Plant Description

4.4.1 Run-of-Mine Stockpiles

Run of mine (ROM) mill feed will typically be stored in the stopes, and will be transported to the crushing plant by rail from the underground adit only during processing campaigns in order to minimize double handling. A ROM ore stockpile will be located adjacent to the crushing plant in order to handle ore developed from the levels (i.e. tops and bottoms of stopes) and campaign ore transported to surface during short periods of potential mill repair.

Thus the size of the ROM stockpile will vary somewhat at times due to the nature of a campaigned operation, but will not exceed 2,500 tonnes. Due to the campaigned nature of this proposed operation, ROM ore will not be stored or exposed at surface for periods of time longer than 2 to 3 months. Water from the ROM stockpile will be collected with the plant site drainage and transferred to the tailings storage facility.

4.4.2 Crushing Plant

Crushing operation will provide a crushed product of minus 12.7mm sizing, being supplied to storage ahead of the primary mill. During mill operations, crushing will be conducted on dayshift only.

4.4.3 Primary Mill

The minus 12.7mm crushed product is transferred by conveyor to a mill feed storage bin. A single storage bin of 500 tonnes (200m³) capacity will provide for approximately 24 hours surge capacity. The material will be discharged from the bin by an electro-magnetic vibrating feeder on to the mill feed conveyor (600 mm wide) and into the primary ball mill.

The estimated ball mill size to grind 500 tonnes per day of minus 12.7mm crushed ore to 80 percent passing 106 micron, is calculated to be 2.44m diameter by 3.5m (8' diam x 11'6") with a power draw of approximately 200 kW (270hp) (Work Index = 9.26 kWh/ton).

Process water is added to the mill inlet for dilution to maintain a mill density of approximately 70% solids and to the mill discharge pumpbox. A weightometer will be installed on the conveyor to monitor and control the feed rate to the mill.

The milled product is pumped to a hydrocyclone at a density of approximately 45 - 50% solids. The cyclone underflow will gravitate to the mill inlet hopper and the cyclone overflow to the rougher flotation circuit. A circulating load of 200% has been assumed for the mill circuit in the solids and solution balance calculations.

4.4.4 Primary Flotation Circuit

Feed to the rougher flotation cells is the classified cyclone overflow product from the primary ball mill circuit at a slurry density of approximately 30% solids. Scavenger concentrate is directed to the inlet of the first rougher flotation cell. The proposed throughput of 500 tonnes per day at a slurry density of 32% solids equates to a volumetric flowrate of 56m³/hr. The rougher and scavenger flotation section will consist of 4 OK-5TC tank cells (5m³ each). Total air requirement for these tank cells is approximately 20m³/min (700cfm) at 19 kPa.

Flotation reagents, a combination of pine oil and a selected frother (e.g. Dowfroth 250), will be delivered from their respective bulk storage tanks by a series of metering reagent feeders to the individual addition points.

4.4.5 Regrind Mill and Cleaner Flotation

The regrind mill has been sized to treat up to 25 tonnes per day of rougher flotation concentrate (5% weight recovery). The regrind mill will produce a product size of 80 percent passing 45 μm (325 mesh size). Based on a work index of 3.0kWhr/tonne the required mill size is calculated to be 0.9m diameter x 1.83m long with a power requirement of approximately 8kW (11HP). The respective mill calculations are detailed in Appendix XI (International Metallurgical and Environmental Inc., 2004).

Rougher concentrate will gravitate to the regrind mill pumpbox and the mill will operate in closed circuit with a hydrocyclone. The cyclone overflow product will gravitate to the first cleaner cell and cyclone underflow returned to the mill inlet.

A series of five stages of flotation are included to upgrade the rougher concentrate. The First Cleaner Tails product will be pumped to the first rougher cell. Subsequent cleaner tails will be recycled to the head of the previous cleaner stage.

A series of four OK1.5-TC cells are proposed for the four cleaning stages with a final stage consisting of a flotation column of approximately 2m³ capacity. The final concentrate tonnage is estimated at a maximum of 10 tonnes per day, based on a final grade of 90% MoS₂ and 95% recovery from a feed stock grading up to 2% MoS₂.

4.4.6 Concentrate Filtration

Final flotation concentrate will be stored in a mechanically agitated storage tank of approximately 10m³ capacity, ahead of the filtration unit.

No filtration characteristics are available for the molybdenite flotation concentrate product, however molybdenum concentrates at other mines tend to fall within fairly defined parameters. Two options are currently being considered to dewater the concentrate. The preferred option is to use an automated pressure filter, will give a low moisture content of approximately 7 to 10% and has advantages for shipping. The alternative would be to use a vacuum disc filter unit, which typically gives moistures of 10 to 14%, followed by further drying.

4.4.7 Tailings

The flotation tailings will be pumped to a thickener, the clean water overflow being recycled via the process water storage tank and the thickened tailings discharged to the tailings storage facility. A flocculant addition system will be installed to assist solids settlement.

Metallurgical testwork conducted by Newmont in the early 1980s included the addition of a flocculant (American Cyanamid's Superfloc 127) to the scavenger tails (pH = 8.3). The addition produced a fast settling rate with clear overflows at a consumption of 0.02 to 0.04 pounds/ton. Analytical results from the tailings solution from the metallurgical tests indicated good quality effluent as shown in Table 4.4-1.

Table 4.4-1 – Tailings Supernatant Quality

Element	Pollution Control Objectives Range ¹	MMER ²		BC Water Quality Guidelines ³	Test MC 1
		Max Grab Sample	Max Monthly Mean		
	mg/L	mg/L	mg/L	mg/L	mg/L
Suspended Solids	25 - 75	30	15	-	6.4
Dissolved Solids	2500 - 5000	-	-	-	228
Copper	0.05 - 0.3	0.60	0.30	0.007 ⁴	<0.03
Iron	0.3 - 1.0	-	-	0.3	0.57
Molybdenum	0.5 - 5.0	-	-	2	0.2
pH		6.0 - 9.5	6.0 - 9.5	6.5-9	8.3

(Modified from Nabbs, 1982)

Notes:

¹ Pollution Control Objectives for the Mining, Smelting and Related Industries of BC, 1979.

² Metal Mining Effluent Regulations, 2002.

³ Approved and Working Water Quality Guidelines for B.C. for the Protection of Freshwater Aquatic Life (BCMELP, 1998a and b).

⁴ Copper criteria calculated for hardness of 50 mg/L [CaCO₃], typical of receiving water environment.

Settling test results provided the basis to calculate the tailings thickener requirements and based on a feed slurry density of 30% solids and a flocculant addition of 0.02 lbs/ton the results indicate 0.85 sq feet/ton/24hours (0.087m²/tonne/24hours) (Nabbs, 1982). At the proposed treatment tonnage of 500 tonnes per day, and including a 50% contingency, the calculated area requirement is 65 m² (thickener diameter = 9.1 metres).

Previous testwork suggests that final tailings solids will contain residual MoS₂ ranging from 0.010 to 0.029 wt%, given a head grade of 0.2 to 0.5% MoS₂. With a planned head grade averaging 2% MoS₂, MAX tailings solids are anticipated to contain up to 0.1% MoS₂. Additional testwork on higher grade feed is currently underway to confirm recoveries and generate tailings for additional environmental testing and characterization.

4.5 Water Management

4.5.1 Surface Water Management

The plant site catchment area is estimated to be approximately 8 hectares (ha). Plant site runoff will be captured by collection ditches on the lower perimeter of the MAX plantsite, as shown in Figure 4.5-1, and directed to the plant site sump for discharge to the tailings containment facility via the tailings pump box and tailings line. Clean, non-contact surface water run-off will be diverted away from the plantsite area by two uphill diversion ditches.

Groundwater currently draining from the underground exploration adit is sourced primarily from faults and drill holes that are producing flows on the order of 35 L/s. In order to maintain the water quality of the 'adit water' (acceptable after the 2004 reclamation efforts), this flow will be kept separate from mine water during operations. To achieve this, adit water will be captured from the fault and wall sources using collection funnels in the vicinity of faults and packers in drill holes producing water. The water will be piped to the adit portal for direct release to the environment, as was occurring under the previously approved closure scenario. Approximately 80% of the current flow (~28 L/s) is expected to be captured and transported via this pipe. This piped adit water will also provide a ready source of fresh water make up for the mill and fire water supply.

Approximately 20% of the current flow (~ 7 L/s) may not be captured, and will continue to flow along the adit floor to the portal, where it will be directed to the mine water settling pond near the adit portal.

Production mine water from the proposed underground workings will be generated in the stopes at a lower elevation than the existing workings and will be collected in underground sumps and directed by pump to surface. The new development and production will occur beyond the Z Fault, which appears to a structural control on groundwater flow, and is expected to be relatively dry. Production water, which will include draindown water, water used by the drills has been estimated at 1 to 2 L/s.

Production water, along with the uncaptured adit water, with a combined total of ~ 9 L/s, will be directed to the existing mine water settling pond near the adit portal. The size of the existing settling pond is consistent with removal of silt-sized particles at a flow of approximately 10 L/s. Water in the settling pond will be tested for quality and released if acceptable. If at any time the mine water tests do not meet discharge criteria, additional settling ponds will be constructed on ample lands to the northwest of the portal, and the water will be directed to those settling ponds for additional settling prior to discharge.

4.5.2 Water Supply

Process water requirements for the site will be supplied from minewater exiting the portal, and plant site runoff and direct precipitation reporting to the tailings facility and being pumped back for reuse as reclaim water.

Two water storage tanks are proposed. Both provide emergency firewater, and can be supplemented by the portal adit flows. One tank, 10 metres in diameter, will provide approximately 5 hours storage capacity for the primary mill operation being the combined tailings thickener overflow and tailings dam water recycle process streams. A second tank of approximately 4.2 metres diameter is required for gland service water supply and general clean water service. Plant make-up water (adit water) will be added to both the mill water tank and the gland service water tank as required.

Potable water requirements will be provided by commercial bottled water suppliers. Water for domestic mine dry service will be sourced from the groundwater source.

4.5.3 Water Consumption

The mill process has been designed to minimize the requirement for fresh water by maximizing the recycling of process water back to the process. It is assumed that approximately 85% of the water discharged with the tailings will be recycled to the plant via a water reclaim line. A process plant solids and solution balance has been prepared (Appendix XI), and indicates the plant make-up water requirement is approximately 2m³/hour (0.56 L/sec), being attributed to the volume of solution retained within the tailings and evaporation losses.

4.5.4 Site Drainage

The regional site drainage is described in section 2.4 above. Drainage at the plant site has been designed such that plant site run-off can be contained within the operations area via small collection ditches as described in section 4.5.1 above and from there will be pumped to the tailings pond via the tailings pump box.

Captured adit water is expected to maintain appropriate discharge water quality, and will be piped to the portal and will continue to discharge at its current location during operations, a small tributary which eventually feeds to Wilkie Inlet D below the plant site. Should captured adit water not maintain acceptable discharge quality, additional settling ponds will be constructed in the vicinity of the former old camp, or on ample ground to the northwest of the portal, to improve water quality prior to discharge.

4.5.5 Site Water Balance

A preliminary site water balance model was prepared by Clearwater Consultants Ltd. as a monthly water balance for the initial campaign period and for one year after completion of the initial campaign (see Attachment A in Appendix XIV, MEMi 2005b). In addition annual water balances for an average precipitation year, a 10-year dry year, a 10-year wet year and a 100-year wet year were completed. The main assumptions included the following:

- Plantsite runoff (catchment area of 8 ha) would be collected and transported to the tailings storage facility with the tailings and tailings water.
- Runoff from the plantsite will include any seepage from the previously reclaimed area, the low-grade stockpile, the mineralized and ramp waste rock pile and surrounding area (~ 8 ha in size).
- Tailings pond catchment area = 12 ha and assumes construction of runoff diversions.
- Process parameters include: 72,000 tonnes per year throughput as per the campaign schedule, tailings slurry at 65% solids and 2.73 specific gravity, 85-90% reclaim from the tailings pond.
- Seasonal discharge from the tailings storage facility will occur during high flow months of April, May, June, July and August at rates ranging from 0.4 to 3.8 L/s.
- Approximately 80% of the current portal discharge (80% of 35 L/s, or 28 L/s) would be collected in a pipe and discharged to the tributary feeding into Wilkie Inlet D.
- The remaining 20% of this flow (9 L/s) and any production (mine water) flow (estimated to be ~ 2 L/s) will be discharged directly to the tributary to Wilkie Inlet D via a settling pond at the mine portal. The option to direct this flow to the tailings storage facility should discharge water quality not be achieved is assumed.

The water balance estimates the release of water piped from the portal discharge, pumped from underground, and released from the tailings storage facility. These flows for the proposed period of operation and for one year following operation have been compared to the estimated flow in Wilkie Inlet D and indicate a dilution ratio of approximately one order of magnitude (see Appendix XIV) at the upper end of Wilkie Inlet D at sampling point G (Figure 2.5-1).

4.6 Reagents, Consumables and Materials Handling

The process reagents and projected consumption, based on a 500 tpd plant operation, are outlined in Table 4.6-1.

Process reagents will be stored in 55 gallon drums in a designated area within the concentrator building. The reagent storage area will have perimeter curbs to contain

accidental spillage and a sump pump to reclaim possible reagent solution spills.

Table 4.6-1 – Projected Reagent Consumption

Product	Consumption (per month)
Pine Oil	630 L (~42 g/tonne of mill feed)
Methyl isobutyl carbinol (MIBC)	210 L (~14 g/tonne of mill feed)
Lime	450 to 750 kg (~30 to 50 g/tonne of mill feed)

4.7 Fuel and Lubricants Consumption and Handling

Low sulphur diesel fuel will be required on the MAX site for the operation of power generators, air compressors, surface diesel equipment and underground mining equipment. Fuel will be delivered from Nakusp or Revelstoke to the site by the fuel supplier’s tank truck and stored in an above-ground, 20,000 L, double walled storage tank located adjacent to the generator sets near the portal. The fuel storage tank will be situated within a bermed containment area and fuel stations will be designed to meet applicable codes for handling, storage and fire. The site is expected to consume approximately 20,000 L of fuel per week.

Various lubricants and solvents will be used on site for vehicle and equipment maintenance and plant operations. A list of anticipated lubricants and solvents used on site and their projected consumption is shown in Table 4.7-1.

Table 4.7-1 – Projected Lubricant and Solvent Consumption

Product	Consumption (per month)
Gear Oil	400 L
Engine Oil	400 L
Hydraulic Fuel	400 L
Solvent	20 L

Lubricants (stored in 55 gallon drums) and solvents will be stored in a contained storage facility at the truck/maintenance shop. Used lubricants and spent solvent will be collected and stored in separate containers for removal from the site by a licensed carrier to an authorized disposal facility.

4.8 Landfill

During operations, inert non-hazardous solid wastes would be transported to the Trout Lake transfer station for appropriate handling, at the commercial weight rates, to a regional landfill.

4.9 Process Plant Development Schedule

It is expected that site clearing and levelling, equipment procurement, foundation laying, construction and commissioning of facilities will take approximately four months. A temporary trailer camp will be located next to the portal for the development period, subject to permits from the Ministries of Energy and Mines, and Water, Lands and Air Protection.

The mining and crushing operations will be contracted with a crushed product, of minus 12.7mm sizing, being supplied to a storage facility ahead of the primary mill.

Once operating, it is anticipated that the plant will require two operators per 12-hour shift and one general maintenance employee on an 8-hour per day basis when the concentrator is running. Because the proposed mine plan is a campaigned operation, there will be periods of time (2 to 3 month intervals) where the concentrator will not be operating, and will remain on a care and maintenance basis. It is believed that the campaign nature of the mine and concentrator operations, with alternating periods of intense work and time off, will attract experienced mining personnel from both local and outlying areas.

Mining and concentrator personnel will include both contract and payroll staff, who may reside wherever they wish. FortyTwo will be offering daily transportation to and from the city of Nakusp (approximately 80 km away). Daily transportation from other towns, such as Revelstoke, may be considered, depending on the location of selected personnel.

FortyTwo held a community meeting at Trout Lake in May 2005 and discussed various aspects of the campaigned small mine proposal. Casual discussions were also held at that time with several residents who identified areas where the project could support and assist local infrastructure improvements. Specifically, the town's water supply and distribution system apparently needs to be refurbished and improvements could be made in the short term that would benefit the residents but also be necessary for the addition of workers who choose to reside temporarily and permanently in Trout Lake. Other local improvements may also be identified in the future to which FortyTwo and the MAX Molybdenum project may be able to participate.

5.0 WASTE MANAGEMENT

The proposed operation will produce approximately 104,000 tonnes of waste rock and low-grade mill feed, as well as a tailings containment facility with a footprint of approximately 12 ha and potential capacity of approximately 360,000 tonnes of tailings, double the proposed initial campaign of approximately 184,000 tonnes. The waste management plan for the waste handling is described in greater detail in the subsections below.

5.1 Tailings

5.1.1 Tailings Management Overview

The proposed mine plan will produce thickened flotation tailings on a campaigned schedule that will be piped through a tailings discharge pipeline from the process plant downslope to the proposed tailings containment facility. The preferred site for the tailings containment facility is located in a small valley downhill of the portal and plantsite area as shown in Figure 5.1-1. A tailings facility in this area can be contained by two relatively short and low dams. These consist of the Upper Dam at the northwest end of the gully and the Lower Dam to the southeast. Surface drainage into the pond will be limited by freshwater diversions ditches (BGC Engineering Inc., 2005a, 2005b; Appendix XII).

The dam locations have been selected to confine the footprint to the one small drainage basin and to limit the amount of runoff being captured by the basin. The upper dam is located at a drainage divide near the northern end of the gully confining the basin. A beach built out from this dam will push all pond water away from the divide. South of this divide, water flows towards the southeast to Wilkie Inlet D, and north of the divide water flows to the northeast. Both drainages eventually report to Wilkie Creek at the bottom of the main valley, which in turn flows into Trout Lake.

The surface water catchment area of the tailings pond will be reduced during construction and operations by two 700 m long diversion ditches on either side of the tailings facility (shown on Figure 5.1-1). Any water will be diverted around the facility and discharge below the seepage pond downstream of the lower dam. Airphoto interpretation suggests the ditches will be excavated into glacial till. An emergency spillway will be constructed in natural ground to protect the dam against overtopping.

In addition to tailings slurry water, any plant site area runoff will also be discharged into the tailings facility. Reclaimed water from the tailings facility will be pumped back to the process plant, via a reclaim line. Reclaim has been estimated to be 85-90% of available water.

The tailings facility has been designed based on the monthly water balance from Clearwater Consultants Ltd. (see BGC Engineering Inc., 2005a and b) and conservatively sized. The storage capacity provides for two years of solids plus an average snowmelt runoff and an operating pond less the assumed release during snowmelt of 30 L/s. The pond will include an emergency spillway to protect the dam from overtopping, with the spillway designed to pass peak flows from a 24-hour probable maximum precipitation (PMP) event. There is great flexibility in the first year when the expectation of reasonable tailings supernatant quality should allow annual excess water to be discharged during the high flow months of April, May, June, July and August with flow rates ranging from 0.4 to 3.8 L/s.

5.1.2 Tailings Facility

The proposed tailings facility dam is a zoned earthfill structure that will consist of an impermeable core supported by a free draining sand and gravel shell. An impermeable core is incorporated so as to minimize seepage out of the dam and to maintain the flexibility to keep the water levels high in the tailings basin should water quality requirements dictate the need for temporary containment. The proposed cross-section for the dams, as shown in Figure 5.1-2, are 6 m high (Upper or Northwest Dam), and 15 m high (Lower or Southeast Dam), and respectively 100 and 200 m long.

Dam side slopes of 2 horizontal to 1 vertical (2H:1V) have been proposed. This assumes that any soft organics or deleterious soft colluvium will be removed from the dam footprint and the dam is built on competent foundations. Given the seismic activity in the region, the uncertainty with regards to foundation material, borrow materials, and tailings beach densities it has been assumed that the dams will be raised in a downstream direction.

The core will be constructed out of compacted fine-grained material consisting of fine grained till or natural clay. If suitable quantities of impervious natural materials are not readily available then an impermeable geomembrane could be substituted.

A filter layer will be incorporated to provide protection of the core against seepage erosion. The filter zone requirements will depend on the grain size distribution of the impermeable core material.

The shell materials will be used to support the core material. Several sand and gravel quarries have been developed in the area historically and thus sand and gravel has been initially selected for the shell fill. The sand and gravel will be free draining to control seepage pressures within the dam and thus some processing may be required. Quarried rockfill could also be used if suitable sand and gravel is not readily available.

The proposed cross-section may be optimized in the future to take advantage of locally available material. A portion of the waste rock generated from crosscuts will contain low, but uneconomic grades of molydenite and is anticipated to contain 0.5 to 1.5% total sulphur (sections 5.2 and 6.1). This material may be suitable for use in the upstream shell below the final estimated tailings beach height, as it is material that will benefit from the low oxidizing conditions resulting from saturated conditions upstream of the impermeable core (MEMi, 2005a). However, logistics of its production (in the later portion of access development) may make its use problematic. The majority of waste rock generated from initial ramp development will contain less than 0.1% molybdenite and is anticipated to contain low sulphur (i.e. 0.3 to 0.8% total sulphur). This material would be suitable for use in the upstream shell below the final estimated tailings beach height, and may also be suitable for downstream shell construction (MEMi, 2005a). Additional geochemical testwork is underway to assess the suitability of this material as general construction material.

A fast track investigation and design process is proposed for the summer/fall of 2005. This will involve drilling and installation of monitoring wells, test pit excavating to assess borrow suitability and also test pit excavation of the dam foundations to estimate the extent of various soils types. The design proposed herein is flexible to allow modifications of the dam section and dam height during construction.

Seepage through the dams will be minimized by construction of impermeable cores and by discharging tailings from the dam crests to form two beaches and push the free water pond away from the dams. By doing so, long-term stability of the structure is enhanced and seepage flow paths will be maximized to minimize possible seepage flows. If seepage occurs through the dams, it will be collected in engineered drains and directed to collection sumps or seepage collection ponds at the toe of the lower dam.

Given that the expected foundation conditions consist of shallow bedrock or shallow rock with some till, seepage through the foundation of the basin is expected to be nominal. Any seepage that permeates through the dam and foundation area will be collected in a settling/seepage collection pond and pumped back to the mill or back into the tailings pond for recycling as required.

The proposed seepage collection dam downstream of the lower (southeast) dam is shown in Figure 5.1-1. The seepage recovery dam is presently proposed to be a 2 to 3 m high dam built of glacial till and placed on bedrock or glacial till foundations.

The seepage collection dam has been located to capture seepage out of the tailings basin while minimizing the amount of fresh water interception into the seepage pond. The diversion ditches will discharge fresh water downstream of the seepage recovery dam.

Given the assumed slope of the bedrock surface underlying the tailings facility, seepage is not expected to flow to the northwest. This assumption will be reviewed when additional site information is available. A second seepage collection sump could be constructed to the north of the facility, or the location of the dam could be adjusted, if required.

A monitoring well system will be installed downstream of the seepage recovery pond in the relatively narrow valley to detect any seepage. If necessary, pumpback wells can also be installed and used to intercept and return the water to the impoundment.

5.1.3 Tailings Characterization

Tailings will be thickened at the mill to minimize the amount of water discharged to the tailings facility. The tailings underflow reporting to the tailings pond is expected to be 65% solids by weight. Tailings reporting to the impoundment will be a mixture of sand and silt sizes. Metallurgical testing to date indicates approximately 65% of the tailings stream will be finer than the #200 sieve (75 microns). The settled density of the tailings in the basin will depend on the grain size, specific gravity, and discharge points. The specific gravity of the tailings has been conservatively estimated to be 2.65, a reduction from the expected in situ specific gravity of the ore of 2.37 to account for the mineral extraction. The reduction results in a greater volume of tailings being associated with the same production tonnage, and therefore a conservatively increased size for solids storage. A dry density of 1.4 t/m³ was chosen for estimating the storage capacity required.

The tailings supernatant water chemistry (see Table 4.4-1) is expected to be of reasonable quality (Nabbs, 1982), suitable for discharge during the higher flow months of April, May, June, July and August. The tailings solids have not yet been directly characterized. However, the sulphide content of the ore is expected to range from negligible to 2% pyrite and 1% to 4% total sulphide. Acid base accounting (ABA) testwork has indicated that tested bulk sample material from the MAX property would be classified as likely or possibly having acid generation potential. Tailings solids are likely to be similarly classified, albeit with a reduced MoS₂ grade and a somewhat reduced sulphide content. Residual MoS₂ in the tailings may be on the order of 0.1% MoS₂. (assuming 95% recovery from ore feed of 2.0% MoS₂). Residual sulphides in the tailings may be similar to that seen in the low grade ore, on the order of 0.5 to 1.5% total sulphur. However, mined materials do not appear highly reactive as they have not demonstrated notable water quality impacts after 20 years of surface exposure (MEMi, 2005a), and tailings are likely to be similar. Impermeable cores have been proposed for the tailings dams to ensure that the supernatant water can be contained if long-term saturation of the tailings is considered necessary.

5.2 Low-Grade Ore and Waste Rock

A maximum of 104,000 tonnes of waste rock and low grade mill feed material will be generated during underground development of the MAX Molybdenum Project. Approximately 60% of this material will be excavated during ramp decline development with the remaining 40% generated from development of Level access to the stopes in the HG zone. Molybdenite and sulphur content in the excavated materials are expected to increase as Level accesses approach the stopes (see Appendix XIII for details, MEMi 2005a).

Low grade material has been conservatively estimated to represent 25% (or ~ 25,000 tonnes) of the total material to be excavated (depending on selected cut-off grade), and will mainly come from the cross-cut development immediately adjacent to the stopes. The low grade material will be transported to a stockpile located adjacent to the offices and concentrator building by an extended rail. The location is within the perimeter ditches that will collect plant site runoff. As it is not certain that this material will be processed, it has been treated in this proposed plan as waste rock. This material will contain greater than 0.1% MoS₂, and is expected to react in a similar manner to bulk sample material that was previously stored on surface; total sulphur content is anticipated to range from approximately 0.5 to 1.5%. Total sulphur is expected to be present primarily as pyrite and molybdenite, with minor pyrrhotite. There is the possibility that this material will be potentially acid generating, but results to date suggest that oxidation rates are very low (see Section 6 for more details).

The ramp waste rock will account for approximately 57% of all excavated material and will tend to be produced early during mine development. It is expected to contain less than 0.1% MoS₂, with total sulphur contents ranging from 0.3 to 0.8%. Ramp waste rock is expected to react in a similar manner to the material previously identified as waste rock or 'overburden' and used to construct the former storage pad. It is expected to have lower sulphur contents than that contained in the bulk sample material that was stored in surface piles.

The mineralized waste rock (approximately 15% or 19,000 tonnes) will contain greater than 0.1% MoS₂, but less than the low grade cut-off, and is also expected to react in a similar manner to bulk sample material that was previously stored on surface, albeit with lesser MoS₂ and sulphur grades. This material is expected to be excavated at the beginning of Level access development, and will be deposited at the northwest end of the waste rock pile, adjacent to the mill, such that it generally remains separate from the bulk of the cleaner ramp rock.

Waste rock (ramp and mineralized) will be transported along the extended rail to the west of

the previously reclaimed area and dumped from the track. The furthest extent of the waste rock pile will not encroach closer than 50 m to the adjacent ephemeral creek. The waste rock pile has been sized initially with the capacity for ~ 75,000 tonnes, which will include both the ramp waste rock (~ 60,000 tonnes) and excavated waste that is mineralized (i.e. containing greater than 0.1% MoS₂, but less the selected cut-off for low grade mill feed). The waste rock storage facility is expected to cover an area of approximately 200m x 50m and be approximately 5m deep. A collection ditch will be constructed around the toe of the dump to a central collection point from which location the water will be pumped to the tailings containment facility.

As noted in section 5.1.2, ramp waste rock produced early in the mine development schedule is suitable for use in the upstream shell below the final estimated tailings beach height (where it would remain saturated), and may also be suitable for downstream shell construction (MEMi, 2005a). Additional geochemical testwork is underway to assess the suitability of the ramp waste rock as general construction material.

A sampling program (section 6.1) will be implemented during ramp and cross-cut development to develop and confirm the operational scale waste rock material characterization and handling program. This program will be aimed at identifying potentially problematic rock from that considered to have a low potential for acid generation or metal leaching. This will allow proper placement of low grade and waste materials, and provide additional information for implementation of final reclamation plans and contingencies.

5.3 Soil

No substantial volumes of soil and overburden are planned for stripping at the site with the exception of the starter areas for the upper and lower tailings dams and the seepage dam. In these areas, the soil and overburden, mainly glaciofluvial soils and till, will be stripped to bedrock or other competent foundations for dam construction and the removed material will be stockpiled near the tailings containment facility, below the clean water diversion ditches. Stockpiled material high in organics will be saved for reclamation purposes; whereas stockpiled material devoid of organics will be set aside separately for later use as final tailings and waste rock covers, if of acceptable properties. Anticipated volumes of stockpiled soils and till are on the order of 2,000 to 4,000 m³ depending on the actual depth of soils encountered (assumes 0.5 to 1m deep soils).

6.0 ENVIRONMENTAL MANAGEMENT PROGRAM

6.1 Metal Leaching & Acid Rock Drainage Considerations

The proposed environmental management program is based on the information provided in the late 1970's and early 1980's during the exploration program conducted on the project and the subsequent reclamation studies of those activities from 1997-2003. In contrast to many new mine applications, the MAX Molybdenum Project has the benefit of having a previously developed site with EA baseline studies, development and closure work already completed from which to build on. This information includes on-site field observations for a period of over 20 years with which to aid in this assessment. This information provides a much greater basis of understanding than many sites are able to achieve at this stage whereby typically geochemical predictions are based solely on laboratory studies of 'fresh' drill core, sometimes in limited quantities.

The existing information from the production size exploration adit, resource and bulk sampling, metallurgical testing, mine planning, baseline environment characterization and preparation of conceptual waste management plans for a large-scale mining project was therefore used in the predictions of acid rock drainage and metal leaching (ARD/ML) of the MAX deposit and host lithologies. In addition, information collected during reclamation of the site between 1997 and 2003 including water quality and geochemical data was available for predictions of ARD/ML for the MAX Project. MEMi used this information for the predictions for the MAX Project as detailed in Appendix XIII (MEMi, 2005a) and summarized in the following sections.

6.1.1 Acid Rock Drainage Potential

Based on previously collected information, ABA results indicate that tested material from the MAX property would be classified as likely or possibly having acid generating potential. This is consistent with the presence of some acid producing materials on site after storage on surface for nearly 20 years, evident as acidic pH values in extraction solutions from visibly oxidized material. However, the majority of samples submitted for ABA testing generated alkaline paste pH, and seep surveys conducted around the stockpiles indicated neutral pH and moderate conductivities.

Low grade ore has been estimated to represent 25% of the material to be excavated (depending on selected cut-off grade), and will mainly come from the Level access development adjacent to the proposed stopes. This material is likely to contain greater than 0.1% MoS₂, and react in a similar manner to bulk sample material that was stored on surface; total sulphur content is anticipated to range from approximately 0.5 to 1.5%.

Ramp waste rock, being the majority (~ 60%) of the excavated waste material, is expected to contain less than 0.1% MoS₂, with total sulphur contents ranging from 0.3 to 0.8%. Total sulphur is expected to be present primarily as pyrite and molybdenite, with minor pyrrhotite. Ramp waste rock is likely to be similar to the material previously identified as waste rock or 'overburden', and used to construct the former storage pad.

The remaining 15% of the waste rock is expected to contain greater than 0.1% MoS₂, but less than the low grade ore cut-off, and is also expected to react in a similar manner to bulk sample material that was previously stored on surface, albeit with lesser MoS₂ and sulphur grades.

Residual MoS₂ in the tailings may be on the order of 0.1% MoS₂. Residual sulphides in the tailings may be similar to that seen in the low grade ore, on the order of 0.5 to 1.5% total sulphur. Metallurgical testing currently underway will allow characterization of tailings solids and tailings supernatant quality to be refined. On the basis of historical metallurgical data, the tailings supernatant is expected to contain low TSS and relatively low metals levels (see Section 4.4.7 above).

6.1.2 Metal Leaching

The predominant neutral to alkaline pH conditions at the site does allow molybdenum to be leached, once oxidized. Molybdenum values in seeps around the piles have been measured at 1.7 mg/L. Molybdenum in the mine water slightly exceeded the CCME guideline of 0.073 mg/L, however it did not exceed the BC criteria of 2 mg/L. Thus, molybdenum is expected to leach from wall rock and excavated materials at neutral to alkaline pH, with concentrations dependent on MoS₂ grade and storage conditions. Proposed saturated/near-saturated storage conditions that minimize oxidation will reduce the subsequent release of soluble molybdenum (and other metals).

Portal discharges have also historically been neutral to alkaline, with pH ranging from 7.25 to 8.1. Sulphate values in the portal discharge are low, ranging from 29 to 55 mg/L. Thus the mined materials stored for 20 years on the surface at site do not appear to be highly reactive, and oxidation rates low enough to minimize the potential for significant environmental impacts.

6.1.3 Mitigation

Current mitigation plans focus on classifying of material based on molybdenum content (i.e. low grade ore, mineralized waste and waste with <0.1% MoS₂), which has also been roughly linked to sulphur content. These criteria will be used during operations to identify potentially

problematic material for selective handling. Additional proposed testwork will be conducted to refine these parameters, and/or seek other site-specific indicators of geochemical characteristics that identify the relative potential for acid generation and/or metal leaching.

Run-off from the low-grade stockpile and the waste storage area adjacent to the plant site will be collected in collection ditches and transported to the tailings storage facility. On closure, the material remaining on surface will be reclaimed as described in Section 7 below (similar to that previously implemented on surface stockpiled materials) to minimize contact with water and metal leaching concerns.

Available contingencies to manage material identified as having significantly more potential for acid generation or metal leaching than previously seen, include:

- Storage underground below the adit level, or below the ultimate flooded mine working water level; and,
- Placement in the tailings containment facility, which has been designed to have excess capacity.

If scheduling is such that mineralized waste rock can be utilized in the upstream face of the tailings dam then it will be used as construction material for this purpose. The intent is to have the most sulphidic material placed in a saturated condition for the long-term.

The site water balance conducted to date suggests a dilution ratio immediately downstream from the proposed tailings facility on Wilkie Inlet D (sampling site G) of ~40:1 for the tailings seepage and discharge water. The dilution ratio in Wilkie Inlet D for all mine site effluent at this site (i.e. considering portal and underground water discharge as well as tailings water discharge) of an order of magnitude is predicted (see Appendix XIV). As such, any drainage from areas affected by the proposed mining activities (i.e. plant site, ore, waste rock and tailings storage areas) will have substantial clean water dilution prior to sampling site G. Site G has been selected as representative of a potential compliance point because it is well upstream of known fish presence (see section 2.7), and is reasonably accessible for monitoring purposes. This station will be routinely monitored and, if needed, the water from the tailings seepage collection pond can be returned to the tailings dam, and upgrades to the plant site run-off and portal discharge water management systems can be implemented to ensure water quality at this location that is protective of the receiving environment.

6.1.4 Monitoring Program

A sampling program will be implemented during ramp and cross-cut development to develop and confirm the operational scale waste rock material characterization and handling program. This program will build on the current database linking static material

characteristics to site water quality collected over the last 20 years, and on the supplemental static and kinetic testwork currently underway.

As material from each blast round is removed, MoS₂ grades will be determined to address relative potential for neutral pH molybdenum leaching. Total sulphur and NAG tests will also be conducted to assess potential acid generation potential.

6.2 Watercourse and Water Quality Protection

6.2.1 Site Drainage

Relatively little information is available with respect to flows in the various tributaries and ephemeral creeks on and near the site. The site water balance is therefore based on estimated values of precipitation, run-off estimates and watershed areas (see Appendix XIV, MEMi, 2005b). In terms of water quantity, the proposed mine plan has very limited direct impact on the flows immediately downstream of the proposed infrastructure. Plant site runoff from an area of approximately 8 ha will be collected from the upper portions of Wilkie Inlet D (and therefore a reduction in downstream flows by ~ 2 L/s), and the diversion around the proposed tailings storage facility will drain an area of 12 ha (~ 3 L/s). This is estimated to account for less than 2% of the flow reporting to Wilkie Inlet D (from a catchment of ~ 1,110 ha). Reducing flows in these upper tributaries is not expected to impact the productivity or habitat of the receiving environments in Wilkie Inlet D, particularly in the extreme lower reaches near the mouth where fish have been observed.

Water quality predictions have also been conducted by means of a load balance in order to evaluate the potential water quality impacts from the proposed mine plan (Appendix XIV, MEMi, 2005b). The load balance included an assessment of Mo and SO₄ as indicators of metal leaching (Mo) and potential ARD (SO₄) impacts from the site. Both parameters are also believed to behave relatively conservatively at the near neutral pH conditions anticipated from the site and as such should provide benchmarks for monitoring and checking of predictions during and following operations.

The source concentrations were selected from the datasets available from earlier work done on the site (see Appendix XIV for details). Loads (concentrations times flows) were assigned to each area of the site and each waste storage facility and summed through the site balance with predictions provided in Wilkie Inlet D below the tailings facility (i.e. sample site G) over the proposed mine life and for one year following closure. Based on this load balance, the predicted molybdenum concentrations at sampling site G varies from 0.004 to 0.03 mg/L seasonally (average of 0.017 mg/L). Sulphate values are predicted to vary from approximately 3 and 30 mg/L seasonally (average of 16 mg/L). These values are well within

the BC water quality guidelines for Mo (2 mg/L) and SO₄ (100 mg/L) and within the CCME guidelines of 0.073 mg/L for Mo (note there is no CCME guideline for SO₄).

6.2.2 Environmental Monitoring and Surveillance Programs

The proposed environmental monitoring and surveillance programs during operations will include, a regular water quality and flow monitoring program, a semi-annual site inspection including seep surveys and general visual inspection, an annual geotechnical inspection, and annual reporting. The regular water quality and flow monitoring program will be implemented following the establishment of agreed sampling locations, sampling frequencies and parameters with regulatory agencies and stakeholders. Ideally, stations would be established at the previously established water sampling sites in order to enable direct comparisons with baseline and past reclamation data. Suggested sites include:

- Captured adit water (historic station 12)
- Settled mine water (combination of uncaptured adit water and production water) (historic station 13)
- Plantsite runoff sump
- Tailings reclaim and effluent discharge
- Settling pond at toe of the lower (SE) tailings dam
- Groundwater wells location downstream of the tailings dams and seepage collection pond
- Receiving water sites A, B, G (proposed compliance point), E (former station 4) and F (former station 7).

Sampling will be conducted monthly during operations, with the exception of the groundwater wells (monitored quarterly), and the tailings reclaim and effluent discharge and receiving water site G, which would be sampled monthly except for the first month of effluent discharge in each year, when sampling would be weekly. Data would be compared, in the annual report, to historical and baseline water quality.

Semi-annual seep surveys would be conducted following spring freshet and in the late summer.

For the first three years following closure, quarterly monitoring and surveillance will be conducted by means of site inspections by person(s) qualified at water quality sampling and ARD/ML assessments. Site visits would include a visual inspection of waste storage facilities and water management structures, water sampling and testing (pH, alkalinity, sulphate, total and dissolved metals) and reporting. Annual status reports will be submitted to the responsible agencies, along with annual geotechnical inspections. Any maintenance required will be conducted as specified in the inspection reports.

On the fourth year after closure, water quality has been found to be consistent and of acceptable quality, water quality and visual inspections will be reduced to once every two years, likely in the mid to late spring. The frequency of geotechnical inspections will also be reviewed at that time. Site inspection frequency may be reduced further after 10 years if agreed by all responsible parties that limited risk exists.

6.3 Air Quality Management

The MAX project will have the following potential sources of dust and emissions contributing to air quality in the project area:

- Wind blown dusting from the tailings storage site, plant site, roads and parking;
- Diesel exhaust from generator sets; and,
- Exhaust from the underground mine operation.

Dusting from the wind erosion and transport of tailings may occur during prolonged dry periods when the top few millimeters of material dries sufficiently to allow this to occur. Since these periods occur infrequently in the summer and since the tailings facility will be operated with a reclaim pond and slurry discharge on beaches, it is believed that the potential for this occurrence will be very limited. In the event that dusting becomes problematic over an extended dry period, operations could mitigate the occurrence by discharging slurry over dry areas.

Dusting from roads, the crusher and plant site area and parking area will be controlled by the application of water by truck or hose as required to prevent or limit the occurrence, again expected infrequently during the summer months.

Diesel emissions from generator sets used to power the plant and underground mine operations will be controlled by regular maintenance of those units and exhaust scrubbers as required. Also, exclusive use of low-sulphur fuel in all diesel equipment will further minimize emissions. Generally speaking, the relative size of these generator sets is sufficiently small so as not to cause an air quality problem. Similarly, diesel emissions from underground equipment will be exhausted from the portal area. In general, the mine would operate under a very small diesel equipment fleet and all underground diesel engines will be equipped with scrubbers, thereby limiting the exhaust particulate load.

7.0 RECLAMATION PROGRAM

The reclamation program described in this section outlines the general plan for returning the site to a state similar to what pre-existed the proposed mine operations at the site.

The project area has been previously disturbed and developed as an advanced exploration project by Newmont Exploration. Reclamation of the site was undertaken in 2003, to the satisfaction of the BC Ministry of Energy and Mines (MEM 2004b).

The Reclamation Program for the proposed project will consist of:

- Removal of site buildings and facilities;
- Reclamation of underground workings and closure of the mine portal with provision for long-term minewater release;
- Decommissioning of the tailings facility and waste rock piles;
- Clean-up and stabilization of the general site areas;
- Restoration of site roads and blocking site access;
- Removing site runoff water diversions and re-establishing pre-mining flowpaths;
- Revegetation of site areas; and
- Post-closure maintenance and monitoring programs for a minimum 3 year-period of time.

The major site features are shown in Figure 3.6-1. Mine development areas that will be disturbed and require reclamation are shown in Figure 7-1.

FortyTwo recognizes the need to demonstrate a proactive reclamation plan as an integral part of its Mine Application.

The current mine plan envisions a 28 month mine life undertaken on a campaign basis. Therefore, progressive reclamation will be limited due to this short mine life and limited construction season windows. However, FortyTwo is committed to environmental stewardship including reclamation of all site areas and to begin progressive reclamation initiatives as described in Section 7.6.

The Reclamation Program will utilize selected components from the previous decommissioning of the site undertaken by Newmont Minerals in the summer of 2003 (Rescan 2004a).

Owners of logging rights to the site (Pope and Talbot) have been notified by FortyTwo of their plans to initiate mine production from the site and to maintain contact concerning mine development and decommissioning objectives so as to enable a smooth transition to an

acceptable post-mining land use.

The proposed approach to reclamation is one of adaptive management and if conditions during operations or at the end of mine life are different than that which is currently anticipated, certain aspects of this program will be modified to best meet the site conditions accordingly. Each main component of the reclamation program is described independently in the following sub-sections.

7.1 Soil Handling Plan

No substantial volumes of soil and overburden are planned for stripping at the site with the exception of the starter areas for the upper and lower tailings dams and the downstream seepage dam. In these areas, the soil and overburden (BGC, 2005a) will be stripped to competent bedrock or other foundation for dam construction and the removed material will be stockpiled.

Several of the site buildings and structures at the plant site will have some preparation work undertaken as part of their construction, including removal of soils and grading prior to pouring of concrete bases. These materials will be similarly stockpiled for later re-use.

Additional volumes of material will be sourced during re-establishment of the existing forestry road to the tailings containment facility. Stockpiled material high in organics will be saved for reclamation purposes, whereas stockpiled material devoid of organics will be used in final tailings and/or waste rock covers if of appropriate properties.

Criteria for selecting areas for stockpiling these soil materials includes:

- Timing of on-going mining, soil salvage and waste pile development and removal; and,
- Locations with no nearby downslope watercourses and where erosion and sediment runoff control will not be a problem.

Areas to be used for stockpiling of these materials must be cleared of timber, large vegetation and incompatible underlying materials prior to placement of stockpile materials

The various stockpiled materials will be kept separated as best as possible (for example: top-soils away from sub-soils such as tills or clays and ore and waste rock materials). The materials will later be used for a variety of purposes including covering of the waste rock pile, reclaimed mine facilities and for use as topsoil cover in preparation for revegetation.

It is not expected that the amount of material stockpiled will be sufficient to cover much of

the tailings facility on closure. Therefore, additional material of the appropriate properties will be sourced as cover material (discussed further in section 7.4.6 below). It is anticipated that local material will be identified that will be suitable for these purposes as was done for the reclamation work conducted for Newmont in 2003.

7.2 Environmental Monitoring and Surveillance

As noted in section 6.2.2, environmental monitoring and surveillance of the MAX property during reclamation will be conducted for the first three years on a semi-annual basis by means of site inspections by person(s) qualified at assessing reclamation success, water quality and ARD/ML issues. Site visits would include a visual inspection, water sampling and testing (pH, alkalinity, sulphate, total and dissolved metals) and reporting on the status of reclamation, in particular revegetation success, water management and erosion and stability. In addition, an annual tailings dam inspection will be carried out by a qualified person of record. Annual status reports will be submitted to the responsible agencies.

In the fourth year, if no reasons are seen to maintain the same frequency, site inspections will be reduced to once every two years. These will be undertaken in the mid to late spring. Site inspection frequency may further be reduced after 10 years if all the responsible parties agree that limited impacts or risks remain.

Site environmental monitoring will be coordinated by the Site Manager. Reports of monitoring results will be forwarded to Ministry of Energy and Mines - Mining Division in the Annual Reclamation Report and other regulatory agencies such as the BC Ministry of Environment, as required. Any additional monitoring or surveillance requirements will be addressed by FortyTwo, if and when such requirements are placed on the company.

These programs will ensure minimal impact from the mining operation and from the future reclaimed site, consistent with regulatory requirements.

Pending satisfactory completion of decommissioning and closure works and follow-up monitoring and maintenance, FortyTwo will request a relinquishment of its mining and associated licenses for the site and request a return of its reclamation security.

7.3 Erosion Control and Sediment Retention Plan

Erosion and sedimentation is not anticipated to be a significant issue at the site during development or operations and is expected to be even less of issue after mine closure.

Overburden stripping during mine development will incorporate standard sediment retention features including silt fences, hay bales and settling areas for fines and avoiding work in

vulnerable areas during major rainfall periods.

Upstream diversion ditches and collection ditches around the perimeter of the plant site will be constructed as soon as possible to control sediment generated from land disturbance associated with plant site construction. Diversion ditches will be constructed around the tailings facility prior to stripping of the tailings dam sites.

During operations, site effluent water quality will be ensured through the use of a settling pond in which mine water from the active workings, and uncaptured adit water, will pass to settle any fines prior to release to the environment. Additional land is available to the northwest of the portal, should additional settling ponds be required. Plant site runoff will be collected and pumped to the tailings area for additional settling prior to discharge. Water from the tailings facility will be recycled during operations. Effluent from the tailings area will be discharged in a controlled manner during high flow periods (April through August) and will be discharged to a rip-rapped area, located above several beaver ponds, to minimize erosion.

At closure, reclamation of the underground workings will be such that sedimentation and subsequent suspended solids in adit discharge will be minimized. All new development and stope areas are below the existing adit level, and expected to flood at closure. Water from the existing adit is anticipated to continue to drain, and is likely to maintain flows in the range of 35 L/s. If required for a short period after cessation of mining, the portal settling pond will be expanded until such time that discharge water quality is established. Ultimately, water draining from the adit will be collected and drained through a French Drain to a hillside discharge point, similar to the method approved for Newmont's previous reclamation efforts which proved successful in reducing suspended solids loads.

The plantsite collection ditch and sump will remain in place during decommissioning and removal of the plant site facilities, to minimize sediment loss. Pumps will continue to carry run-off from the plantsite to the tailings facility until the site landforms have been re-established and revegetated. At this point, upstream diversion ditches will be filled to re-establish natural drainage patterns.

Reclamation of the waste dump and tailings facility will include covering and revegetation as well as construction of rip-rap lined run-off channels to minimize erosion. Diversion ditches for the tailings facility will be removed to re-establish natural drainage patterns. A permanent spillway will be constructed in the bedrock adjacent to the lower (SE) tailings dam with energy dissipaters to minimize erosion from discharge of high runoff events. Site inspections and water monitoring (see section 7.2 and 7.4.12) will allow refinement of erosion maintenance requirements should they be required. However, at this time erosion

maintenance of the diversion and run-off structures is planned to occur semi-annually by means of debris removal (beaver dams, sediment etc.) and rip-rap replacement or repair, if needed. If additional settling of discharge or diverted water is required this will be integrated into the site water management plan.

At closure, the plantsite and general infrastructure area will be re-contoured to ensure adequate drainage and prevent pooling of water. A maximum grade of 15% will be used as design criteria for the overall site, to blend into the surrounding hillside topography and to reduce the risk of erosion damage. An upper limit of 40% slope (2.5H:1V) will be the general goal for the tailings facility and waste rock side slopes.

The Reclamation Plan also includes the installation of a number of passive sediment retention systems to ensure there are no sediment releases to the local streams. Especially important is erosion control on sloped approaches to any streams, in and around the site. Other more aggressive features such expanded settling ponds may be considered in the final closure, if required. Long-term fines generation should not be an issue as mining activities cease, therefore use of a settling pond is not anticipated for extended periods, nor are contaminants of concern likely to be an issue.

The majority of the site area will be hydroseeded with a blend consisting of seed mix, fertilizer and tackifier. Special attention will be given to areas vulnerable to erosion in which case mulch may also be added to the blend. In smaller, harder to access areas, broadcast seeding with the same mix will be undertaken. The tailings facility will be revegetated by broadcast seeding from an ATV. The proposed seed mix for revegetation will be the same as was used in 2003 (Table 7.3-1). It is the standard mix used by the Ministry of Forests for revegetation of forestry roads in the Trout Lake area (Rescan 2004a).

Based on annual site inspections and more detailed future tests of the success of the previously reclaimed areas, the recipe may be adjusted in future revegetation efforts.

A water management plan will be implemented to ensure the success of the passive minewater polishing system. The management plan will include inspections of the portal, pipeline and French Drain areas during scheduled site inspections for the first four years after site reclamation.

Table 7.3-1 - Hydroseed Mix Used at Max Molybdenum Project Site

Seed Species	% Composition	
Fall Fescue	10	
Annual Rye Grass	15	
Orchard Grass	5	
Creeping Red Fescue	15	
Perennial Ryegrass	20	
Kentucky Bluegrass	5	
Timothy	5	
Smooth Bluegrass	10	
SC Red Cover with Qwik Grow	10	
Alfalfa with Qwik Grow	5	
Application Rate	30 kg/ha	
Fertilizer	Composition	13-16-10
	Application Rate	300 kg/ha

7.4 Conceptual Final Reclamation Plan

The Final Reclamation Plan will be consistent with Parts 10.5 and 10.6 of the *Health, Safety and Reclamation Code for Mines in British Columbia* (B.C. Government, 1997):

- Part 10.5 defines Mine Closure, applicable notices and filing information; and
- Part 10.6 provides Reclamation Standards.

The goal of the Final Reclamation Plan is to provide an acceptable plan detailing how FortyTwo will return the site to the Crown after mine closure. The Plan will continue to be refined during the operational period of the mine. After closure work has been completed, the lease area will be safe and secure for the long-term in preparation for mining lease surrender. The work undertaken will include:

- Removal of all equipment, chemicals, infrastructure, etc from the mining operation;
- Reclamation of disturbed areas including sites of building and structures, waste rock pile, tailings area and demolition debris landfill;
- Application of a sustainable vegetative cover of grasses using hydroseed or broadcast seeding methods, or with shrubs on the tailings facility, with a soil cover where required. The soil cover will be comprised of previously stockpiled soils and local till materials;
- Ensuring the site is made safe to casual access, without the need for a permanent buffer zone or perimeter fencing;
- Providing as-built information on the closure plan components; and finally
- Monitoring performance of the completed reclamation to ensure attainment of performance objectives, with additional monitoring and maintenance as required.

Reclamation cost estimates are summarized in section 8 of this report. The standard BC

Ministry of Energy and Mines, Mining and Minerals Division *Mine Reclamation Costing and Spreadsheet* template (Version 3.5.1) (MEM, 2004a) was used in the development of the cost estimates. It has been completed with an initial assessment of components and cost estimates and is provided in Appendix XV along with a table of Lump Sum Cost Items providing detailed cost estimates used to generate the numbers provided in the Spreadsheet.

7.4.1 End Land Use Objectives

The lands on which the mining claims are situated as well as the surrounding area have been previously utilized for mining exploration and logging. The area of the site is considered good for future logging and mineral exploration with a low risk of slides.

The goal of the proposed reclamation plan is to return the site to a similar condition to that which currently exists. The end land use objectives for the minesite are to return the site to productive forestry, mineral exploration, wildlife and recreational use.

The wildlife species anticipated to inhabit the area include those described in section 2.10 above; namely, woodland caribou, mule and whitetail deer, mountain goat, grizzly and black bear, wolf and coyote as well as a variety of furbearers in the Wilkie Creek lowlands and the surrounding forests and a number of bird species that utilize the area at various times of the year.

Access to the site will not be fenced off or restricted. The main access road to the area will be left in place to provide access to others who have rights to the lands including surface rights such as timber companies, mining leases, and trappers. It will be up to others subsequently using the site to control access as required, by the installation of a gate across the road right of way that enters the site.

7.4.2 Productivity or Capability Objectives

The previous advanced exploration program included baseline environmental studies as part of its application process in 1979/81. However, pre-mine development site productivity estimates have not been determined as there have been no recent baseline studies undertaken. The site has been monitored and inspected since previous site activities as required by the previous and current mine exploration permits.

The area of disturbance will be relatively small at the MAX mine, with the tailings facility representing the largest disturbed area (~7 ha). Closure of the tailings facility includes placement of a dry cover and revegetation, which will provide an area likely to be attractive to wildlife. The area of the site is considered good for future logging and has a low risk of slides.

To ensure maximum survivability of vegetation being established on the reclaimed minesite, soil enhancement may be required in some areas of the site. Materials required to make a soil cover for the disturbed areas of the site will be salvaged from on-going overburden stripping operations. These may be supplemented with additional materials from the site and surrounding area (including from along the access road as was done in the 2003 reclamation program).

7.4.3 Long-term Stability

The reclamation measures proposed in the reclamation plan have been selected so as to minimize the potential for physical and chemical instability of the site post closure. The mining claim lease area has been reported to have a low risk of slides, which facilitates maintenance of long-term physical stability.

The site will have several structures remaining after closure. These consist of a closed mine portal, a covered tailings facility, a covered waste rock pile, and an encapsulation pile (from the Newmont operation). All of these will have been appropriately decommissioned and reclaimed for long-term stability, as required under the Mines Act.

The success of these measures will be assessed through the post-closure monitoring and maintenance program. During construction of the tailings facility dams, piezometers will be placed at locations that will provide the geo-technical information required for the long-term stability analyses of those structures. Water quality stations and wells will also be placed such that any possible off site seepage and drainage can be monitored and reported on.

In addition to piezometers and wells, site inspections will look for signs of seepage from facilities, slope instability, erosion and mass wasting on the dams and waste rock piles.

The waste pile and low grade ore stockpile are anticipated to be relatively small (maximum volume of 104,000 tonnes with some proportion of that potentially remaining underground, moved to the tailings containment facility, or used in construction of the tailings containment facility). Because of the size of the pile, limited height (i.e. ~5m height), and the anticipated foundation conditions, the overall stability of the waste rock pile is not of concern. If the waste rock is found to demonstrate appropriate properties, it may be used for rehabilitation and construction purposes (possible cover material, or backfill material). Any remaining mine waste rock stockpiles will be graded to a maximum steepness of 2.5 horizontal to 1 vertical (2.5H:1V).

The portal will be closed to the satisfaction of the Regional Engineer and consistent with the current exploration permit and reclamation bond (MEM, 2005). All reclaimed surfaces will be

revegetated to increase surface stability and minimize erosion.

Several minor watercourses through the site will remain, in a secure state with minimal risk of blockage due to erosion or landslides, not unlike what pre-existed mining at the site.

7.4.4 Treatment of Structures and Equipment

All buildings and structures on the site will be removed after mining operations are completed. This includes the concentrator building and tailings thickener, office and camp buildings, truck shop, explosives magazines, and secondary buildings and structures. Portable buildings and equipment will be removed from site.

Concrete pads and foundations will be left in place and covered with a vegetated cover. Larger areas will be drilled to enable drainage of surface water through the cover materials and into the underlying soils.

Other secondary materials to remove upon mine closure will include:

- Buried sewage holding tank;
- Pipelines, tailings and reclaim water; and
- Powerlines.

Any scrap wood will be stockpiled and burned. All remaining non-hazardous debris will be disposed of adjacent to the waste rock pile and buried (i.e. the demolition debris landfill) or transported off-site to the Trout Lake municipal landfill. Any hazardous debris will be removed to a licensed off-site facility.

7.4.5 Waste Pile and Low Grade Ore Stockpile Reclamation

The *Health, Safety & Reclamation Code for Mines in British Columbia* (B.C. Government, 1997) stipulates:

Prior to abandonment of any impoundment, dam, or waste dump, the long-term stability of exposed slopes shall be assured to the satisfaction of the chief inspector (reference: Sec. 9.2.4).

As part of the Reclamation Program, the development waste rock pile and low grade ore stockpile will be reclaimed at mine closure.

As described in section 6.1.1 above, a portion of the waste rock (~ 15,000 tonnes) and the low grade ore stockpile are likely to be mineralized, and may present a potential concern with respect to long term potential for acid generation and metal leaching. This material will

be selectively handled and placed in specific stockpiles (low grade stockpile) and in specific areas of the waste rock pile (i.e. that section closest to the concentrator) to allow additional mitigation measures to be applied, if required. Additional testwork is proposed to clarify the potential reactivity of the various materials. If materials are identified as having significantly more potential for acid generation or metal leaching than previously displayed, available contingencies include:

- Storage underground below the adit level, or below the ultimate flooded level of the mine workings; and,
- Placement in the tailings containment facility, which has been designed with excess capacity.

However, these materials are expected to act in a similar manner to the bulk sample material previously left on site for nearly 20 years, and subsequently consolidated, covered with local borrow material, and revegetated. Similar measures are proposed for all residual waste rock and low grade ore left on surface at closure. Characterization during placement, and mapping of final stockpile locations may allow these materials to be recovered and milled at a later date.

The majority of material that will be stored in the waste rock pile (~ 60,000 tonnes) is expected to be non-acid generating, or have a very low potential for acid generation, and will contain MoS₂ grades less than 0.1%. Seepage from the waste dump is expected to be buffered to near neutral pH conditions. The waste rock and low grade ore piles will be resloped to slopes no steeper than 2.5H:1V, with dry cover placement over the facility to minimize infiltration through the waste material and therefore minimize seepage. The current cover plan is for a compacted 0.5m thick layer of local till materials or glacio-fluvial sediments, or non acid-generating, non metal leaching waste rock, then overlaid by a loose 0.25m thick soil cover which will be hydroseeded. A detailed cover design will be prepared and submitted prior to closure at which point a definitive cover source will be identified and fully characterized. Run-off will be minimized to the extent practical with diversion ditches around the facility until revegetation is sufficiently established that water quality is of satisfactory quality to release to the environment.

7.4.6 Tailings Area Reclamation

The tailings impoundment will be reclaimed so as to provide a stable and healthy terrain for re-establishment of forestry over the area.

The long term ARD/ML potential of the tailings cannot be assessed definitively with currently available information. However, results to date (MEMi, 2005a) suggest that there will be slow oxidation rates, substantial buffering capacity and low levels of residual MoS₂ (<0.1%).

Neutral pH metal leaching (e.g. Mo) may result, but to be conservative, the reclamation plan will be designed to minimize seepage. A compacted layer will be placed on the surface of the tailings to minimize water infiltration into the underlying tailings. A vegetated soil cover will quickly be established over the area. Cover materials will be sourced locally if acceptable materials can be found. Possible sources include non-acid generating, non-metal leaching waste rock or local tills. A characterization program will be conducted to identify an appropriate source.

The two 700m long diversion ditches on either side of the facility will be removed once work on the tailings surface has been completed, allowing natural drainage patterns to re-establish. A final spillway, sized to carry the Probably Maximum Flood (PMF) around the main dam, will be included in the closure design and located in bedrock adjacent to the lower (SE) dam. Surface run-off will be routed across the area and diverted around the dam towards the spillway by means of sloping the final surface of the tailings and cover placement to achieve positive drainage off and around the dam. The monitoring program will include sampling of this continued discharge from the tailings facility.

The monitoring program will also include monitoring of surface run-off waters and groundwater wells immediately downstream of the tailings dams. These monitoring wells could be instrumented with pumpback facilities if needed. However, both surface and ground water quality are anticipated to be of acceptable quality for direct discharge to the receiving environment. If required, the seepage collection pond can be retained as a settling pond for a short time. See section 7.4.12 for further details on the post-closure monitoring program.

7.4.7 Portal Closure and Underground Reclamation

The site has one portal, the main mine portal accessing the 960m Level. It was decommissioned in 2003 as part of the site reclamation program by Newmont (Rescan, 2004a). That work included a coffer dam and fill at the portal and a buried big-O pipe system transferring on-going mine water production subsurface a distance out from the portal and discharging over the bank to an area safe from beaver activity. The portal area was recently re-commissioned for entry to the adit and mine workings as part of the current exploration permit held by FortyTwo.

The current underground workings will continue to be largely drained by the Z fault system that is currently producing flows on the order of 35 L/s. Beyond this fault system, the new mine development, cross-cuts and stopes are expected to be relatively dry since the rock appears to be relatively impermeable and similar fault structures are not anticipated. The new workings are all located below the existing adit. Thus, at closure, the new workings will be encouraged to flood to the lip of the existing adit by directing adit water to those areas.

Boreholes may be established to connect the steady flows from the current adit walls towards the new workings. Once these workings are flooded, it is expected that a steady flow of $\sim 35\text{L/s}$ will continue to emanate from the portal.

Once operations cease, sedimentation and any subsequent suspended solids content in adit discharge water will be monitored. If required, the settling pond will not be immediately reclaimed on closure and will be included in the monitoring and maintenance program. However, similar to experience in 2004, once underground activities cease, suspended solids are expected to gradually drop to very low levels ($< 3\text{ mg/L}$). Dissolved water quality from the adit may have marginally elevated levels of molybdenum, sulphate, iron and manganese and pH values near neutral. Iron and manganese are expected to precipitate upon aeration once discharged from the adit. Sulphate and molybdenum will likely remain in solution. However, levels are likely to be similar to what was reported by Rescan in 2003 and 2004, and as such are expected to meet B.C. MELP aquatic life guidelines (Rescan, 2003a, 2004a,b).

Surface water management at the site must consider the significance played by the large amount of beaver activity in the area. Minewater that will continue to exit the mine in the long term will be routed to a steep hillside using a large French Drain utilizing coarse rock and a cover along its length.

Therefore, the proposed closure and reclamation plan for the underground mine and portal involves the following components:

- Securing underground workings;
- Lock-block sealing of portal entrance;
- Installation of subsurface 1.5m x 1.5m French drain to extend from inside portal to creek bank outside of portal;
- Covering of French Drain with geo-textile and a granular cover along its entire length and revegetation of section from portal to the bank.

7.4.8 Watercourse Reclamation

With the site re-graded, capped with a soil cover where required and re-vegetated there will be no contaminated runoff from the site. Surface water from the areas uphill of the disturbed areas (plant site and tailings area) previously diverted will be re-established to original alignments once all site reclamation is completed. The same tributaries of Wilkie Inlet D will be used.

Runoff from the reclaimed tailings area will enter Wilkie Inlet D and flow toward Wilkie Creek. Reclamation of the diversion ditches should not require any further watercourse

reclamation.

Indirect impacts relating to water quality are also not expected. The water quality monitoring plan (see section 7.4.12) includes scheduled monitoring of discharges and receiving streams below those discharges.

If necessary, any tailings area seepage can be collected in the downstream seepage pond for as long as required. Once satisfactory water quality can be demonstrated, it will be removed and original watercourse in that area re-established.

7.4.9 Road Reclamation

Once the frequency of access around the site areas is reduced to a point where vehicle access is no longer required, the roads will be decommissioned. This will consist of removing culverts and replacing them with cross-ditches/swales, ripping the road surface and revegetating. Access will remain for ATVs or similar transport for site monitoring and inspections and with minimal effort vehicle access could be re-established. Other criteria for the return of these roads to forestry use will be determined at the time of closure, based on regulatory and permit requirements.

The main access road will remain for other users of the area. However, culverts will be removed and water bars installed, so as to enable access, but with less on-going maintenance, unless otherwise instructed by Ministry of Forests.

7.4.10 Trace Elements in Soil and Uptake in Vegetation

After removal of buildings and equipment during decommissioning work at the MAX site, a soil sampling and testing program will be undertaken to delineate any areas in which trace elements are elevated above guidelines in the British Columbia Contaminated Sites Regulation for industrial sites (B.C. Government, 2005). Depending on the parameter identified as elevated, and the concentrations indicated, mitigation measures may include:

- Removal of any substantial areas with concentrations above these guidelines to the tailings facility prior to final cover placement on the tailings;
- Removal to a remediation facility or suitable approved storage site; or,
- Undertaking a risk assessment to define site specific guidelines and appropriate mitigative/management measures.

If metal uptake in vegetation is a potential issue at this site, it is suspected that it will become evident in the areas that were closed and revegetated by Newmont (Rescan, 2004a). This provides an opportunity to evaluate potential metal uptake in revegetated areas, and such studies will be undertaken in 2007 (at the second year of operations) on

previously revegetated areas and compared to a local control area to assess the possibility of metal uptake. This timing will allow approximately 3 to 4 years following Newmont's reclamation in 2003/2004. Only molybdenum is considered likely to be potentially elevated metal at this time. Molybdenosis in ungulates grazing largely on vegetation elevated in molybdenum can be counteracted by the placement of copper salt licks.

Given the results from the 2007 tests, seed mixtures may be adjusted to limit the species susceptible to uptake of any metals identified as potentially elevated. Revegetated facilities (tailings and waste rock storage facilities) may undergo a vegetation sampling and testing program once vegetation has been adequately established, assumed to be approximately 3 to 5 years following closure. If elevated molybdenum levels are defined, copper salt licks will be provided.

7.4.11 Disposal of Toxic Chemicals

Due to the limited number of products used on site (see Sections 4.6 & 4.7), disposal of any toxic chemicals will not be an arduous task at closure. No chemicals or hazardous materials will be required after the mining operation is shut down and the site has been decommissioned.

Fuels, lubricants, drilling fluids and other machinery fluid inventories on site will be depleted wherever possible prior to closure. Explosive materials will be similarly depleted. No explosive materials will remain on site after the site is closed. Mill reagents will be depleted and any remaining materials will be returned to their respective suppliers where possible. Otherwise, they will be removed from site for disposal at a licensed hazardous materials facility.

During decommissioning activities at the site, fuels and lubricants for equipment will be contained in portable tanks that will be removed from site when work is completed.

7.4.12 Post-Closure Monitoring

A number of reclamation related programs will be implemented as mine operations continue. These include:

- Vegetation surveys: including an assessment of existing areas of natural invasion on the site;
- Assessment of any erosion on quarry or waste dump slopes;
- Water course inspections for signs of sediment releases from the mining operation;
- Water quality monitoring of selected locations;
- Tracking of progress building stockpiles of soil materials for future reclamation;
- Monitoring the clearing of lands prior to inundation by advancing mining or waste dump development;

- Tracking progress of reclamation efforts (such as revegetation test plots) on areas of the mine lease that are considered available and can be reclaimed while mine operations continue; and
- Geo-technical reviews of all tailings facilities and rock/ore piles, as required.

A number of monitoring programs will continue for a specified period of time after mine closure. These will include:

- Water quality monitoring program of selected sites previously sampled during mine operations. It is anticipated that the number of sites will drop from 13 to 8;
- Semi-annual inspections of the site for physical integrity, erosion damage, etc; and
- Semi-annual surveys of revegetation progress until typical industry standard performance objectives have been met.

The proposed water quality program will be an extension of that utilized during mining operations. The following table provides a summary of sampling points and a comparison between operations and post-closure:

Table 7.4-1 – Water Quality Sampling Sites

Location *	Number of Sample Sites	
	Operations	Post-Closure
Captured adit water (site 13)	1	-
Settled minewater-final discharge (site 13)	1	1
Plantsite runoff sump	1	-
Tailings area reclaim water (when no effluent discharge)	1	-
Tailings area effluent discharge	1	1
Settling pond below tailings dam	1	1
Groundwater wells below tailings dams	2	2
Receiving water sites A, E (site 4), & G	3	3
Receiving water sites B, & F (site 7)	2	-
TOTAL	13	8

* Note: Sample locations include reference to historic sample designations, where available

Post-closure monitoring will be conducted by means of site inspections by person(s) qualified at assessing reclamation success, water quality and ARD/ML issues. Site visits would include a visual inspection, water sampling and testing (pH, alkalinity, sulphate, total and dissolved metals) and reporting on the status of reclamation, in particular revegetation success, water management and erosion and stability. Areas deemed to have had poor revegetation success will be broadcast seeded. Areas with signs of erosion will be stabilized if required with rip-rap. In addition, an annual tailings dam inspection will be carried out by a qualified person of record. Annual status reports will be submitted to the responsible agencies. Any maintenance

required will be conducted as specified in the inspection report.

Beginning in the fourth year, if monitoring has shown elements to be stable and of acceptable quality, site inspections will be reduced to once every two years, preferably in the mid to late spring. Site inspection frequency will likely not extend beyond 10 years after mine closure, if all responsible parties agree that limited risks remain.

7.5 Detailed Five Year Mine Plan

The mine plan currently envisions a 28 month mine life, and is described further in Section 3.0 and Appendix X. Any changes to the plan will be presented annually in the Annual Reclamation Report for the project.

7.6 Detailed Five Year Reclamation Plan

As mentioned above, a 28-month mine life is currently being planned. This short mine life prevents significant reclamation work being undertaken during the mine operations period.

The minesite lands have previously been logged and used for advanced mineral exploration. With previous mine exploration and reclamation program having been undertaken at the site there is an opportunity to characterize and evaluate the success of the various measures implemented in order to better develop detailed site specific reclamation measures for the proposed operation. As such, during operations, a number of studies are envisioned to help refine the reclamation plans described in this document to provide for the best reclamation success for this site. This includes:

- An evaluation of revegetation success on the encapsulated ore and bulk sample wastes pile including a metal uptake evaluation;
- An evaluation of the plant succession in control and revegetated areas and the success of various species in the seed mix used;
- Continued water quality monitoring and evaluation with comparisons to historic and baseline water quality; and
- Monitoring of erosion control measures on re-contoured, covered and revegetated areas.

Restoring the site to pre-mining land capability in a safe and secure configuration are the fundamental goals of the MAX Molybdenum Reclamation Program.

8.0 RECLAMATION COST ESTIMATES

8.1 Overview

Reclamation costs have been determined for the proposed MAX Molybdenum Project. The cost estimate includes all the items outlined in the Reclamation Program, found in section 7 of this report. The total reclamation cost is estimated at \$688,570. Summary of the costs for the various components is provided in the table below.

Table 8.1-1 – Summary of Reclamation Costs

Component	Area (ha)	Cost
1. Area Disturbances		
Development Waste Rock Pile	1.2	\$56,160
Low Grade Stockpile	.36	\$16,860
Tailings Facility	7.0	\$315,350
Tailings Facility Seepage Pond	.05	\$1,400
Plant Site	4.0	\$63,200
Roads	2.0	\$16,000
Demolition Debris Landfill	0.2	\$9,360
2. Lump Sum Items		
Mill building and thickener		0 *
Office buildings		\$480
Truck shop		\$1,960
Fuel storage facilities		\$1,780
Secondary buildings and structures		\$1,350
Site contamination survey		\$2,000
Portal sealing and minewater drainage system		\$15,230
Pipelines-tailings and reclaim water		\$5,200
Fresh water diversion ditches		\$2,020
Plant site runoff collection ditch and sump		\$3,800
Site electrical system		\$2,320
Sewage system		\$1,200
Site Management		\$30,000
Tailings Facility – spillway and diversion ditches		\$103,400
Post-Closure Monitoring and Maintenance		\$39,500
TOTAL	14.81	\$688,570

* Note: no cost has been included for mill building due to re-sale value being used to offset decommissioning cost. This was the only site item for which any asset value was given.

The standard BC Ministry of Energy and Mines, Mining and Minerals Division *Mine Reclamation Costing and Spreadsheet* template (Version 3.5.1) (MEM, 2004a) was used in the development of the cost estimates. It has been completed with an initial assessment of

components and cost estimates and is provided in Appendix XV along with a table of Lump Sum Cost Items providing detailed cost estimates used to generate the numbers provided in the Spreadsheet.

8.2 Costing Details and Assumptions

8.2.1 Overview

An overview of the costing details provided in the individual worksheets that make up the costing spreadsheet work is provided below. It is presented here in the same order as the spreadsheet costing tabs.

Major equipment proposed to be used for the reclamation program and their estimated costs are provided below (Table 8.2-1):

Table 8.2-1 – Reclamation Equipment Costs

Unit – Task	Uses	Hourly Cost with Operator
Bulldozer – Cat D6	Re-grading, pushing	\$80
Loader – Cat 980	Loading, hauling small quantities	\$80
Excavator – Cat 330	Pulling down items, digging out trenches	\$100
Dump truck	Haulage of materials	\$70
Mob/Demob – Trout Lake		\$150
Mob/Demob-Nakusp/Revelstoke		\$500

Source: S. Broughton, FortyTwo, for equipment sourced from Trout Lake

These equipment unit costs are based on local availability and could be vulnerable to increases (by 50-75% higher) if they need to be sourced from further points, such as Nakusp, Revelstoke or beyond.

8.2.2 Site Preparation

Re-contouring will be required for portions of the site.

Ripping of the surface prior to revegetation will only be required in the following areas:

- Plant site;
- Roads being removed

Locally sourced fill materials (till, topsoil) have been assigned a cost of \$4/m³ for uses as a cover material, as described below.

A compacted till cover will be applied to the waste rock pile, low grade ore stockpile and landfill. It will be comprised of local till materials primarily from the immediate area, site or from the main access road. Volume calculations for cost estimating are based on application of a compacted 0.5m thickness (0.75m with swell factor). This is shown under the 'Spread' heading in the appropriate worksheets in the MEM Costing spreadsheet, $1000\text{m}^2 \times 0.75\text{m}$ loose depth $\times \$4/\text{m}^3 = \$30,000/\text{ha}$. A similar depth of the same material will be placed over foundation slabs estimated to cover 0.5 ha, but un-compacted. All of the above will then be covered with the top dressing, described below.

A top dressing of local topsoil will be applied to areas requiring additional assistance in establishing a vegetative cover. Areas to have a topsoil dressing include the tailings area, waste rock pile, low grade stockpile, and landfill. Volume calculations for cost estimating are based on a 0.25m thickness. This is shown as Loose soil cover in the appropriate worksheet in the Costing spreadsheet, $10000\text{m}^2/\text{ha} \times 0.25\text{m}$ depth $\times \$4/\text{m}^3 = \$10,000/\text{ha}$.

The above was varied slightly for the plant site where a 0.15m thickness of local topsoil will be applied to areas where foundation slabs have been covered. It has been costed at \$6000/ha.

The Plan anticipates using a truck-mounted hydraulic (aerial) application of hydroseed mixture. It will be undertaken on most areas so as to ensure rapid re-establishment of vegetation. This will provide some soil stability to help minimize erosion and provide a quick greening of the site.

The revegetation mix will consist of the following components:

- Seed mix – the same regional "MOF-approved" blend will be used as was used in the 2003 Newmont Reclamation Program, and as shown in the report text, Section 7.3.

The \$3000/ha cost estimate for hydroseeding is a total cost per hectare applied. It includes the cost for materials (seed mix, fertilizer, tackifier and mulch) and application. Thus a breakdown of unit costs of the individual components of the mix has not been provided.

The tailings area will be broadcasted seeded using an ATV or small farm tractor unit. The same seed mix will be used as in the hydroseed mix. It has been costed at \$500/ha.

The Plan anticipates that no on-going maintenance of re-seeded areas will be required. However, it does include a maintenance re-seeding of areas found to have not taken after 1 year following the first application, assumed to be 10% of the original areas re-seeded.

The Plan anticipates some minor erosion repairs after the first year following site

reclamation.

8.3 Breakdown of Individual Reclamation Activities

This section describes the information found in the completed MEM Mine Reclamation Costing Spreadsheet as it applies to the MAX Molybdenum Project. It is presented in the same order, worksheet by worksheet as in the Costing Spreadsheet provided in Appendix XV. The summary worksheet (Appendix XV) provides a summary of all the costs for the various areas being reclaimed, as well as the lump sum items. The reclamation prescription and lump sum item sections of this worksheet are linked to data provided in the appropriate worksheets where the information has been entered.

8.3.1 Area Disturbance

Each main category considered in the area disturbance category is underlined and summarized below.

Dump Face Resloping

The Reslope sheet has not been utilized for this Project. It is intended for use at sites with large waste rock dumps where re-sloping is a major and site-specific costing item. At this project, the development waste rock pile will only be in the order of 5m high, and the tailings impoundment will have minimal dam shell re-sloping requirements.

Development Waste Rock Pile

The waste rock pile is estimated to have a surface area of 1.2 ha. The proposed cover will consist of 0.50m thick compacted layer over the waste rock and a 0.25m thickness of loose topsoil for a vegetated cover, applied by hydroseeding.

Low Grade Stockpile Area

The low grade stockpile area is estimated to have a surface area of 0.36 ha. The stockpile may be significantly removed prior to site reclamation. But base material and some residue may remain. The proposed cover will consist of a 0.50m thick compacted layer over the remaining ore and 0.25m thick loose topsoil for a vegetated cover, applied by hydroseeding.

Tailings Facility

The footprint of the tailings storage facility is estimated to be approximately 7 ha, including the 2 clean water diversion ditches upslope of the facility. The surface area of downstream shells of two perimeter dams is 1 ha. The downstream slope of dam shells is considered satisfactory for closure.

Re-grading of the tailings surface is costed at \$3000/ha (versus \$2000/ha) due to the uncertainty of trafficability and the need to establish specific contouring to route surface water towards the spillway.

A conservative cover design is being proposed for closing the facility. The current design involves a 0.50m thick compacted layer cover over the tailings overlaid by a 0.25m thickness of loose topsoil for establishing a vegetated cover. The seed mix will be applied by broadcast seeding. The final design of the cover recipe may be adjusted during mine operations as additional information becomes available.

Dam slopes (shells) are comprised of granular materials and will not be seeded.

The spillway adjacent to the eastern main dam will be upgraded at mine closure to meet long-term closure criteria at a cost estimated at \$100,000.

Tailings Facility Seepage Pond

The pond is assumed to have an area of 200m². Its downstream containment dam is comprised of approximately 1300m³ of borrow materials.

The pond will remain during mine reclamation activities to ensure satisfactory water quality from the dam toe area.

Once removal of the pond has been approved, work will consist of emptying the pond of accumulated materials, pushing berm materials down so as to re-grade the area to blend in with the surrounding area. If sufficient granular materials are available, they could be pushed up against the toe of the main dam to act as a toe berm.

The unit cost for the recontouring has been raised (to offset the very small surface area) to achieve a total cost equivalent to an estimated effort of three hours of work with a bulldozer. The area will then be revegetated by hydroseeding the area.

Plant Site

The complete plant site and disturbed area covers an area of 8 ha. A portion of this was previously reclaimed by Newmont and will likely not be used for the proposed mine development.

This cost estimate has been assumed that 4 ha will require reclamation attention. It includes:

- Re-contouring;
- Ripping; and

- hydroseeding of the area.

Of the 4 ha area, an area estimated at 1 ha will involve previous building and structures and will require additional fill materials to cover foundation slabs. These will also have a soil cover, prior to revegetation.

Roads

Costing includes decommissioning of main access road and secondary roads on the minesite. The main access road will only be partially reclaimed so as to provide access to others who hold mining leases and have surface rights in the area as well as a trapper who uses the area.

The main access road is ~ 3 km in length with 12 culverts. There is approximately 2 km of site roads with 15 culverts on site; and 10 m average width of road to reclaim. The estimated total road surface area is 5 ha. Culverts will be removed and water swales installed. These have been estimated to cost \$100 apiece. Site roads (2 ha) will be ripped at \$1500/ha and hydroseeded at a cost of \$3000/ha.

It is assumed that no roadside cutbanks will require reclamation. However, some minor re-grading of the road surface and adjacent side slopes will be required prior to ripping and revegetation and therefore a small charge (\$500/ha) has been added for this work.

Demolition Debris Landfill

A landfill will be required during the site reclamation program for the disposal of non-hazardous debris from the site. The location will likely be adjacent to the waste rock pile. A final location will be selected during operations.

The landfill will have a 0.5m thick compacted silt/fines layer which will be covered with a 0.25m loose cover and hydroseeded. Unit costs are the same as have been used previously.

8.3.2 Lump Sum Items

Estimated fixed costs are provided for decommissioning individual components.

The listed components include the following additional items:

1. Concentrator Building including tailings thickener-assumed to cover a surface area of 3000m² with a slab foundation;
2. Office Buildings – assumed to be mobile office trailers;
3. Truck Shop – assumed to be a building of some 200m², with a slab foundation;
4. Fuel Storage Facilities – assumed to be in a lined area of 200m²;

5. Secondary Buildings and Structures – all considered to be wooden buildings with no foundations;
6. Site contamination survey – a sampling of areas with suspected soil contamination will be undertaken to confirm any possible need for mitigation;
7. Sealing of Portal and Installing MW Drainage System;
8. Pipelines – tailings and reclaim water - pipelines from tailings area back to concentrator building. Includes emptying of contents, flushing with water, dismantling and relocation to plant site for re-sale for re-use or scrap value in Nakusp, B.C. Costs are expected to be offset by sale revenue;
9. Clean Water Diversion Ditches – Two of 400m length above plant site. Assumed to be 1.5m² in cross sectional area. To be backfilled with original materials and broadcast seeded;
10. Plant Site Runoff Collection Ditch and Sump – 700m length-to be cleaned of any residues and hauled to tailings facility. Ditch and sump will be refilled with original materials, stockpiled immediately beside the excavations, and broadcast seeded;
11. Site Powerlines – There will be a number of power poles distributing power from the genset to the various users such as the portal, mill building, tailings facility, seepage pond, etc. Disconnecting the service, removing the equipment and bringing down the poles and cabling are included,
12. Sewage System – Work will consist of pumping out tank sludge and disposal off site, disconnecting piping, and removal of the sludge tank to the landfill.
13. Site Management – A site manager will oversee reclamation activities at the site. This is anticipated to take a three month period. An estimate of \$10,000 per month included all associated costs such as wages, benefits, a vehicle and travel.
14. Tailings facility – The two fresh water diversion ditches located just upslope of the facility will be backfilled and broadcast seeded. The facility spillway will be upgrade to meet long-term post closure criteria. BGC Engineering had previously estimated \$100,000 for this item.
15. Post-Closure Monitoring and Maintenance- see below, under Post-Closure.

The Lump Sum worksheet of the Mines Branch reclamation costing program permits the assignment of salvage values up to the cost of the decommissioning for those items. No additional credit can be achieved. For this cost estimate, the mill building has been assigned a salvage value equivalent to its estimated decommissioning cost. This is considered very conservative.

In reality, significant revenues can likely be generated for the Company from the sale of a number of items that will generate substantially more revenue than their respective decommissioning costs.

8.3.3 Post-Closure Costs

No items are anticipated to require continued post-closure attention at the MAX Molybdenum project site beyond 3 years of post-closure monitoring and maintenance. The items listed below were included, but their costs have been added to the Lump Sum Cost Items list due to their short duration instead of the Post Closure Costs worksheet. (The MEM costing spreadsheet program cannot handle a short duration post-closure monitoring and maintenance program)

Site Monitoring

To include water quality, site vegetation, erosion, and geo-technical inspection of civil features. It will be required for first three years following site reclamation.

An annual inspection of the site will be undertaken to evaluate revegetation success and identify any areas of concern.

Post-closure water quality monitoring will likely be undertaken at a total of 8 sites. Quarterly sampling has been proposed.

The federal MMER Regulation mandates a range of requirements during operations and will extend post-closure for 3 years. For post-closure, it is assumed to include weekly sampling of site discharge waters and a final biological sampling of the downstream environment.

Maintenance

- Annual inspections will identify areas where remedial work will be required.
- Minimal maintenance is likely to be required.
- No further inspections and maintenance is planned beyond 3 years following completion of site reclamation work.

The report assumes the main access road to the site requires no further reclamation work and there will be no long-term liability associated with it.

REFERENCES

- APEGBC, 2003. Guidelines for Terrain Stability Assessments in the Forest Sector. <http://www.degifs.com/pdf/Final%20Terrain%20Stability%20Guidelines%20as%20published.pdf>
- B.C. Government (1997). *Health, Safety and Reclamation Code for Mines in British Columbia*, prepared by Regional Operations, Health and Safety Branch, Ministry of Employment and Investment, Victoria, British Columbia.
- B.C. Government (2002). Provincial Policy for Consultation with First Nations, October, 2002. http://www.gov.bc.ca/arr/down/consultation_policy_fn.pdf
- B.C. Government (2005). *Contaminated Sites Regulation* (includes amendments up to B.C. Reg. 76/2005, March 7, 2005) of the *B.C. Waste Management Act*. http://www.qp.gov.bc.ca/statreg/reg/E/EnvMgmt/EnvMgmt375_96/375_96.htm
- B.C. Ministry of Environment, Lands and Parks (BC MELP) (1998a): British Columbia Water Quality Guidelines (Criteria): 1998 Edition. Water Quality Section, Water Management Branch, Environment and Resource Management Department, B.C. MELP, Victoria, B.C.
- B.C. Ministry of Environment, Lands and Parks (BC MELP) (1998b): A Compendium of Working Water Quality Guidelines for British Columbia: 1998 Edition. Water Quality Section, Water Management Branch, Environment and Resource Management Department, B.C. MELP, Victoria, B.C.
- Beak Consultants Limited (1981): The Trout Lake Property Preliminary Stage I Environmental Assessment, for Newmont Mines Limited.
- Beak Consultants Limited (1982): Environmental Studies in the Trout Lake Area, 1981, for Newmont Mines Limited.
- BGC Engineering Inc. (2005a): Tailings Scoping Study, Max Molybdenum Project. Prepared for FortyTwo Metals Inc., June 7, 2005.
- BGC Engineering Inc. (2005b): BGC Project Memorandum regarding 'Tailings Basin Storage Update', MAX Molybdenum Project. Prepared for FortyTwo Metals Inc., 3pp, July 18, 2005.
- Boyle, H.C. and Leitch, C.H.B. (1983): Geology of the Trout Lake Molybdenum Deposit, CIM Bulletin Vol. 76, No. 849, p.115-124.
- Burns, J.F. (1978): An Inventory of Inlets Tributary to Trout Lake. Surveyed September 14 to September 20, 1978. Stream Inventory Section, Fish & Wildlife Branch, Victoria, B.C.
- Canadian Council of Ministers of the Environment (1999): Canadian Water Quality Guidelines

- for the Protection of Freshwater Aquatic Life: Summary Tables (December 2003). In Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, Manitoba.
- Clearwater Consultants Inc. (2005): Memorandum CCL-MM-1 Max Molybdenum Project – Site Hydrology Characterization. Prepared for Roca Mines Inc., January 12, 2005.
- Hamilton, Dennis, RPBio (2004): 2004 Population Census for the Central Selkirk Mountain Caribou, April 10, 2004, for Pope & Talbot Ltd.
- HATCH (2005): Preliminary Assessment, Max Molybdenum Project. Prepared for Roca Mines Inc., May 2005.
- International Metallurgical and Environmental Inc. (2004): Max Molybdenum Property, Scoping Study, Capital and Operating Costs Estimate for a Grinding and Flotation Recovery Plant. Prepared for Roca Mines Inc., December 23, 2004.
- Klohn Leonoff Ltd. (1980). Water Supply Alternatives, Trout Lake Mine, for Newmont Mines Ltd., File VA 2559, January 31, 1980.
- Klohn Leonoff Ltd. (1981): Feasibility Report on a Tailings Storage Facility for Trout Lake Mine, July 29, 1981.
- Klohn Leonoff Ltd. (1982): Final Report, Hydrologic and Climatological Data Collection, Trout Lake Mine, B.C. Prepared for Newmont Mines Ltd., File PB 2850-0201, July 30, 1982.
- Ktunaxa/Kinbasket Treaty Council (K/KTC) (2005): Memorandum of Understanding (MOU) to Establish an Effective Government-to-Government Relationship for Energy and Mineral Development, April 19, 2005.
www.ktunaxa.org/fourpillars/land/documents/MEM-MOU.pdf
- Ktunaxa Nation (2005): www.ktunaxa.org/treaty/negotiations.html.
- Landmark Forest Management Ltd. (2000): Report: Wilkie Creek Fish Passage – Culvert Inspection (FP-CI), 32 pp., December 2000.
- Larkin, P.A. (1951): The Effects on Fisheries of Proposed West Kootenay Water Storage Project at Trout Lake. Management Publications of the B.C. Game Dept. # 1, 25 pp.
- Linnen, R.L., Williams-Jones, A.E., Leitch, C.H.B., Macauley, T.N. (1995): Molybdenum Mineralization in a Fluorine-poor System: The Trout Lake Stockwork Deposit, in "Porphyry Deposits of the Northwestern Cordillera of North America", CIM Special Volume 46, p. 771-780.
- Macauley, T.N. (1992). Summary Report on the Trout Lake Molybdenum Project. Oct. 8, 1992.
- Macauley, T.N. (2004). Technical Report on the Max Molybdenum Property. Prepared for

- Roca Mines Inc., September 20, 2004.
- Mehling Environmental Management Inc. (2005a). Review of Acid Rock Drainage and Metal Leaching Potential. Prepared for FortyTwo Metals Inc., June 10, 2005.
- Mehling Environmental Management Inc. (2005b). Water Quality Impact Assessment. Prepared for FortyTwo Metals Inc., July 8, 2005.
- MEM (2004a): Ministry of Energy and Mines, Mine Reclamation Costing and Spreadsheet- Version 3.5.1, dated January 2004.
- MEM (2004b). Ministry of Energy and Mines Memorandum Regarding Permit MX-5-55 – Newmont Exploration Canada Ltd. – Trout Lake Mine, dated August 24, 2004.
- MEM (2005). Ministry of Energy and Mines, Mineral & Coal Exploration Activities & Reclamation Permit, Permit Number MX-5-534, dated March 10, 2005.
- Nabbs, S.W. (1982): Metallurgical Investigation of Samples from the Bulk Sampling Program, Trout Lake. Prepared for Newmont Exploration Limited, June 14, 1982.
- Rescan Environmental Services Ltd. (1997): Trout Lake Exploration Site Audit. Prepared for Idarado Mining Company, October 1997.
- Rescan Environmental Services Ltd. (1998): Summary of Analytical Results from May 1998 Site Visit. Prepared for Newmont Exploration of Canada Ltd., July 1998.
- Rescan Environmental Services Ltd. (2003a): Trout Lake Water Quality Report. Prepared for Newmont Gold Company, February 2003.
- Rescan Environmental Services Ltd. (2003b): Trout Lake Exploration Project Closure Plan. Prepared for Newmont Exploration of Canada Ltd., April 2003.
- Rescan Environmental Services Ltd. (2004a): Trout Lake Exploration Project Site Closure and Reclamation Report. Prepared for Newmont Gold Company, January 2004.
- Rescan Environmental Services Ltd. (2004b): Max Molybdenum Project – 2004 Site Inspection. Prepared for Roca Mines Inc. October 2004.
- Resource Inventory Committee (RIC), 1997. Terrain Classification System for British Columbia. <http://srmwww.gov.bc.ca/risc/pubs/teecolo/terclass/index.html>
- Westra, G. and Keith, S.B. (1981): Classification and Genesis of Stockwork Molybdenum Deposits: Econ. Geol., 76, p. 844-873.
- Wild Stone Resources Ltd. (1995): Report: FRBC West Kootenay Landscape Level Stream Inventory Project 1995 – Arrow Forest District, Appendices 1 and 2. January 1995.
- Wittneben, U. (1980): Soil Resources of the Lardeau Map Area (82K). Report # 27, British Columbia Soil Survey, RAB Bulletin 15, Resource Analysis Branch, Ministry of Environment.