MINNOVA Inc.
Mining Innovation

A PROSPECTUS TO THE B.C. MINE DEVELOPMENT STEERING COMMITTEE

Samatosum Project

TABLE OF CONTENTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This "Prospectus" to the B.C. Mine Development Steering Committee provides a summary of information with respect to the potential development of the Samatosum Mountain property located approximately 25 km east of Barriere and 60 km north of Kamloops.

Development of the Samatosum Mountain property, a base and precious metal deposit, is subject to a Joint Venture agreement between Minnova Inc. (formerly Corporation Falconbridge Copper) and Rea Gold Corporation. Minnova Inc., a successful, publicly owned mining company with operating divisions in Ontario and Quebec is the operator of the Joint Venture and has carried out exploration on the property since 1983.

The Samatosum deposit is located at or near the contact between mafic volcanic pyroclastics and a complex sedimentary package of the Eagle Bay Formation. The deposit, which has a strike length of 450 m, dips 30° to 45° to the northeast and appears to be lying on the easterly overturned limb of a northwest plunging syncline. The principal ore types include bedded massive to semi-massive sulphides and polymetallic sulphides in quartz veins.

The undiluted in-situ mineral inventory, to date, based on 80 diamond drill holes has been calculated to be 600,000 tonnes grading 1,100 g/T silver, 1.8 g/T gold, 3.5% zinc, 1.7% lead, and 1.2% copper. Exploration is continuing and a feasibility study has been initiated. It is anticipated that sufficient reserves will be proven and engineering and design sufficiently advanced during the Stage I studies for a production decision to be made by the third quarter of 1988.

A prefeasibility study suggests that approximately 325,000 tonnes grading 1,160 g/T Ag could be economically mined by open pit methods at a production rate of 300-500

tonnes per day using conventional drilling, blasting and hauling equipment. Waste generated from open pit mining would increase from a strip ratio of 3:1 during the first year of operation to 18:1 at the end of year three and would be placed immediately to the southwest of the open pit. Underground development and mining would commence towards the end of the open pit operations.

The mill and ancillary facilities would be located close to the deposit. A specific location will depend on logistics, economics and environmental considerations. On the basis of preliminary metallurgical investigations, the mill will employ conventional crushing, grinding and flotation to produce either a differential zinc and copper-lead or bulk concentrates for shipment elsewhere to smelters. A number of possible tailings disposal sites are being evaluated to determine the most feasible and environmentally acceptable.

This Prospectus addresses the socio-economic and environmental issues associated with this proposed development and discusses the Stage I program that will be implemented. There is considerable environmental information available for the Adams River and Adams Lake area from government and private sources. However, this information is not specific to the mine site or in sufficient detail to meet the requirements of a Stage I Report. The salient information highlighted in this Prospectus forms the basis for determining the proposed field studies that will be completed during the Stage I studies. The Stage I studies are designed to provide site-specific information to a level of detail to satisfy the Stage I Report requirements. They are designed recognizing the need to fill data gaps revealed by the compilation of existing regional information. These studies are important in the determination of the mitigative measures necessary to minimize environmental impacts and to ensure rapid project approval-in-prineiple. Noting the proximity of the mine site to the Adams River system, the importance of the fishery resources of this system and that there are other users of this system, aquatic environmental issues are considered to be the most important. However, possible impacts upon other environmental resources such as wildlife and wildlife habitat, heritage and archaeological resourees, vegetation and forestry resources, etc., will also be addressed.

With respect to the socio-economic data base, it is important to note that the Samatosum site is within the Thompson Nicola Regional District and that community profiles have been prepared that will serve as a basis for developing a project related socio-economic evaluation during the Stage I study. Information currently available addresses subjects such as unemployment, labour force skills, community services and facilities, availability of goods and services, etc. In preparing the socio-economic evaluation for this proposed development, it will be necessary to update the existing information with more recent unpublished information that will be obtained through a comprehensive interview program. The following points will be taken into consideration with respect to the Samatosum project:

1. A new townsite to serve the operating mine will not be required.

2. Three established communities (Barriere, Louis Creek and McLure) will be affected as a result of this proposed development.

3. Noting the location of the proposed mine development and that other industrial activities have taken place and are taking place in the area of the proposed mine, the required infrastructural changes will be minor in nature.

Minnova Inc. is committed to providing a public participation and information program to help ensure that government approval-in-principle is not granted in isolation of public acceptance of the project. An "Open House" program will be implemented and will provide an opportunity for interested people to obtain information about the project and to input their views concerning the project.

1.0 INTRODUCTION

Exploration in the Samatosum Mountain project area has been intermittent over the last forty years. Although various blocks of land in the area have been held by major companies, no significant production has ever been realized.

The Samatosum Mountain property was optioned from Rea Gold Corporation by Corporation Falconbridge Copper (now Minnova Inc.) in late 1983. Since that time, Minnova Inc. has carried out an exploration program over much of the property. Detailed exploration resulted in the discovery of the Samatosum Deposit in June, 1986. The deposit is currently being further delineated by detailed drilling.

This Prospectus has been prepared by Minnova Inc. as a first step in obtaining approval for the development of a mining operation at Samatosum. Minnova exploration programs have delineated sufficient reserves to warrant the initiation of detailed feasibility studies leading to the preparation and submission of a Stage I Report.

Minnova Inc. is a successful, growth oriented mining company that produces copper, gold, zinc and silver from operating divisions in Ontario and Quebec. In 1983, the company initiated exploraton programs for base metals and gold in British Columbia. Minnova Inc. currently has active exploration projects on Vancouver Island, in the Okanagan Valley, in the Squamish-Howe Sound region, and in the Barriere area.

2.0 THE SAMATOSUM MOUNTAIN PROPERTY

Minnova Inc. is presently conducting exploration work on a base and precious metal property (Samatosum Mountain) east of Barriere, B.C. (Figure 1).

Exploration work carried out since 1983 has delineated sufficient reserves (Samatosum deposit) on the property to warrant the commencement of a feasibility study leading to a possible production decision.

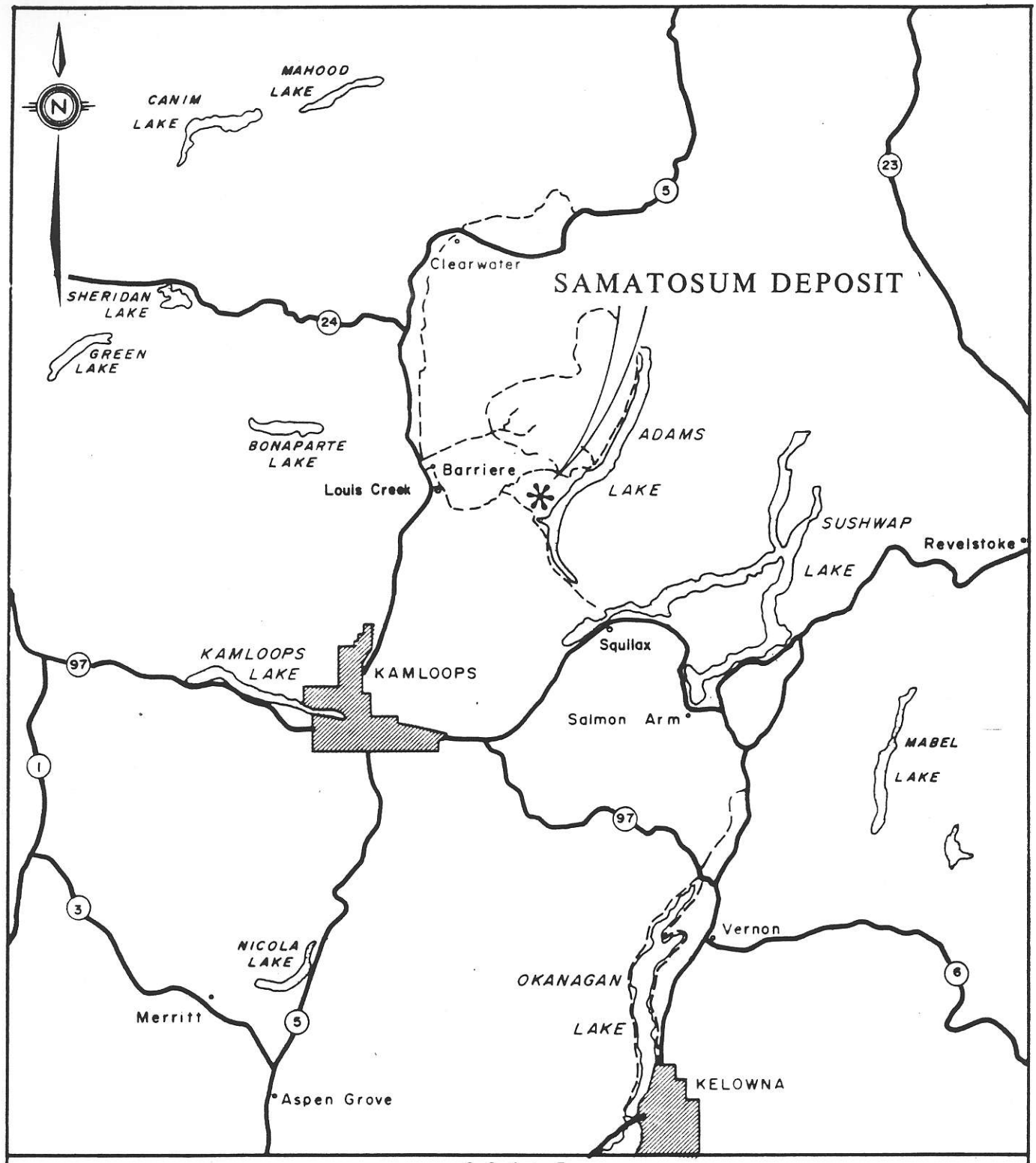
This Prospectus summarizes preliminary information on geology and mineralization, a conceptual development plan, existing environmental information, and proposed scope of work for development of Stage I - Socio-Economic and Environmental Impact Assessment. Minnova Inc. is seeking the designation of a "small" development under the Guidelines Review Process. To ensure that the proposed work will fulfill the Stage I requirements, we propose a follow-up meeting in January, 1988 with members of the Steering Committee Review Panel.

2.1 LOCATION AND LAND TENURE

The Samatosum Mountain property comprises 107 units in 14 claims (including five fractional claims) located approximately 25 km east of Barriere, B.C. and 60 km north of Kamloops. Coordinates of the claim group are 51°09'N by 119°49'W. Access is by four-wheel drive vehicles on existing roads. The Samatosum deposit is on the northwest slope of Samatosum Mountain at an elevation of 1370 m. The property is a Joint Venture between Minnova Inc. (70%) and Rea Gold Corporation (30%). Minnova is the operator of the Joint Venture.

2.2 HISTORICAL OVERVIEW

The Barriere area has received intermittent exploration since the 1920's, mainly for base metals. The Chu Chua copper deposit was discovered in 1978 northwest of North Barriere Lake. Other deposits in the area are the Birk Creek deposit and the Homestake deposit.



SAMATOSUM DEPOSIT

LOCATION MAP

FIGURE 1

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Gold bearing massive sulphide mineralization was originally discovered on the Samatosum property in August, 1983 by local prospectors, J.A. Hilton and R. Nicholl. The mineralization, now called the L100 lens of the Discovery Zone, was partially exposed in a logging roadcut approximately 30 m from an existing haulage road.

Rea Gold Corporation optioned the Samatosum property from Mr. Hilton in October, 1983 and in turn optioned the property to Corporation Falconbridge Copper (now Minnova Inc.) in November, 1983.

Corporation Falconbridge Copper subsequently carried out extensive geophysical, geochemical and geological surveys on the property. Initial diamond drilling outlined two small lenses of gold bearing massive sulphides totalling approximately 150,000 tonnes. In 1985, Corporation Falconbridge Copper returned the immediate area of these deposits to Rea Gold Corporation.

Diamond drilling of other targets on the property recommenced in June, 1986. Following up on narrow zones of silver bearing sulphides initially intersected in April, 1985, hole number RG-64 intersected what is now known as the Samatosum Deposit approximately 600 m north-east of the original discovery Zone. The Samatosum Deposit has subsequently been defined by approximately 80 additional diamond drillholes.

3.0 GEOLOGY AND MINERALIZATION

3.1 GEOLOGICAL SETTING

The Barriere area has been geologically mapped by V.A. Preto, G.P. Mc.Laren and P. Schiarizza (1980), V.A. Preto (1981, 1984), T. Hoy and F. Goutier (1985) and P. Schiarizza (1986) of the B.C. Geological Survey.

The area is underlain by a complex assemblage of weakly metamorphosed volcanics and sediments of the Upper Paleozoic (Carboniferous) Eagle Bay Formation. The Eagle Bay Formation consists of mafic to felsic volcanics and both carbonates and clastic sediments. These volcanics and sediments have undergone several phases of deformation involving folding and thrusting. This deformation has produced a moderate to strong foliation in most of the units. The Eagle Bay Formation is intruded by granite and quartz monzonite of the Cretaceous Baldy Batholith and is overlain by later (Tertiary - Pleistocene) volcanics. The Samatosum Deposit is hosted by these Eagle Bay volcanics and sediments.

3.2 MINERALIZATION

The Samatosum deposit is located at or near the contact between mafic volcanic pyroclastics and a complex sedimentary package consisting of chert, argillites, siltstones and minor sandstones. The units strike northwest - southeast and dip 30° to 50° northeast. The Samatosum deposit appears to be lying on the easterly overturned limb of a northwest plunging syncline. The deposit is stratabound in nature and has a strike length of about 450 m. It dips 30° to 45°, has a dip extent of up to 150 m and ranges from 0.1 m to 12 m thick.

Two major types of mineralization have been recognized to date in the Samatosum deposit. These are:

1. bedded, massive to semi-massive pyrite with sphalerite, tetrahedrite, chalcopyrite and galena; and

2. massive galena - sphalerite - tetrahedrite - chalcopyrite in quartz veins.

The bedded ores appear to predominate at the southern end of the deposit and at depth. It is currently thought they may represent syngenetic volcanogenic massive sulphide mineralization located at the top of a mafic volcanic sequence deposited in a submarine basin. This type of mineralization generally makes up the lower grade (300-700 g/T Ag) part of the Samatosum Deposit.

The massive galena - sphalerite ore appears to predominate at the north end and in the up dip portions of the deposit. This ore is associated with bull quartz veining and appears to be a later crosscutting, structurally controlled type of mineralization. The massive galena - sphalerite ore is often superimposed on the banded syngenetic ores and generally makes up the higher grade (700-30,000 g/T Ag) part of the Samatosum Deposit.

3.3 PRELIMINARY GEOLOGICAL ORE RESERVES

The Samatosum Deposit has been delineated by 40 ore holes and 40 barren or unmineralized holes. Based on these, an undiluted in-situ mineral inventory has been calculated as follows:

Tonnes	% Cu	% Pb	% Zn	g/T Ag	g/T Au
600,000	1.2	1.7	3.5	1,100	1.8

The above reserves have been calculated based on a 250 g/T Ag cutoff and a minimum width of 2 m.

4.0 CONCEPTUAL DEVELOPMENT PLAN

The following conceptual mine, milling and waste disposal plans are preliminary in nature and are presented primarily for initial comment by the Mine Development Steering Committee. These plans will be modified during the engineering and design phase as more detailed information becomes available regarding the ore bodies, metallurgy, and geotechnical and environmental factors pertaining to the tailings disposal site.

4.1 CONCEPTUAL MINE PLAN

A portion of the Samatosum Deposit can be mined by open pit methods while the remainder will be accessible from underground.

A prefeasibility study (G. Blackwell and A. Bonham-Carter, 1987) indicates that a block of ore totalling approximately 325,000 tonnes grading 1,160 g/T Ag could be economically recovered from an open pit. At an initial production rate of 300-500 tonnes per day, this pit would operate for about three years.

Stripping of overburden and waste rock is planned in five stages. Each stage is independent, is 40 meters wide from south to north and would be worked from east to west. Bench heights would be 5-10 meters. Drilling, blasting and loader or shovel digging with truck haulage is assumed at this stage. Major waste dumps would be sited close to the southwest edge of the deposit. The stripping ratio would increase from about 3:1 at commencement to about 18:1 at the end of Year 3 for an overall average of 12.3:1.

The main ramps would have a gradient of 15% and enter the pit at the top of the ore body at the western end and switchback one to three times on the west wall. As stripping moved to the next stage, the ramp would be extended at one of the northerly switchbacks.

Several methods of mining are available given ore widths of 2 m to 10 m and a dip of 30 to 45 degrees. Optimum results would be obtained by careful removal of the overlying waste and then removing the ore without footwall dilution. Scrapers, assisted by ripper equipped dozers are an alternative to drill and blast methods.

Figures 2, 3 and 4 illustrate the five pit stages and the development of the open pit mining plan. Underground development and mining would commence towards the end of the open pit operations.

4.2 CONCEPTUAL MILLING PLAN

The proposed mill will be located close to the Samatosum deposit. Several potential mill locations will be examined with respect to logistics, economics and environmental considerations and a decision will be made prior to submission of the Stage I assessment.

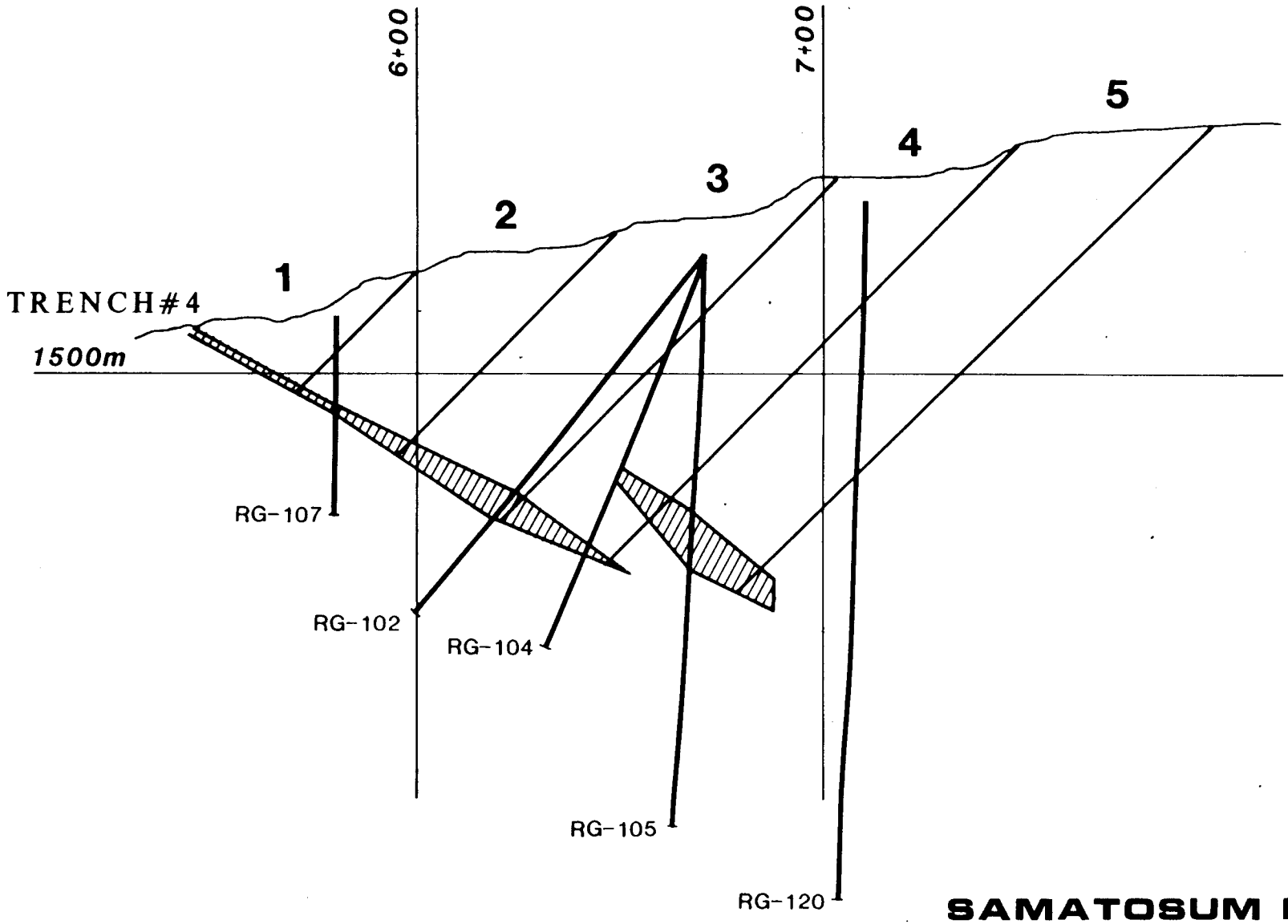
Some preliminary metallurgical test work has been completed on Samatosum ores. It is expected that operations will employ crushing, grinding and flotation to produce either a bulk concentrate or differential zinc and copper-lead concentrates. Concentrates produced at this mill will be shipped elsewhere to a smelter.

4.3 ANCILLARY FACILITIES

The proposed ancillary facilities may consist of administration facilities, change houses, mine equipment maintenance shop/warehouse complex, metallurgy/assay laboratory, water supply and distribution system.

The preferred source of process, domestic and fire water is Johnson Lake. A study to determine the feasibility of Johnson Lake as a water supply source will be undertaken. Various alternatives are now being studied for providing the required power. A final decision on power supply will be made in conjunction with B.C. Hydro and will consider related socio-economic and environmental factors.

It is proposed that all sewage be treated in a suitable manner consistent with environmental and health standards. Appropriate grease traps would be included.



SAMATOSUM DEPOSIT

PROPOSED PIT STAGES

(SECTION 99+00)

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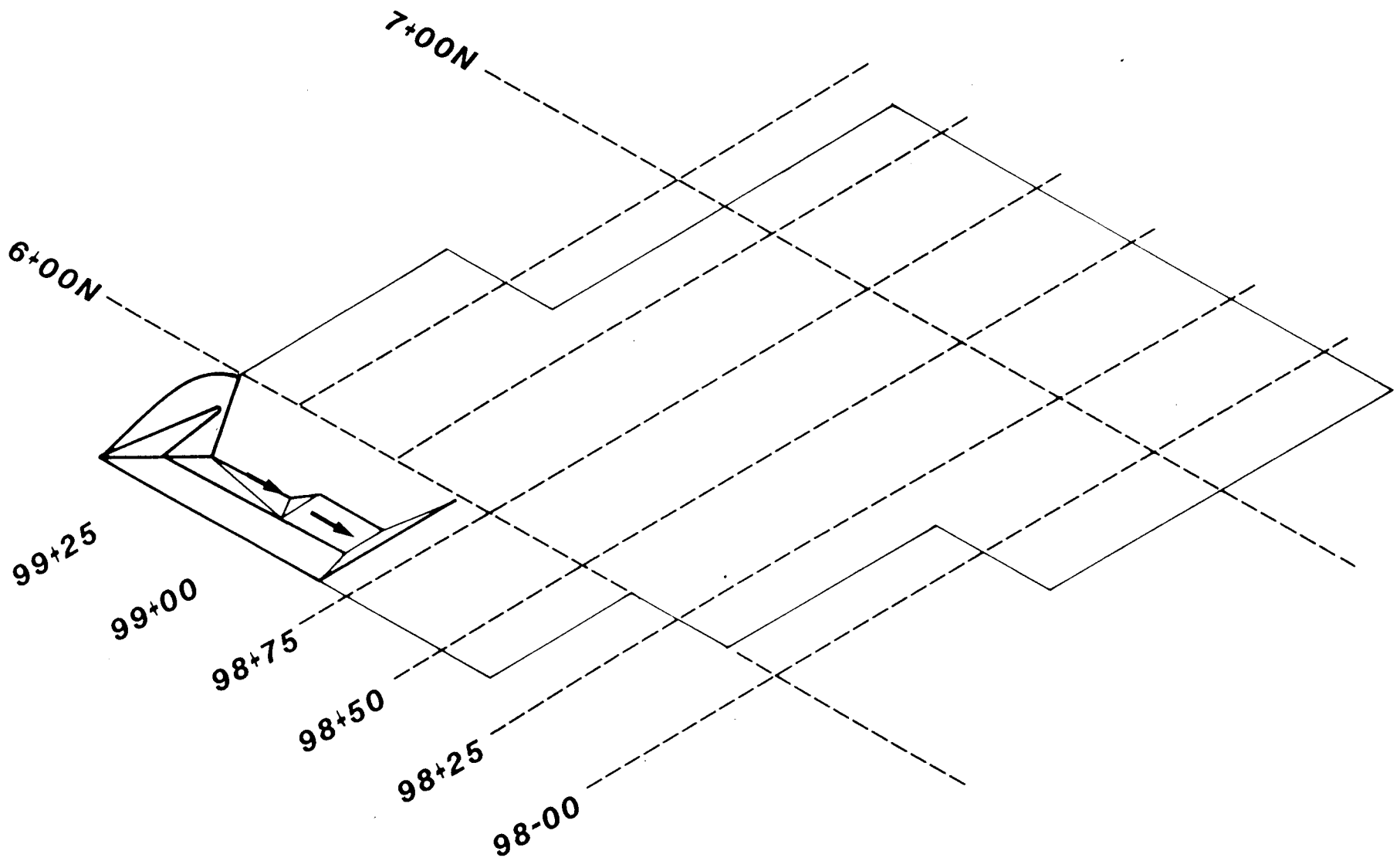
FIGURE 2



SAMATOSUM DEPOSIT

PROPOSED PIT STAGES

(POSSIBLE RAMP DESIGN)

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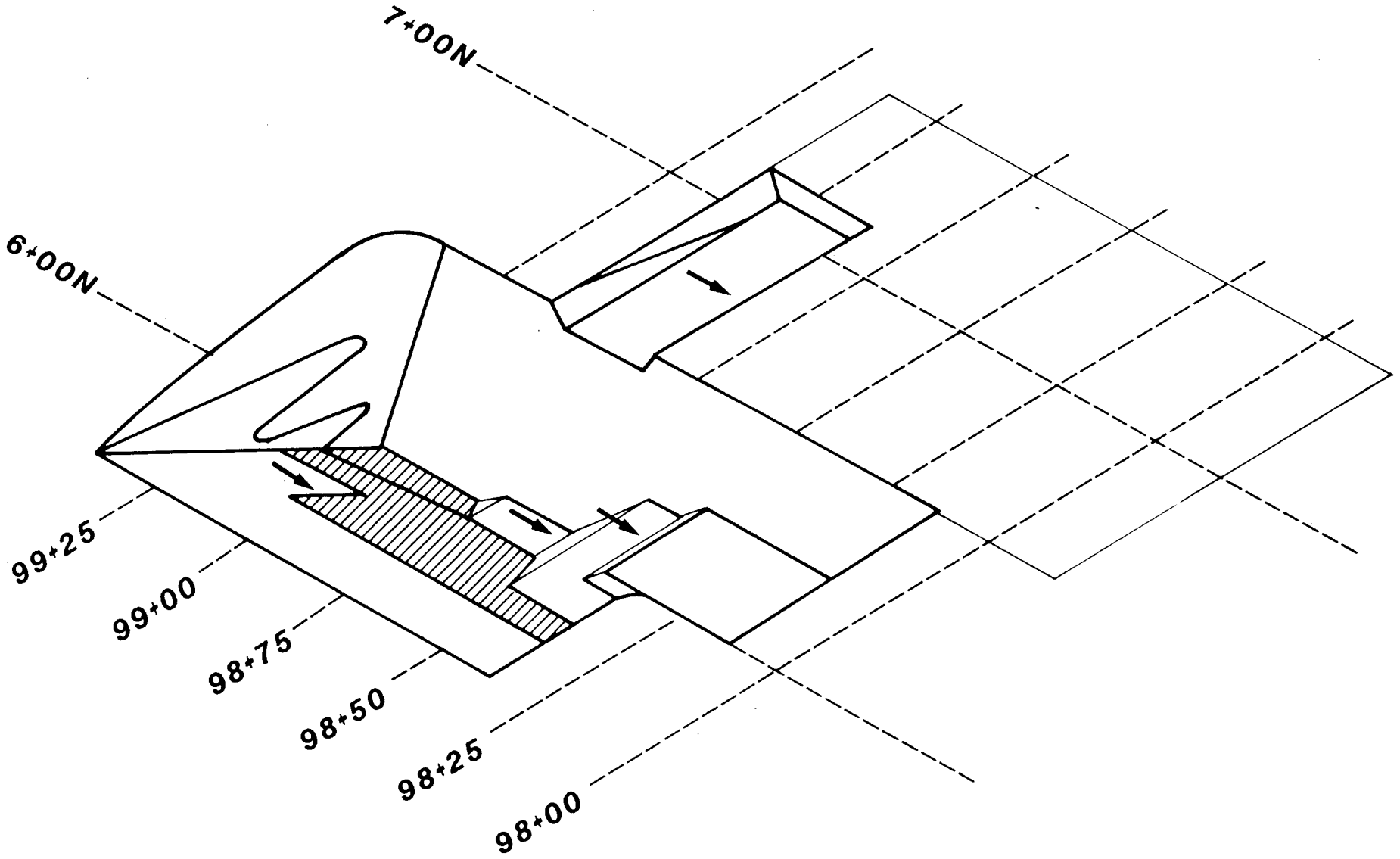
FIGURE 3



SAMATOSUM DEPOSIT

PROPOSED PIT STAGES

(POSSIBLE RAMP DESIGN)

MINNOVA

FIGURE 4

4.4 CONCEPTUAL TAILINGS DISPOSAL PLANS

A number of alternative tailings disposal methods and possible sites are being evaluated to determine the most feasible and environmentally acceptable system.

5.0 DEVELOPMENT SCHEDULE

Minnova Inc. anticipates sufficient reserves will be proven and engineering and design sufficiently advanced during the Stage I studies for a production decision to be made by the third quarter of 1988. This will, however, be contingent upon the project receiving financial and Government Approval-in-Principle by June, 1988. To this end, Minnova Inc. proposes to complete and submit a Stage I Socio-Economic and Environmental Impact Assessment to the B.C. Mine Development Steering Committee for review by early May, 1988. In order to accommodate this schedule, we suggest a meeting be arranged for the week of January 11, 1988, to receive initial comment and feedback on this Prospectus.

6.0 PUBLIC PARTICIPATION AND INFORMATION PROGRAM

A "Public Participation and Information Program" is an important component of the Stage I submission. Such a program helps ensure that Government Approval-in-Principle is not granted in isolation of public acceptance of the project; specifically, local communities affected by the project. The program outlined below will provide an opportunity for interested persons to obtain information on the project and contribute views in a positive manner. Secondly, the program sets the basis for a cooperative relationship with people and authorities in the area.

The proposed program of work will consist of the following elements:

1. preparation of a social profile of adjacent communities;

2. preparation and publication of an introductory description of the project in the local press with a response coupon;

3. organizing and holding an Open House; those persons interested in the project may communicate directly with company representatives; and

4. preparation of a brief report summarizing the results in a manner for submission and inclusion in the Stage I Report. Requirements for follow-up activities will be identified, as needed.

7.0 AVAILABLE INFORMATION

There is considerable socio-economic and environmental information available for the proposed mine site area from both private and government sources. However, this information is not entirely specific to the mine site or in sufficient detail to meet the requirements of a Stage I Report. Salient information has been highlighted in following sections and forms the basis of proposed field studies described in Section 8.0.

7.1 ENVIRONMENTAL

7.1.1 Physiography and Soils

The mine site area is situated within the Shuswap Highlands of the Interior Plateau; a subdivision of the main Cordilleran Interior System which runs north and south through the middle of the province. The Shuswap Highlands consist primarily of foliated metamorphic rocks and lie between the Thompson Plateau on the west and the Monashee Mountains to the east. Some of the area is underlain by phyllite, limestone, greenstone and schist. In general, most ridges and summits are rounded and total relief may be fairly great with valley walls commonly steep due to glacial erosion. Major lakes in the area are legacies of Pleistocene ice occupation (Holland, 1976).

Soils in the proposed development area are Class 7 brunisolic and luvisolic, with no capability for arable culture or permanent pasture. Limitations cited are primarily steepness of terrain, shallowness of soils and stoniness. The best soils in the area, Class 4, are found in the Sinmax Valley. These soils have severe limitations that restrict the range of crops and require special conservation practices (Environment Canada, 1973).

7.1.2 Seismicity

The proposed operations are located in an area of relatively low seismic activity; Peak Horizontal Acceleration Zone 1 and Peak Horizontal Velocity Zone 1 (Basham et al., 1985).

7.1.3 Climate

May to September precipitation varies greatly (199 mm in the Sinmax Creek area to 234 mm at the junction of the Barriere and East Barriere Rivers). A summary of relevant stations is presented in Table 1 (Environment Canada, 1980). Snowfall accounts for 25% to 30% of the total annual precipitation.

7.1.4 Hydrology

Water Survey of Canada have operated a flow gauge on Barriere River near the mouth (Station No. 08LB020) since 1915 with interruptions in the 1930's and 1940's, but continuously since 1964, and on Barriere River below Sprague Creek (Station No. 08LB069) since 1964.

The annual mean discharge of Barriere River near the mouth (drainage area 1140 km^2) averages 14.8 m^3/s over the period of record and peaks in June at 54.6 m^3/s. Low flows occur in February and average 3.06 m^3/s. A maximum daily discharge of 157 m^3/s was recorded on May 31, 1972, and a minimum daily discharge of 0.566 m^3/s was recorded in February 6, 1921.

Water Survey of Canada also operates a gauge on Louis Creek at the mouth (Station No. 08LB072) and near Squilax (Station No. 08LD001). A station was also operated on Sinmax Creek below Johnson Creek (Station No. 08LD004) for a short time in the 1920's and between 1965 and 1976 but primarily for the months of July, August and September.

7.1.5 Fisheries Resource

The Samatosum Mountain property is situated within the Johnson Creek Drainage System. Johnson Creek accepts discharges from Johnson Lake and ultimately drains into Sinmax Creek, southwest of the proposed development site.

TABLE 1: CLIMATIC NORMALS FOR TEMPERATURE AND PRECIPITATION AT SELECTED STATIONS

STATION	ELEVATION	TEMPERATURE° (C)			PRECIPITATION (mm)			
		AVERAGE	MINIMUM	MAXIMUM	RAIN	SNOW	TOTAL	DAYS
Barriere	(375 m)	6.7	-42.8	40.0	308.7	133.7	442.5	123
Barriere N.	(389 m)	-	-	-	264.1	103.1	362.4	91
Chase	(355 m)	7.6	-36.7	37.2	276.9	126.8	402.5	98
Kamloops	(379 m)	8.7	-38.3	41.7	167.7	67.2	241.7	77
McLure	(381 m)	-	-	-	268.6	108.2	398.0	91
Sorrento	(390 m)	-	-	-	359.7	173.6	533.2	137
Sorrento E.	(488 m)	6.9	-27.2	37.0	309.0	202.0	486.9	125

Johnson Lake is categorized as oligotrophic (Pers. comm. Mr. D. Holmes). A reasonable recreational fishery for rainbow trout (Salmo gairdneri) exists in Johnson Lake. Stocking of the lake with rainbow trout occurs on alternate years; in 1986 for example, approximately 5,000 rainbow were introduced (Pers. comm. Mr. S. McDonald).

Silverspray Falls constitutes a migration barrier for fish originating in Sinmax Creek proper to the upper regions of Johnson Creek.

The Sinmax Creek system is utilized by anadromous sockeye (Oncorhynchus nerka) and coho (O. kisutch) salmon. Spawning of sockeye appears to be located primarily in regions from the mouth of Sinmax Creek at Skwaam Bay upstream approximately 2 km.

Coho also utilize the lower sectors of Sinmax Creek for spawning. Low creek discharges appear to limit the extent of the upstream spawning migrations by coho. During years of high creek discharge, it may be possible for coho to expand their spawning range upstream to near the confluence of Sinmax and Homestake Creek (Pers. comm. F. Voycey, cited in IEC Beak, 1980).

Landlocked kokanee salmon also frequent Sinmax Creek and constitute the largest proportion of salmonid spawners in the Sinmax system. Average kokanee escapement generally ranges from 5,000 to 10,000 individuals (Pers. comm. F. Richter, cited in IEC Beak, 1980). The lower regions of Sinmax Creek are utilized by kokanee.

Rainbow trout and Dolly Varden char (Salvelinus malma) also have been recorded utilizing Sinmax Creek.

7.1.6 Water Quality

Water quality data are in existence for Sinmax Creek above Homestake Creek and Sinmax Creek at its mouth. These data are contained in the B.C. Ministry of Environment EQUIS file. Data are summarized for the period January 1, 1965, through March 30, 1984. Parameters included in these data summaries include:

Colour
pH
Total Residue
Filterable Residue
Non-filterable Residue
Conductivity
Dissolved Oxygen
Turbidity
Total Alkalinity
Carbon
Cyanide
Hardness
Dissolved Nitrate/Nitrite
Dissolved Nitrate
Dissolved Nitrite
Total Kjeldahl Nitrogen
Total Nitrate
Orthophosphate
Total Dissolved Phosphate
Total Phosphate
Dissolved Silica
Dissolved Phosphate
Total Sulphide
Dissolved Calcium
Dissolved Copper
Total Copper
Dissolved Iron
Total Iron
Dissolved Lead
Total Lead
Dissolved Magnesium
Total Magnesium
Total Molybdenum
Total Molybdenum
Dissolved Nickel
Total Nickel
Dissolved Zinc
Total Zinc
Dissolved Silver
Total Silver

A preliminary water quality study within Johnson Creek was undertaken by Minnova Inc. during the spring of 1987. These data will be available for review during the Stage I submission in conjunction with comparisons to existing EQUIS file information.

7.1.7 Vegetation/Forestry Resources

The Sinmax Creek Valley proper lies in the interior Douglas Fir Zone (elevation 300-1,300 m). Extending from approximately 1,200 to 2,200 m is the subalpine Englemann Spruce/Alpine Fir Zone (Krajaina, 1973, cited in IEC Beak, 1980). Lodgepole pine is also present (Environment Canada, 1980).

Terrestrial areas adjacent to Johnson Creek consist primarily of lodgepole pine cover in association with some Douglas fir. As the transition is made to higher elevations along the northwest facing slopes, Douglas fir becomes increasingly more dominant with a gradual reduction in concentrations of lodgepole pine. Occasional stands of aspen and birch are also evident. At higher elevations (approximately 1,500 m+), Engleman spruce, lodgepole pine and alpine fir are the primary cover species. Within the Englemann Spruce and Subalpine Fir Zones moderately dense shrubs, forbes and mosses persist.

In terms of forestry capability, the lowlands of Johnson Creek, northwest facing slopes of Johnson Creek and elevations to approximately 1,500 m, exhibit moderate to severe limitations for growth of commercial timber. These conclusions are based on soil

characteristics, drainage, texture, presence of bedrock, climate, etc. (Environment Canada, 1980). Most of the area encompassed by the proposed site was recently logged (i.e. 1986-1987). Reseeding by the forest company concerned has been held in abeyance until development plans are finalized.

7.1.8 Wildlife

Mule deer (Odocoileus hemionus hemionus) utilize the northern slopes of the Sinmax Creek valley as winter range. Prior to winter snows, deer will frequent upper slopes and higher elevations along Johnson Creek (Pers. comm. Mr. D. Lowe). Moose (Alces alces andersoni) frequent areas near Johnson Creek during all seasons. Marshy areas on upper slopes provide habitat throughout the year. The Subalpine Englemann Spruce-Subalpine Fir Zone provides cover and browse; however, use may be less than at lower elevations.

The B.C. Fish and Wildlife Branch has initiated an ongoing transplant program of big horn sheep (Ovis canadensis canadensis) to the Sinmax Creek area during the winter of 1986-1987 (Pers. comm. Mr. D. Lowe). The herd, originally introduced in 1933 from Chase, and essentially disappearing by 1964, utilized slopes along the northern perimeter of the Sinmax Creek valley. Forage vegetation and rock faces for escape terrain rendered the region good for sheep habitat.

The Johnson Creek regions, above Silverspray Falls to elevations of approximately 1,500 m, are rated as exhibiting slight limitations to production of ungulates in general. Climate and soil depth (related to vegetation rooting due to bedrock and/or other impervious materials) have been cited as contributing factors (Environment Canada, 1975). Areas 1,500 m+ in elevation are rated as exhibiting moderately severe limitations to ungulate production based on excessive snow depth.

Other wildlife that may frequent the area (Sinmax Creek, Johnson Creek and higher elevations) include black bear (Ursus americanus) coyote (Canis latrans), marten (Martes americana), fisher (Martes pennanti), weasel (Mustela spp.), lynx (Lynx canadensis canadensis), bobcat (Lynx rufus), and wolverine (Gulo luscus) (Pers. comm. Mr. F.R. Richter, cited in IEC Beak, 1980).

Bluegrouse (Dendragcapus obscurus), Ruffed Grouse (Bonasa umbellus) and Franklin's Grouse (Canachites canadensis) inhabit the Sinmax Creek valley. Waterfowl production capability for the Sinmax Creek, Johnson Creek and Samatosum Mountain area are rated as severely limiting due to adverse topography; virtually no waterfowl are produced.

Johnson Lake proper has been rated as exhibiting severe limitations for waterfowl production; however, some production may in fact occur. Near the outlet of Johnson Lake, a small marshy zone limits waterfowl production due to a reduced marsh edge (Environment Canada, 1971).

7.1.9 Recreation

It was stated in the Fisheries section that Johnson Lake supported a good rainbow trout recreational fishery (Pers. comm. Mr. S. McDonald).

Land capability analyses (Environment Canada, 1974) have categorized shoreline areas of Johnson Lake as exhibiting a moderate capability for outdoor recreation which encompasses water access for angling or viewing and family beach activities including camping.

In the lowland regions of Johnson Creek, from Johnson Lake to near Silverspray Falls, capability is rated as low. This rating results from a lack of natural features of significant interest to warrant public attention.

Samatosum Mountain is rated as exhibiting a low capability for outdoor recreation. Hiking, nature studies and general aesthetic appreciation of the area are highlighted as most practical for these regions by the general public.

7.1.10 Archaeological and Heritage Resources

The Shuswap area supports archaeological sites, particularly along shoreline boundaries. However, these sitings have been categorized as "too vague to plot" on maps of the Adams Plateau (IEC Beak, 1980). Archaeological studies designed to assess specifically the mine site area may be required.

7.2 SOCIO-ECONOMIC

The area of the proposed mine development is predominantly rural. In 1976 the population of the North Thompson area (Subdivision A of the Thompson-Nicola Census Division) totalled 7,724 persons, a 33.4% increase from the previous census conducted in 1971. Major population centres that would be affected by the mine development are located in the North Thompson River valley at Barriere (pop. 835), Louis Creek (pop. 246) and McLure. There are a few residents (less than 100) which live along the Barriere River and Haggard Creek access road and along the Louis Creek-Sinmax Creek valley with a small community at Skwaam Bay.

The majority of people in the area rely on either cattle ranching or the forest industry as the major source of employment. Tourism is of minor importance with resorts located at Skwaam Bay (Agate Bay Resort) which is reported to include ten cottages, 12 campground sites, 35 trailer hook-ups, and a store and a fishing camp at Johnson Lake (Johnson Lake Fishing Camp) which includes nine cabins, 19 campground sites and a store.

The nearest medical and educational facilities are located at Barriere, and the nearest hospital is located at Kamloops. Shopping facilities are located at Barriere, Louis Creek and Kamloops.

8.0 STAGE I REPORT AND PROPOSED STUDIES

Stage I studies outlined in the following sections are designed to provide site-specific information to a level of detail commensurate with Stage I Report requirements. Investigations are designed recognizing the need to fill data gaps revealed by a compilation of existing regional information. Studies are also important in the determination of mitigative measures necessary to minimize environmental impacts.

8.1 ENVIRONMENTAL STUDIES AND INVESTIGATIONS

8.1.1 Physiography and Surficial Geology

A generalized mapping of surficial geology of the study area will be undertaken at a scale of approximately 1:50,000 on NTS topographic base using E.L.U.C. terrain classification system. General surficial features and soils resources will be identified and followed up by ground proofing.

A ground survey of the mine and mill site areas will be conducted to assess the stability of the adjacent slopes, particularly above proposed facilities. All occurrences of rock screes, snow slide activity, slope scouring, colluvial material, and any other indications of slope instability will be noted on a site map. The site investigation will be supplemented with a stereoscopic examination of aerial photographs of the project area. These data are to be used for planning roads and locating site facilities.

8.1.2 Soils

Typical samples of local soil materials will be collected and returned to Vancouver for analyses (10-12 samples). The Stage I Report will include a discussion of field collections, method of soil analyses, soil textures, interpretation of soil chemistry, and fertilizer and lime requirements. The report will include a map of sample locations and tabulated analyses. This information is required for engineering and design.

8.1.3 Seismic Risk Analyses

Historical information on seismicity for the mine site area will be obtained from the Earth Physics Branch of the Pacific Geoscience Centre at Sidney, B.C., and an estimate of the following will be obtained from their computer program:

- percentage of gravity and Modified Mercalll Intensity Scale; and
- predictions on future events, including duration, horizontal displacements and intensity.

A summary analyses including tabulation of data and seismic zoning map will be provided for the Stage I Report. These data will be used in support of a tailings dam design and building design.

8.1.4 Acid Generation Potential Tests

Representative samples of ore, development muck, hanging wall and foot wall rock will be collected and returned to a laboratory for Acid Generation Potential Testing. Samples of potential tailings from metallurgical test work will also be tested. An initial test and confirmation test (if necessary) will be undertaken. These data will be incorporated into the Stage I Report and used to support a tailings and waste rock disposal strategy (Waste Management Plan).

8.1.5 Meteorology and Air Quality

Several meteorological stations exist in the region within a 50 km radius of the proposed mine site (Barriere North, McLure, Kamloops, Sorrento, Sorrento East, and Chase). A study will be undertaken to review, compile and interpolate existing data, by selected paired adjustment and data reconstruction techniques for application to the mine site. These data will be used in developing a regional hydrology scenario and site Water Management Plan.

8.1.6 Surface and Groundwater Quality

A baseline water quality program was initiated in June, 1987 and will continue on a monthly basis until the scheduled submission of the Stage I Report. Sample locations are show in Figure 5 and the analyses to be performed shown in Table 2. Analyses performed consist of conductivity, turbidity, pH, alkalinity, suspended and dissolved solids, nutrients including nitrates, nitrites and phosphates, cyanide and a variety of total and dissolved metals.

Samples of groundwater will be obtained where possible from springs, producing drill holes or trenches, and submitted together with surface water samples for analyses.

8.1.7 Surface and Groundwater Hydrology

Water Survey of Canada operate hydrology stations on Barriere River, Louis Creek and Adams River. A station was also operated on Sinmax Creek for a short period of time. No long-term records exist for any of the immediate mine site drainages. Local watersheds such as Homestake, Johnson and Sinmax Creeks are reported to dry up most years. Sinmax Creek is reported to be fully licensed for agricultural purposes.

Given no long-term records of flow exist for adjacent watersheds, the hydrology program will consist of two components:

1. monitoring of flows over the study period; and

2. an examination of regional data to facilitate extrapolation of monitoring data into long-term records for engineering and design in conjunction with support of Water Licence Applications.

The regionalization of hydrology is a comparison of nearby long-term records coupled with climatic information and site-specific data. This approach provides a basis for extrapolation of on-site data for estimates of average and the extreme annual discharges, estimation of flood recurrence intervals, minimum flow recurrences and unit discharges.

FIGURE 5. Sampling Stations, Samatosum Mountain Property.

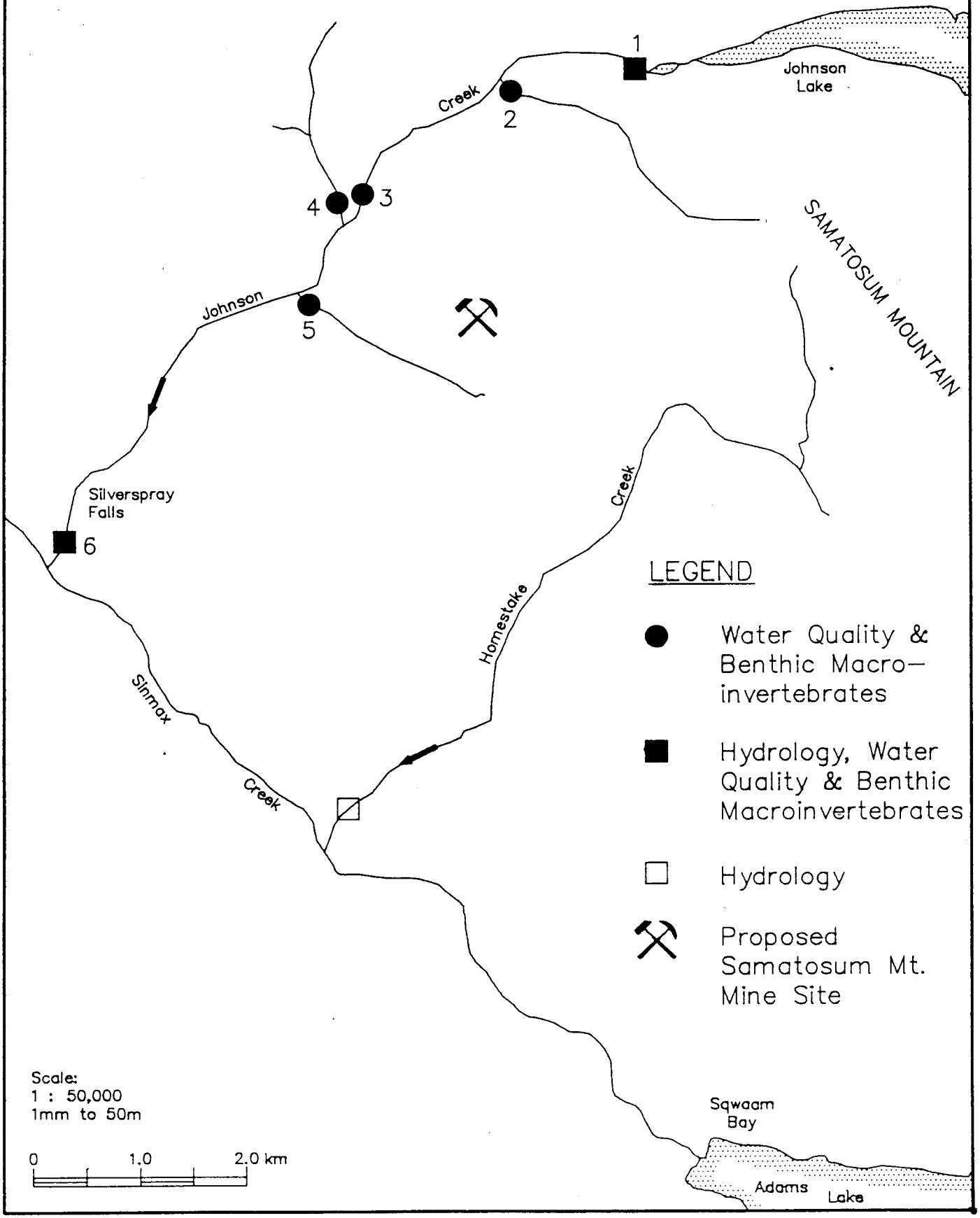


TABLE 2: PROPOSED STAGE I WATER QUALITY MONITORING PROGRAM.

CHARACTERISTICS	DETECTION LIMITS
pH	0.5 units
Conductivity	10 umhos/cm
Suspended Solids	1 mg/L
Total Dissvoled Solids	1 mg/L
Total Alkalinity	1 mg/L
Sulphate	1 mg/L
Nitrate	20 ug/L
Nitrite	5 ug/L
Ammonia	10 ug/L
Total Dissolved Phosphorous	3 ug/L
Total Cyanide	5 ug/L
Total Mercury	0.5 ug/L
TOTAL AND DISSOLVED METALS	
Antimony	5 ug/L
Aluminum	10 ug/L
Arsenic	5 ug/L
Cadmium	1 ug/L
Copper	1 ug/L
Iron	30 ug/L
Lead	1 ug/L
Molybdenum	1 ug/L
Nickel	10 ug/L
Selenium	1 ug/L
Silver	5 ug/L
Zinc	5 ug/L

Staff gauges have been installed on Johnson and Homestake Creeks, and are read on a weekly basis. Stream flows will be metered during field studies in order to develop reliable rating curves (i.e., during maximum runoff periods, June; early summer, July; low summer flows, August; and fall, October).

Information from geotechnical and groundwater investigations, relating to tailings dam design, foundation investigations or piezometer installations, will be included in the Stage I Report. Depending on studies required, these may include results of falling head tests, permeability tests, borehole log data, pump tests, etc., that are used to estimate recharge and discharge zones and foundation conditions.

8.1.8 Vegetation and Forestry Resources

Major vegetation communities will be plotted on 1:50,000 NTS topographical maps from stereo-examinations and interpretation made for wildlife habitat suitability, forestry capability and reclamation species. This mapping will incorporate information gathered by the B.C. Surveys and Resource Mapping Branch and the Canada Forestry Service.

A ground proofing survey and assessment will be conducted, consisting of transect documentation of understory and ground cover species. Larger tree species will be identified and measured with DBH calipers to verify airphotograph interpretation of forestry resources.

8.1.9 Wildlife Resources

A wildlife habitat survey was undertaken during the summer of 1987 and a fall wildlife study is also planned. The field program includes an assessment of representative habitat units, available food vegetation mapping, wildlife observations, feces counts, and recording of game trails, dens, licks, and other important features. Wildlife habitat descriptions, assessment of ungulate range, status of furbearers and predators, and

location and description of particularly sensitive areas will be documented. This study will also incorporate existing data from various government information sources.

A Wildlife Observation Log will also be maintained by on-site staff and any incidental wildlife observation during the period of study will be recorded.

8.1.10 Fisheries and Aquatic Resources

Fish sampling and fish habitat assessments were conducted on Johnson Creek and its tributaries to identify areas of spawning, overwintering, rearing, inaccessibility and food production. Ponds that may be potential tailings deposition sites will be examined. Emphasis will, however, be restricted to the relevant tributaries of the property. Fish sampling will establish species composition and population characteristics (length, weight, age), if possible during low flow and during peak spawning.

A survey of benthic macroinvertebrate organisms at each water quality site was conducted during the summer survey. Population abundance and species composition will be determined and related to watershed productivity and water quality.

8.1.11 Land Capability and Historic Use

An assessment of the property's historic use and resource capability will be documented. This evaluation will include present land use and tenure, agriculture, forestry, recreation, hunting, fishing, guiding, and trapping.

8.1.12 Archaeological and Heritage Resources

A review of the potential archaeological and heritage resources has been initiated. A site investigation has been carried out. Heritage potential will be rated based on the field study, a literature review of existing archival information in government files as well as other sources such as local museums.

8.2 SOCIO-ECONOMIC STUDIES

Access to the proposed mine site will be from Barriere with most of the prospective employees residing in the North Thompson River valley. A new townsite to serve the operating mine will not be required. Consequently, the communities of Barriere and Louis Creek would be most affected. There may also be some minor impact on the community of McLure and adjacent districts as a result of a slight population increase. Noting the location of the proposed mine development, and given that other industrial activities are taking place in the area of the proposed mine development (specifically forest industry activities), the required infrastructural needs will be minor. Both road access and power supply are in close proximity to the proposed development.

Increased employment opportunities for both construction and operating personnel and a possible increase in the permanent population of the area would provide a net economic benefit to the immediate area and to businesses in Barriere and Louis Creek. However, a considerable portion of the benefits are expected to accrue to the Kamloops area since most residents of the area commute regularly to Kamloops to make major purchases.

It is the intention of Minnova Inc. to purchase local goods and services in instances where such are available and competitive on the basis of cost and quality. In this regard the Kamloops area is noted for its capacity to provide a significant number of highly qualified support services to the mining industry.

Recognizing requirements of the Stage I review process, the socioeconomic evaluation will address both positive and negative impacts of the proposed mine development on local communities. A study will be undertaken to detail community populations, demographics, levels of employment and housing availability. Interviews will be held with appropriate provincial and municipal agencies to document availability of community services such as schools, medical services, cultural and recreational programs, police and fire protection. Information on community infrastructure, commercial and industrial sectors, communications and transportation will also be described.

8.3 ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT PLANS

A section of the Stage I Report will be devoted to Environmental Protection and Waste Management Planning. These components of the report will be prepared during the development of the project plans and include sections dealing specifically with:

- Waste Management Plans: The disposal and management of tailings, waste rock, mine water, process effluents, sewage, industrial and municipal refuse during operations.

- Water Management Plans: The protection of natural surface flows transecting the property; segregation, collection and treatment of affected waters before return to the natural environment; and incorporation of recycling procedures, where appropriate.

- Spill Contingency Plans: Facilities and measures incorporated into the overall development plans for the isolation and containment of accidental losses of material.

- Environmental Monitoring Plans: Recommendations on a monitoring program to be incorporated into operating permits and implemented during the development and operational stages of mine life.

- Conceptual Reclamation Plan: Conceptual plans for the decommissioning and final abandonment of the proposed development.

These components of the Stage I Report cannot be finalized until potential design and environmental resource conflicts are identified and resolved during environmental and preliminary engineering studies. Negative environmental impacts will be mitigated at an early planning stage.

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