METALLURGICAL TEST

&

PETROGRAPHIC STUDY

on the

CU 4 REDUCED CLAIM
VANCOUVER MINING DIVISION

92 G/11

49° 42'22"N
123° 27'19"W

Owner: D.K. Bragg
Operator: D.K. Bragg
Author: D.K. Bragg
Date: September 1, 1998

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ILLUSTRATIONS

APPENDIX

INTRODUCTION & HISTORY

The Cu 1 to 4 claims were located over the known mineralization in the vicinity of Smithe and Slippery Lakes north of Mt. Donaldson on NTS 92G/11 in November 1987. The claims were recorded on December 23, 1987. On December 21, 1988 the 80 units were reduced to 4 units. On that date a Prospecting Report was filed (see Prospecting Report on Cu 4 Reduced Claim by D.K. Bragg).

For numerous years the claims were held by paying cash in lieu. However, in 1990 some geological mapping was done (see Geological Report on the Cu 4 Reduced Claim by D.K. Bragg dated April 15, 1991).

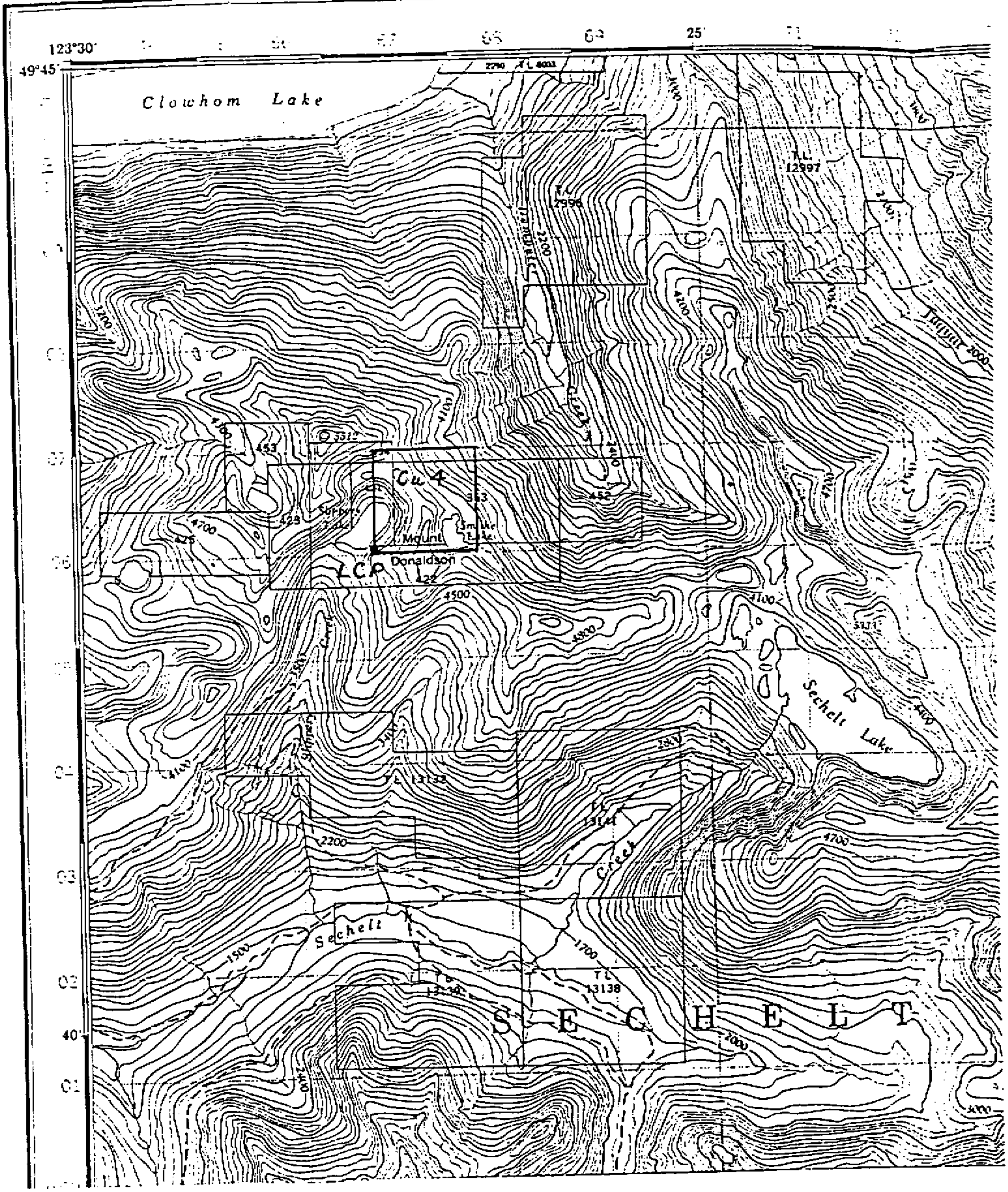
On November 1, 1995 the property was again visited and approximately 320 kg of rock samples were collected and brought off the property for metallurgical bench testing to determine if a salable product can be made of both the mica and silica in the rock, and to determine if the sulphides and precious metals can be economically extracted. This bench testing will be done in different phases over the next few years or as additional monies become available.

The first phase was done during 1996 (see Muscovite Processing Study Report No. 1 by Process Research Associates Ltd. dated April 9, 1997). This current report covers the work done during 1997. (See Appendix I; Muscovite Processing Study Report No. 2 by Process Research Associates Ltd. dated December 23, 1997 and Appendix II Petrographic Study by Anne J.B. Thompson, P.Geo. dated October 10, 1997).

The history of the showings on Mt. Donaldson date from 1874 when the Howe Sound Mining Company reported finding copper mineralization on the mountain. Since then an adit has been driven for 90 feet on the best showing to date at Smithe Lake and numerous other showings have been trenched. The area has been staked numerous times since with some recorded work having been done, such as an airborne magnetic and electromagnetic survey, limited ground surveys of both magnetic and electromagnetics, geological mapping and 2,500 feet of drilling. However, this work has been sporadic and has not yet resulted in a conclusive evaluation of the potential of the area.

In researching the bibliography of the area there is little of substance to be found. There is mention of early shipments having been made from the property but no record of tonnages or assay results could be found. During 1967, five diamond drill holes were drilled for a total of 2,500 feet, but as yet no record of the logs or assays could be found.

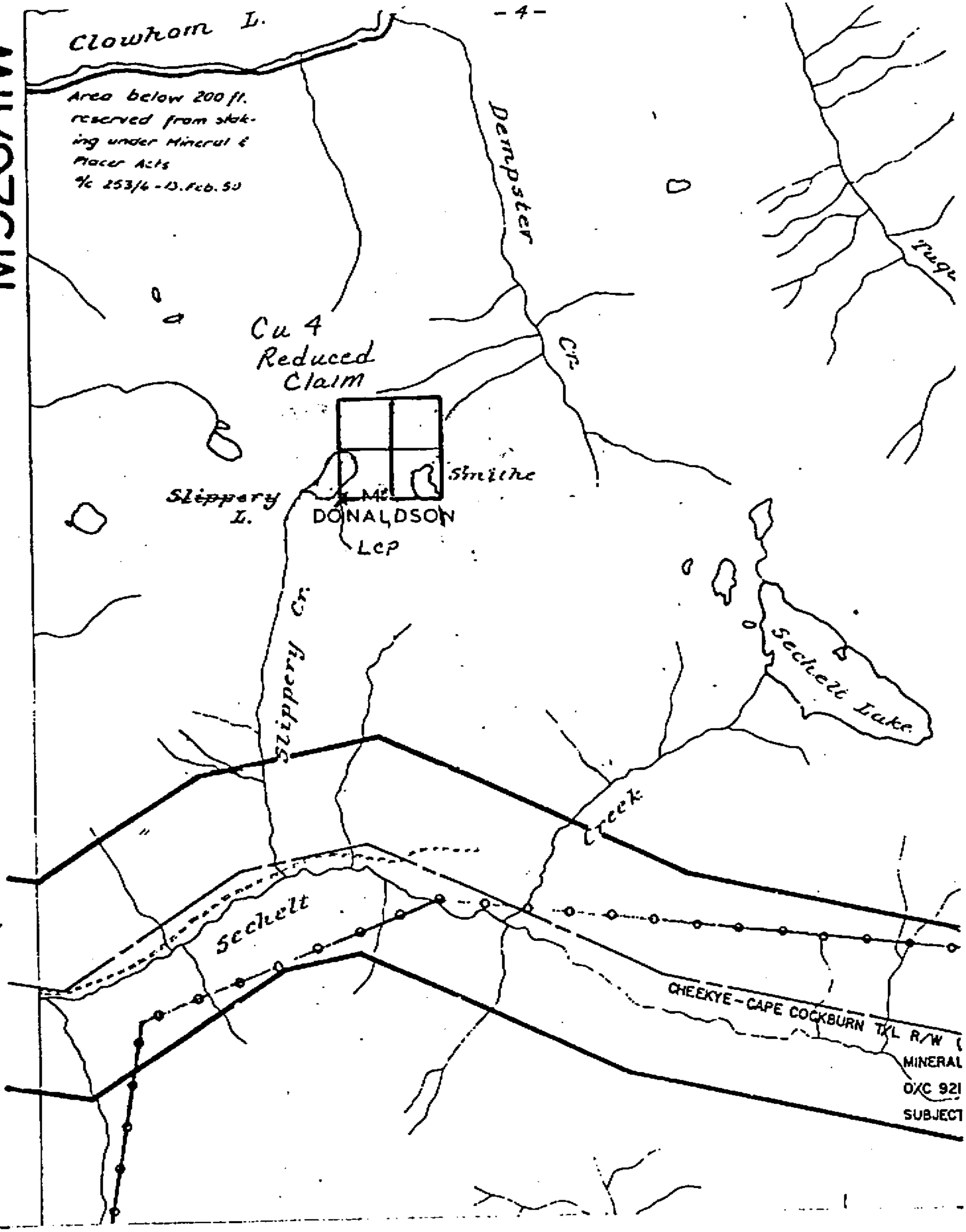
Table 1 of the CIMM Vol 15 mentions a reserve of ± 5 million tons of .02 copper (this perhaps should have read 0.2 copper), but no record of the logs or grade intersections have been found to date. This mention in the CIMM Vol suggests that the mineralization may be hosted in a greisen.



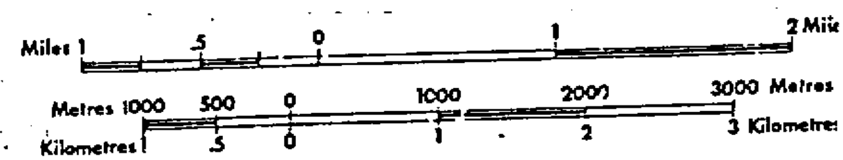
Index Map of Cu 4 Reduced Claim Fig 1

Scale 1 - 50,000

Miles 1 .5 0 1 2 Mile
Metres 1000 500 0 1000 2000 3000 Metres
Kilometres 1 .5 0 1 2 3 Kilometres



Location Map of Cu 4 Reduced Claim Fig. 2
Scale 1 - 50,000



PROPERTY LOCATION AND ACCESSIBILITY

The Cu 1-4 claims were located on Mt. Donaldson within the Coast Range approximately 35 miles north northwest of Vancouver. The L C P is at 49°42'22"N and 123°27'19"W (see Figure 1). Elevations on the Cu 1-4 range from 730 metres to 1,680 metres. The elevations on the remaining 4 units of Cu 4 after reduction range from 1,150 metres to 1,550 metres (see Figure 2 and 3). The topography of the area is very steep and precipitous to the point where some areas are impassable by foot or at the least treacherous. Much of the lower elevations on the southern two claims, Cu 1 and 2, have been logged and numerous road do exist in the area, however some of these roads are now impassable due to washouts and renewed growth on the roads. The remainder of the claim area up to about the 1,350 metre elevation is covered by typical dense coast range forest. Above the 1,350 metre elevation this forest cover decreases to sub-alpine, and above 1,500 metres the area is mainly rock, talus and snow. In some areas this snow may remain all year around.

Previous assessment reports on the area had suggested that vehicular access could be via the power line from Port Mellon along the north shore of Thornbough Channel to McNab Creek and thence via the logging roads into Slippery Creek.

When the claims were located in 1987, this power line route was no longer passable, so a truck was barged into McNab Cr from Horseshoe Bay and driven to within two km of the L C P via the logging roads up McNab creek, over the pass into Sechelt creek and up to the 760 metre elevation on Slippery Creek. The only other route into the area is by barge from Sechelt up Sechelt Inlet to Salmon Inlet to Sechelt Creek and thence into the property. However, due to the aggressive deactivation of roads neither of these routes may be available.

GENERAL GEOLOGY OF THE AREA

The general geology of the area is covered by Map 42 - 1963, Squamish, B.C. by H.H. Bostock, with more specific geology present in Assessment Reports 752, 4003, 8822 and 11619.

The area of the Cu 1-4 claims is within the Coast Plutonic Complex consisting here mainly of medium grained quartz, biotite and hornblende, biotite granites. In the area of the showings west of Smithe Lake within the quartz, biotite granite is what is probably a late stage intrusive body of muscovite granite.

The mineralization appears to be closely associated with this muscovite granite and occurs as disseminations and small blebs within the muscovite granite and in many of the numerous quartz veins and quartz masses within the muscovite granite, and to some extent within the surrounding envelope of quartz biotite granite.

Small aplitic dikes cross the property parallel to the joint systems. Also within the area are linear outcrops of bedded lapilli tuffs or tuffaceous rocks. The relationship of these tuffs to the granite is unclear.

STUDIES 1997

The second phase of the metallurgical bench listing was done during December of 1997 by Process Research Associates Ltd. and the result of this is reported in Appendix I - Muscovite Processing Study Report No. 2.

Also a limited petrographic study was made on one of the rock samples from the Mt. Donaldson mineralized area by Anne J.B. Thompson of PetraScience Consultants Inc. This is reported on in Appendix II.

RESULTS

Little comment on the results can be made at this time since the metallurgical testing has not been completed and is still ongoing, other than the specific results as commented on in the Muscovite Processing Steel Report No. 2 (Appendix I).

CONCLUSIONS & RECOMMENDATIONS

Again, little comment can be made on the conclusions as the study is not complete. However, based on the results obtained so far, it is recommended that these studies proceed.

STATEMENT OF COSTS

Process Research Associates Ltd. - cost of Report No. 2		$ 1,200.00
Petrographic Study		53.00
	Total	1,253.00
PAC Withdrawal		347.00
	Total Recorded	$ 1,600.00

STATEMENT OF QUALIFICATIONS

D.K. Bragg supervised the work involved in this investigation.

His qualifications are as follows.

Graduated Armstrong High School, Armestrong B.C., 1951

Attended U. B. C. from 1958 to 1962 in Arts and Science; Honors Geology.

Has worked in the mineral exploration industry since 1956.

Worked for Kennco Explorations during the summers of 1956, 1957, and 1959 in the Yukon and northern B.C. as an assistant prospector and geochem sampler under the direction of Dr. R. Campbell and R. Woodcock.

Worked as head prospector for the Nahanni 60 Syndicate in the Northwest Territories in 1960 under the direction of Doug Wilmont.

Worked as head prospector in the Yukon for Dualco in 1961 under the supervision of E. Wozniak.

Worked as head prospector for Mining Corp. of Canada in southwest B.C. in 1962 under J. S. Scott and Dr. K. Northcote.

Worked as head prospector during the summer of 1963 for the Fransis River Syndicate in central Yukon, under the direction of Dr. A. Aho

Worked as field geologist in the Greenwood area of B.C. for Scurry Rainbow Oil.

Worked as field supervisor for Alray Explorations Ltd. from Sept 1965 to April 1967 under the direction of Rae Jury.

Since 1956 has also worked as a self employed contractor, working for various mining companies in the following fields: prospecting, property examination, staking claims, line cutting, topagraphical mapping, geological mapping and reconnaisance, mineral sampler, drafting, air photo interpretation, geochemistry, geophysics, and supervising property exploration programs. Since 1956 has also been a self employed prospector working in various areas in B.C. on numerous properties.

Has assisted in teaching the geochemical section of the Ministry of Energy, Mines & Petroleum Resources Mineral Exploration Course For Prospectors under the direction of Dr. S. Hoffman in 1984, 1985, 1986, 1987, 1988. 1989, 1990, 1991

Has recieved the B.C. Provincial Grubstake for the years 1964, 1968, 1969, 1970, 1980, 1981, 1982, 1983, 1985, 1986, 1987, 1988. 1989, 1990.

Has worked in the Rossland Camp since 1971 as a miner on the Snowdrop and Bluebird claims. Has spent considerable time in the camp as a prospector and mining exploration contractor.

REFERENCES

Map 42 - 1963, Squamish, B.C. by H.H. Bostock

BCDM MMAR	1917 - 281 1922 - 251 1924 - 244 1928 - 389 1965 - 222 1966 - 245 1967 - 62
BCDM GEM	1972 - 277 1975 - E106
BCDM	Open File
EMR MRD	Corpfile (Pacific copper Mines Ltd., Grasset Lake Mines Ltd.)
CIM	Special Vol 15 - Res
BCDM	Ass Rpt 752 4003 8822 11619

APPENDIX

MUSCOVITE PROCESSING

STUDY

REPORT NO. 2

Prepared for: **D.K. Bragg**
6474 Prince Albert Street
Vancouver, B.C.
V5W 1K1

Attention : **Mr. Don Bragg**

Prepared by: **PROCESS RESEARCH ASSOCIATES LTD.**
9145 Shaughnessy Street
Vancouver, B.C.
V6P 6R9

PRA Project No.: **96-122**

Bryan Tatterson, P.Eng.
Senior Metallurgical Engineer

Date: December 23, 1997

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PROJECT No. 96-122

1.0 SUMMARY

Air separation tests on the crushed product of the samples from the Mount Donaldson deposit were performed using an Infrasizer at The University of British Columbia to investigate the potential of this method for separation of the muscovite from the siliceous portion of the rock sample.

The scoping tests were performed on two size ranges: the -65+100 mesh size fraction and the -6 mesh size fraction. These tests showed that separating the lighter mica flakes from the denser and more granular silica was partially successful using rising air flow to achieve the separation.

Analysis of the products was done by screening and visual examination. There was an estimated 50% of micaceous material in the +100 mesh size range fraction collected in cone 4 during Test 2. This was the range with the highest percentage of mica content.

The feed size distribution for Test 2 was too broad for efficient pneumatic separation. The test products collected, although indicating partial separation, highlighted improvements required in the test procedures which could possibly result in improved separation. Additional tests will therefore be carried out using a narrower size range for the feed.

The results from these tests will be reported as an addendum to this report.

Recommendations for further study are as follows:

1. Stereo microscope point count of products for mica content, mica size range and degree of mica liberation;

2. X-Ray Diffraction Analysis (XRD) to provide a quantitative analysis of the mica content of the products;

3. Electrostatic Separation tests;

4. Mica flotation;

5. Cross-flow pneumatic separation i.e. winnowing, using rented or manufactured equipment.

2.0 BACKGROUND

PRA were commissioned by Mr. D. K. Bragg to conduct a study on the potential for the recovery of muscovite from rock samples from a claim on the North slopes of Mount Donaldson within the Coastal Range of B.C. The deposit is approximately 55 km NNW of Vancouver.

The deposit also contains some copper, silver and molybdenum mineralization which are potentially recoverable by flotation. Their possible recovery would form a later phase of the study. In addition it was hoped that the abundant quartz present could be readily upgraded into a saleable product.

The objectives of this study, in order of importance and increasing process complexity, were

1. Muscovite recovery.
2. Copper, silver and molybdenum recovery.
3. High grade silica recovery.

This report details the initial scoping tests for muscovite recovery which included crushing, screening and examination of the screen fractions.

As recommended in Report No. 1, Phase II of the study investigated the applicability of a pneumatic action to separate the free mica from other crushed material.

This report details the initial scoping tests for muscovite concentration and recovery by a simulated winnowing action using an infrasizer.

3.0 PROCEDURE

3.1 Sample Preparation

During the previous study (Report No. 1) all sample preparation has been carried out. A complete set of various size fractions were available for use in this phase of the study. Additional sample preparation was unnecessary.

Two size ranges were chosen for the infrasizer tests: the -65+100 mesh size fraction and the -6 mesh size fraction of the crushed ore. The feed size distribution in the second test was considered to be too broad for efficient pneumatic separation.

3.2 Infrasizer Test

The infrasizer consists of a series of inverted cones with increasing base diameter and decreasing cone weight. Using a constant volumetric air flow causes each cone to exhibit successively reducing up flow velocity of the air stream. Particle separation is based on the individual particle terminal settling velocity due to mass, density and particle shape.

Material is fed into the top of the first cone, which has the steepest cone angle, then the airflow is turned on causing the sample to be fluidized. The cone contains a golf ball which is used to agitate the sample while breaking up any agglomeration due to the build up of static electricity.

The overflow from the first cone is carried by the air stream from the top of the cone through a hose into the bottom of the next cone, which has a lower cone angle. This transfer of the lighter cone overflow is repeated for the remainder of the 5 cones.

3.3 Test Conditions

3.3.1 Test 1

The -65+100 mesh size fraction of the potential crushed rock samples was chosen for the initial scoping test to examine the capabilities of the infrasizer. A sub-sample (57.4 g) of this material was charged into the infrasizer and was tested for a total of 4 hours.

The airflow was set at 80% from a gauged central air supply, providing a pre-filter pressure of 70 psi and a linear airflow feed of 60% into the first cone, measured by a Brooks flowmeter, model No. 1110-08H2B1A. Although seven cones were used in this test, the airflow velocity can only be controlled into the first cone. An assumption is made that the airflow velocity remains constant throughout the test system.

The actual volumetric flow of air was not known, because the conversion factors, applicable to the instrument used, were unavailable at UBC. The manufacturer will be traced in order to obtain the necessary information.

3.3.2 Test 2

The second test was performed on 500g of the -6 mesh size fraction of the crushed material. This test was performed for a duration of 2 hours, with only cones 1, 3, 4, 5, 6 and 7. Cone 2 was isolated from the series after the initial test because of a leak in the airflow hose, therefore cone 1 overflow was connected directly to the apex of cone 3.

The airflow for the second test was set at 94% from the gauged central air supply, providing a pre-filter pressure of 76 psi and consequently a higher linear airflow feed of 65% into cone 1.

After each test, the products from each cone were collected, weighed and stored for further analyses.

3.4 Inspection Analysis

The individual cone fractions were examined visually to determine the liberated muscovite separation achieved by the air separation method used. The product collected in cone 3, Test 1, were screened at 80 mesh. The product from cone 1, Test 2, was screened at 14 and 28 mesh. The products of cones 3 and 4 of the Test 2 were screened at 100, 140 and 200 mesh sizes to investigate the mica distribution in the size fractions.

The screen analysis was performed using standard 8" diameter by $2^7/_8$" deep square mesh test sieves. The sample was placed on the top (coarsest) sieve in a stack of sieves. The top sieve was covered, and a pan formed the base of the stack to collect the undersize material. The stack was manually oscillated in a horizontal circular motion to separate the mica flakes which lay flat on the screen mesh from the granular silicate particles. Any vertical motion would cause the near size mica to pass through the screen mesh with the smaller grains of gangue material.

The screen fractions produced from cones 1, 3 and 4 were weighed and examined. The approximate mica content was visually estimated in the screen fractions.

4.0 RESULTS AND DISCUSSION

4.1 Infrasizer Test Results

The product weights from each cone of Test 1 are presented in Table 1. This test was inconclusive due to a leak at the outlet of cone 2 and a portion of the sample that should have entered cone 3 was lost.

The recovered products from the remaining cones were examined to estimate the mica content.

Table 1 - Test 1 Infrasizer Cone Products - Minus 65 Mesh Feed

	WEIGHT	
Cone	(g)	%
1	8.55	17.9
2	33.95	71.3
3	0.51	1.1
4	1.45	3.0
5	0.92	1.9
6	0.96	2.0
7	1.30	2.7
Total	47.64	

Test 2 was performed with cone 2 isolated from the series and therefore some material contained in cone 3 would be the total weight of cone 3 and cone 2. This resulted in the large product weight of cone 3. The results from Test 2 are tabulated in Table 2.

Test 2 was of a shorter duration (2 hours) compared to test 1, as most of the initial separation of the feed occurred within fifteen minutes of starting the test. The remaining test was continued for a further 1-3/4 hours in order to improve the separation of the material already collected in the 6 cones.

Table 2 - Test 2 Infrasizer Cone Products - Minus 6 Mesh Feed

	WEIGHT	
Cone	(g)	%
1	254.47	57.2
3	131.80	26.5
4	35.19	7.1
5	28.97	5.8
6	17.01	3.4
7	29.73	6.0
Total	497.17	

The product collected in cone 1, Test 2, was mainly the coarser materials. The cone 1 product was screened into three size fractions, -6+14, -14+28 and -28+65. The minus 6 mesh plus 14 mesh fraction contained unliberated mica. Liberation of the mica flakes started in the -14+28 mesh fractions and increased in the -28+65 mesh fraction.

The cone products from both tests were inspected visually. The separation of the mica from the gangue material using the infrasizer was only partially successful. The products from each cone contained mixed particles of the liberated mica flakes, and the granular siliceous particles. Another separation technique would be required to improve the separation of these two major constituents of the cone products from each other.

4.2 Size Analysis

Visual examinations of the various cone products indicated mixtures of granular siliceous particles and mica flakes.

The product collected in Cone 1, Test 2, was screened into three size fractions. The results are presented in Table 3.

Table 3 - Size Analysis of Test 2 Cone 1 Product

Size Fraction (Tyler Mesh)	Weight (g)	Individual % Retained	Cumulative % Passing
-6			100
-6+14	31.31	73.2	26.8
-14+28	6.06	14.2	12.6
-28+65	5.38	12.6	
Total	42.75	100.0	

The minus 6 mesh plus 14 mesh fraction was predominantly gangue minerals plus unliberated mica flakes.

The minus 14 mesh plus 28 mesh fraction contained a small percentage of liberated mica flakes with a low percentage of unliberated flakes.

The minus 28 mesh plus 65 mesh fraction contained about 20% liberated mica flakes and 80% gangue minerals by visual examination.

Sub-samples of the products from cone 3 and 4 were screened at 100 mesh, 140 mesh and 200 mesh in order to determine the degree of separation of the mica that could be achieved if mica can be separated from the gangue at each of these sizes. The results of the size analyses are presented in Tables 4 and 5, respectively.

Table 4 - Size Analysis of Test 2 Cone 3 Product

Size Fraction (Tyler Mesh)	Weight (g)	Individual % Retained	Cumulative % Passing
+100	0.07	0.2	99.8
-100+140	0.79	2.3	97.5
-140+200	3.52	10.1	87.4
-200	30.35	87.4	
Total	34.73	100.0	

Table 5 - Size Analysis of Test 2 Cone 4 Product

Size Fraction (Tyler Mesh)	Weight (g)	Individual % Retained	Cumulative % Passing
+100	7.67	22.6	77.4
-100+140	13.02	38.3	39.1
-140+200	9.69	28.5	10.6
-200	3.62	10.6	
Total	34.00	100.0	

The screen fractions contained various mixtures of the liberated mica flakes and the gangue minerals. An estimate of the mica percentage was made by visual inspection. Table 6 shows the estimated percentages of mica from cones 3 and 4 of Test 2 according to their size breakdown. This visual assessment has an accuracy of ± 10%.

Table 6 - Estimated Percentages of Mica in Cone Products according to Screen Size

Size Fraction (Tyler Mesh)	% Mica	
	Cone 3	Cone 4
+100	10-20	>50
-100+140	<5	50
-140+200	~1	25-50
-200	<1	<5

5.0 CONCLUSION AND RECOMMENDATIONS

The study showed that, although some concentration of the mica was achieved, the siliceous gangue concentrations in each product remained too high. The infrasizer feed should be screened into very narrow size fractions prior to testing. The individual fractions should provide an improved separation efficiency due to a smaller size variation.

Additional infrasizer tests will be carried out and the results will be reported as an addendum to this report. The results indicated that the infrasizer is not the ideal pneumatic equipment to achieve the desired separation. An alternative method would be required for the cleaning stage. Options to be examined could include electrostatic separation, froth flotation and cross flow pneumatic separation (winnowing).

During examination of the various size fractions in plastic petri dishes static electricity resulted in separation of the mica flakes indicating that an electrostatic separation process has better potential for improved concentration of the mica than a pneumatic process used in this study.

Recommendations for further study are as follows:

1. Stereo microscope point count of products for mica content, mica size range, and the degree of mica liberation;

2. X-Ray Diffraction Analysis (XRD) to provide a quantitative analysis of the mica content of the products.

3. Electrostatic Separation tests;

4. Mica flotation;

5. Cross-flow pneumatic separation i.e. winnowing, using rented or manufactured equipment.

APPENDIX I

BRYAN TATTERSON
Senior Metallurgical Engineer
PROCESS RESEARCH ASSOCIATES LTD.

EDUCATION	B.Sc. Metallurgical Engineering University of the Witwatersrand, Johannesburg, South Africa 1961	
PROFESSIONAL AFFILIATIONS	P. Eng.	Association of Professional Engineers, Geophysicists & Geologists of Alberta
	Pr.Eng.	Engineering Council of South Africa (1978)
	Member	South African Institute of Mining and Metallurgy
	Member	Canadian Institute of Mining and Metallurgy
	Member	Society of Mining, Metallurgy and Exploration of the AIME

EXPERIENCE

1994 - Present **PROCESS RESEARCH ASSOCIATES LTD.**, Vancouver, B.C.
Senior Metallurgical Engineer and Project Manager

Have managed metallurgical test programs to process various base metal, precious metal and industrial mineral ores. Metallurgical projects included the concentration, dissolution and recovery of precious metals (free milling and refractory gold, silver and platinum group metals), copper, cobalt, nickel, manganese and zinc. Concentration processes used included gravity concentration, flotation and magnetic separation. The leaching systems used included rolling bottles, agitated tanks, pressure leaching and bacterial oxidation which embraced both acid and alkaline lixiviants. The metallurgical programs also included metal recovery by cementation, precipitation, carbon and resin adsorption, solvent extraction, solution purification and electrowinning. Industrial mineral experience includes the processing and evaluation of a potash ore by electrostatic separation, dissolution and crystallization.

Managed several environmental test programs for treatment of acid mine drainage (AMD) and other process effluents, including metallurgical process effluents.

Projects, as detailed above, have included batch and continuous chemical precipitation of dissolved metals, neutralization, flocculant selection testing and associated settling tests. The continuous environmental tests incorporated pilot high density sludge systems.

Oct/Nov 1994 **ROYAL OAK MINES,** Colomac Mill NWT
Contract Mill Metallurgist

Responsible for the optimization of gold recovery of the mill during recommissioning. Unit operations included milling, gravity concentration, cyanidation, carbon adsorption, elution and regeneration, electrowinning and refining.

1990 - 1993 **TECHNIKON WITWATERSRAND,** Johannesburg
Lecturer

Seconded from Anglo American Corporation as a Lecturer in the Department of Extraction Metallurgy.

Lectured at the National Higher Diploma level on the extractive metallurgy of the major base metals; Ferro Alloys and Industrial Minerals; and gold and uranium to the fourth (final) year, Extraction Metallurgy students. Duties included complete revision and compilation of all lecture material as well as setting and marking the final examinations as first examiner. Supervisor and examiner for Masters Diploma in Technology.

Lectured on Pyrometallurgy at the National Diploma level.

1978 - 1990 **ANGLO AMERICAN RESEARCH LABORATORIES**
Johannesburg, Republic of South Africa

Anglo American Research Laboratories situated in Crown Mines, Johannesburg, is a major research establishment providing Metallurgical, Mineralogical and Analytical services to Anglo American Corporation interests in Southern Africa and internationally in Australasia and South America.

1981 - 1990 Divisional Research Metallurgist
1978 - 1981 Principal Research Metallurgist

Basic R&D projects in addition to investigatory projects were conducted on behalf of the Group mines and processing plants. Projects involved various aspects of hydrometallurgy, chemical engineering and mineral processing, including grinding, flotation, gravity separation, leaching of gold and uranium, carbon adsorption of gold, gold elution from carbon, gold electrowinning and uranium recovery including solvent extraction and plant sampling for metallurgical accounting systems.

Project Leader of a team of graduate and non-graduate staff for the following major projects:

MAGNESITE PROJECT

Research into the potential production of pure magnesium sulphite for high quality magnesia refractories. The process developed was for treating a local low grade deposit via the sulphite route, using sulphur dioxide gas as the leachant. A small scale continuous countercurrent leaching and crystallization pilot plant was successfully developed, constructed and operated, generating design data for a large scale pilot plant.

GOLD AND URANIUM FLOWSHEET DEVELOPMENT

The project investigated the optimum flowsheet for a new ore body. Unit operations included milling, gravity separation, flotation, leaching (both conventional and pressure leaching), roasting of flotation concentrates and subsequent leaching of the calcine together with gold and uranium recovery from the leach solutions. The project included investigation into the optimum sequence of unit operations.

PROCESS DEVELOPMENT

The project involved the development of a novel carbon adsorption system for gold which was piloted successfully on a small scale. The project evolved into the design, construction, commissioning and operation of a commercial scale prototype unit (1000 tonne/day) including all ancillary plant and equipment. Involved in the direction of engineering and construction contractors.

ROUTINE METALLURGICAL LABORATORY

Responsible for the establishment and initial operation of a routine metallurgical laboratory within the Anglo American Research Laboratories. The work entailed carrying out all routine hydro-metallurgical test work.

METALLURGICAL ACCOUNTING AND QUALITY CONTROL

Co-ordination of the evaluation of metal/mineral accounting, process control and quality control (reagents and consumables) of all surface metallurgical plants of the Anglo American Corporation group, comprising the gold, uranium, flotation, acid and calcine plants and the analytical laboratories. The project also embraced the total gold (and uranium) accounting system for the Vaal Reefs mining complex from the underground stope to the residue dam. The work covered measurement of process variables, sampling, sample preparation, analysis and subsequent accounting.

1967 - 1978 **PALABORA MINING COMPANY (RIO TINTO),** Phalaborwa, South Africa

1974 - 1978 Project Engineer

Managed projects from the concept stage through basic engineering, estimating, approval, design, procurement, construction and commissioning. Coordinated all engineering disciplines i.e. mechanical, electrical, systems, chemical and metallurgical. Prepared detailed proposals and justification for expenditure.

1970 - 1974 Assistant Refinery Superintendent

Responsible to the Refinery Superintendent for the safe, clean and orderly operation of the refinery complex inclusive of the electrolytic refining tankhouse and the casting plant operation with related acid, coal, naphtha and metal handling facilities plus the copper electrowinning, nickel sulphate and by-product facilities. Drew up design parameters for a 100% Tankhouse expansion.

During this period was Acting Refinery Superintendent with the added responsibility for the operation of the direct fired boilers. During this assignment plant modifications were commissioned for operation at higher deposition current densities which required close control and alteration to the plant operating conditions.

1967 - 1970 Refinery Metallurgist

Involved in the commissioning of the 60,000 ton per annum Electrolytic Tankhouse, comprising both electrorefining and electrowinning and the vacuum evaporator Nickel Sulphate plant. Subsequently involved in the commissioning of the Casting Plant comprising melting furnace, wirebar casting and continuous casting and rod rolling facilities. Trained operating staff. Investigated and solved plant operational problems, implemented process improvements, supervised metallurgists, did metallurgical accounting and assisted with daily plant operations.

1961 - 1967 **RHOKANA CORPORATION LIMITED**, Kitwe, Zambia

1966 - 1967 Acting Assistant Superintendent - Pyrometallurgy

Managed the pyrometallurgical division of Rhoanglo Mine Services. Planned, coordinated and directed the research carried out by the metallurgical staff. Work comprised research into both new and existing processes for all Anglo American base metal mines (copper, cobalt, lead and zinc) in Zambia.

Aug-Sep 1966 Acting Assistant Superintendent - Smelter

Responsible to the Smelter Superintendent for daily operation of the smelter and acid plant complex, comprising: materials receiving and handling plant, 5 smelting reverberatory furnaces, 5 copper converters, 3 anode furnaces and all ancillary equipment including molten metal and slag handling and sulphuric acid plant.

1965 - 1966	Plant Metallurgist (Pyrometallurgy) - R&D	Zambia
1963 - 1965	Plant Metallurgist - Smelter	Zambia
1962 - 1963	Plant Metallurgist - Electrolytic Refinery Tankhouse	Zambia
1961 - 1962	Metallurgical Assistant - Electrolytic Refinery Tankhouse	Zambia
1961	Learner Mine Official	Zambia
1956	Operator in Rhokana Corporation's Cobalt plant.	Zambia

Process Research Associates Ltd.
A Metallurgical Laboratory for Evaluation of Mineral Samples
9145 Shaughnessy Street, Vancouver, B.C., Canada V6P 6R9
Tel: (604)322-0118 Fax: (604)322-0181 Email: PRA@PRAprocess.com

Project No: 96-122 **December 23, 1997**

TO: **D.K. Bragg**
6474 Prince Albert Street
Vancouver, B.C.
V5W 3E6

ATTENTION: Mr. Don Bragg

RE: Professional Services to December 23, 1997

Infrasizer Tests	$500.00
Product Analysis	$55.00
Disbursements (Equipment Rental)	$300.00
Project Management	$345.00
Total amount owing this invoice	**$1200.00**

Terms: Net 30 days. Interest @ 1% per month on overdue accounts
G.S.T. Number R132440272

QF-002, Revision B.

PETROGRAPHY
'Greisen' Sample

10 October, 1997

Prepared For: Don Bragg
1291 East 53rd Avenue
Vancouver, B.C. V5X 1K1

PROFESSIONAL
PROVINCE OF
J. B. THOMPSON
BRITISH COLUMBIA
GEOSCIENTIST

10/10/97

PetraScience Consultants Inc.
3995 W. 24th Avenue
Vancouver, B.C. V6S 1M1 Canada
phone/fax: 604.222.4642
email: petrascience@compuserve.com

Sample: Bragg 1

LITHOLOGY: Greisen - granite
ALTERATION TYPE: Muscovite-topaz

Hand Sample Description:
Medium-grained, light grey to white, moderately hard, intrusive rock. Rock appears to be comprised of dominantly interlocking grains of quartz and well developed 'books' of muscovite and slightly coarser grains of quartz. Staining also indicates the presence of K-feldspar. Vugs are lined with muscovite. Minor chalcopyrite is present. The majority of sulfide has been weathered to form hematite.

MAJOR MINERALS

Mineral	%	Distribution & Characteristics	Opt. Prop.
Quartz	60	medium-grained throughout, minor larger (coarse) grains: one example of a possible intergrowth with K-feldspar	
K-feldspar	15	(based on stain) zoned and twinned grains, one example of a possible intergrowth with quartz	
Muscovite	15	disseminated flakes, tabular grains	
Topaz	05	high relief grains, throughout sample	

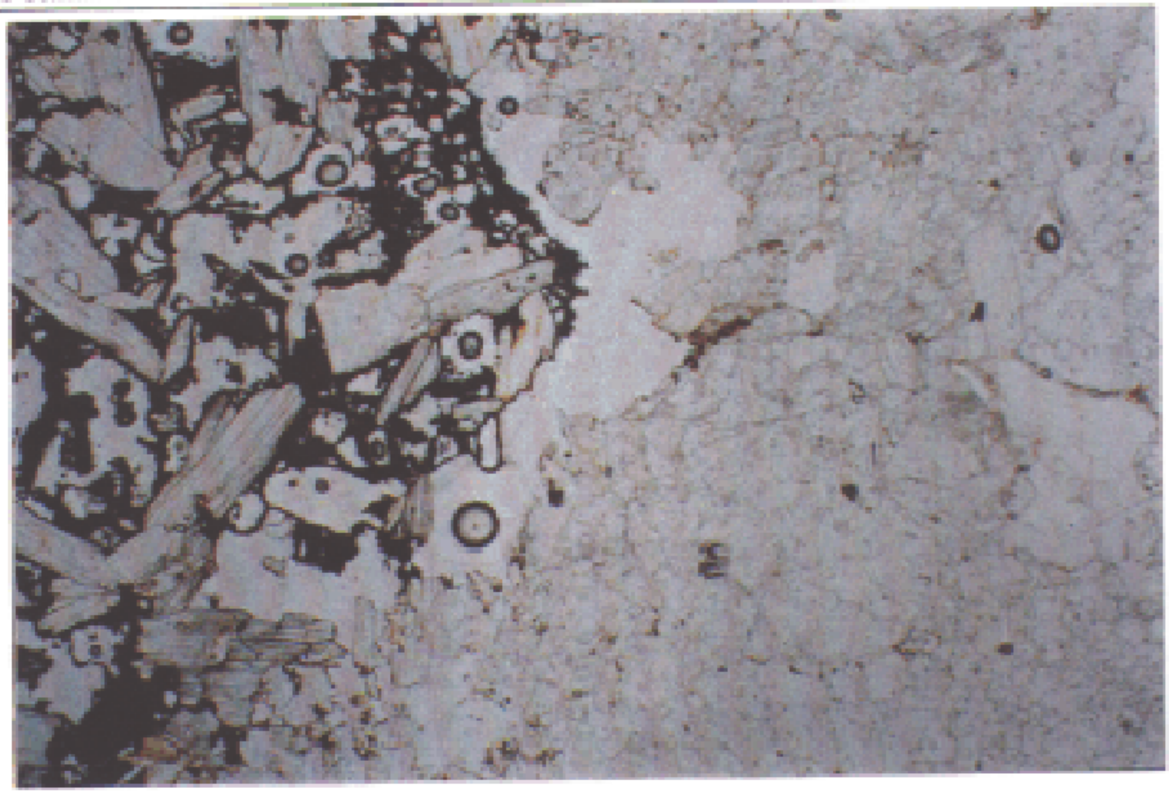
MINOR MINERALS

Mineral	%	Distribution & Characteristics	Opt. Prop.
Unknown	01	anhedral to tabular grains, grey to blue 1st order δ, negative interference figure	
Fluorite	01	patches, adjacent muscovite - hematite	isotropic
Rutile	tr.	aggregates rimming grains with hematite within a probable weathered out sulfide patch, extremely fine grains disseminated throughout	
Hematite	tr.	rimming grains with rutile in a patch of probable weathered out sulfide	
Chalcopyrite	tr.	rare grains with hematite and rutile	
Vugs		infilled with muscovite and unknown bladed mineral	

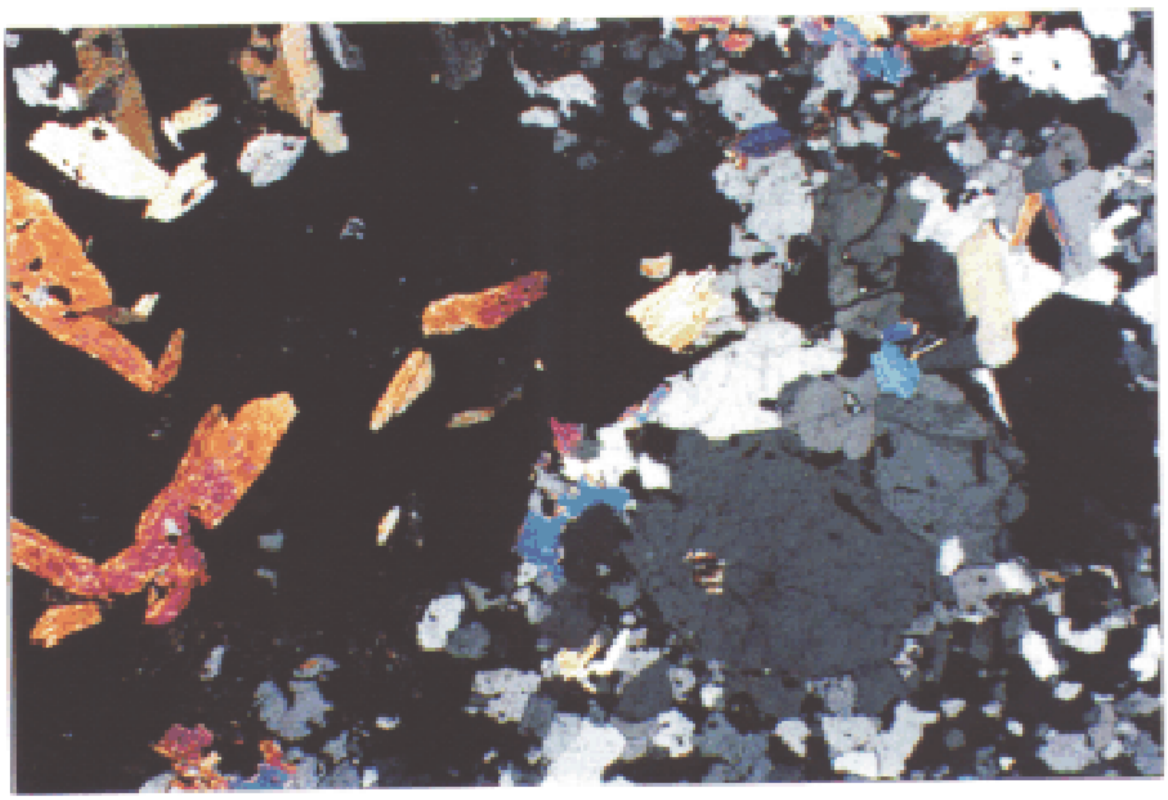
Thin Section Description:
The sample consists dominantly of intergrown quartz, K-feldspar, topaz and coarse muscovite. Minor fluorite occurs near aggregates of muscovite (vug infill). Section contains unknown anhedral to tabular mineral which could be amblygonite. Hematite and rutile, with trace chalcopyrite, also occur in the sample with hematite probably a result of weathered sulfide. Extremely fine-grains of rutile are dissemated throughout section.

Small single vapour inclusions within the quartz grains.

Audrey Robitaille
Anne J.B. Thompson, P.Geo.

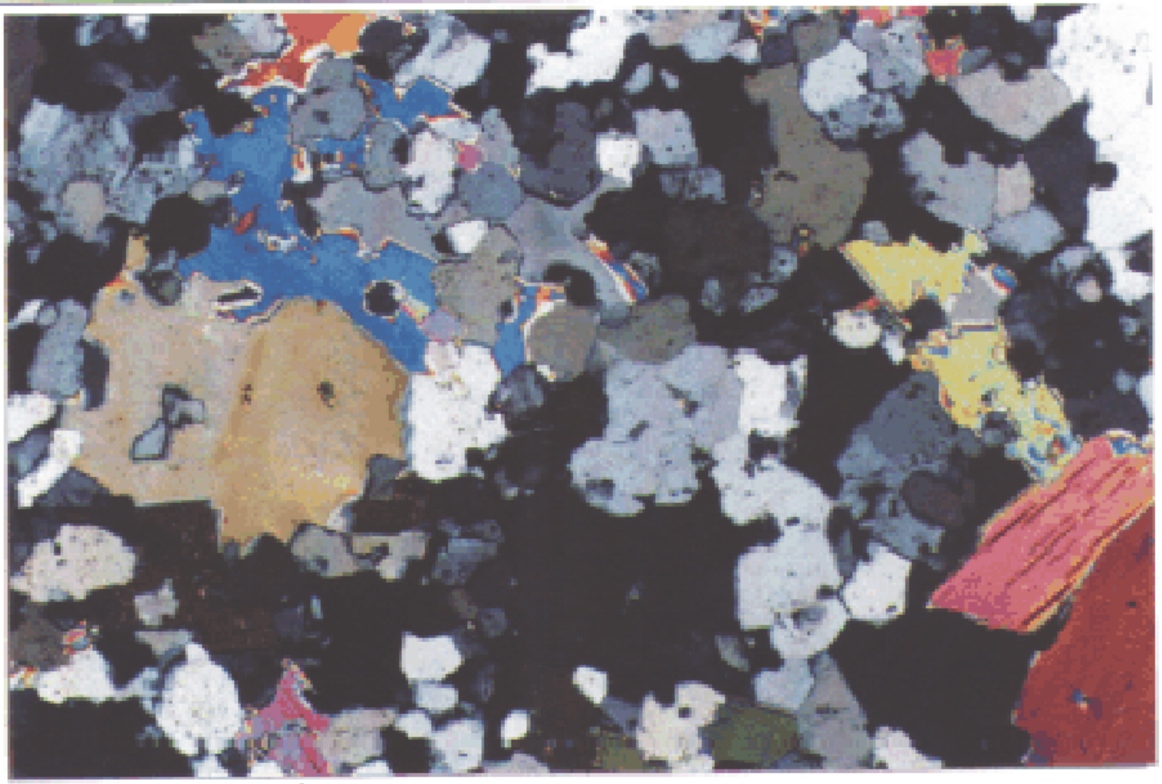


Bragg 1: Topaz with quartz and muscovite Field of view = 2.5mm. PPL.

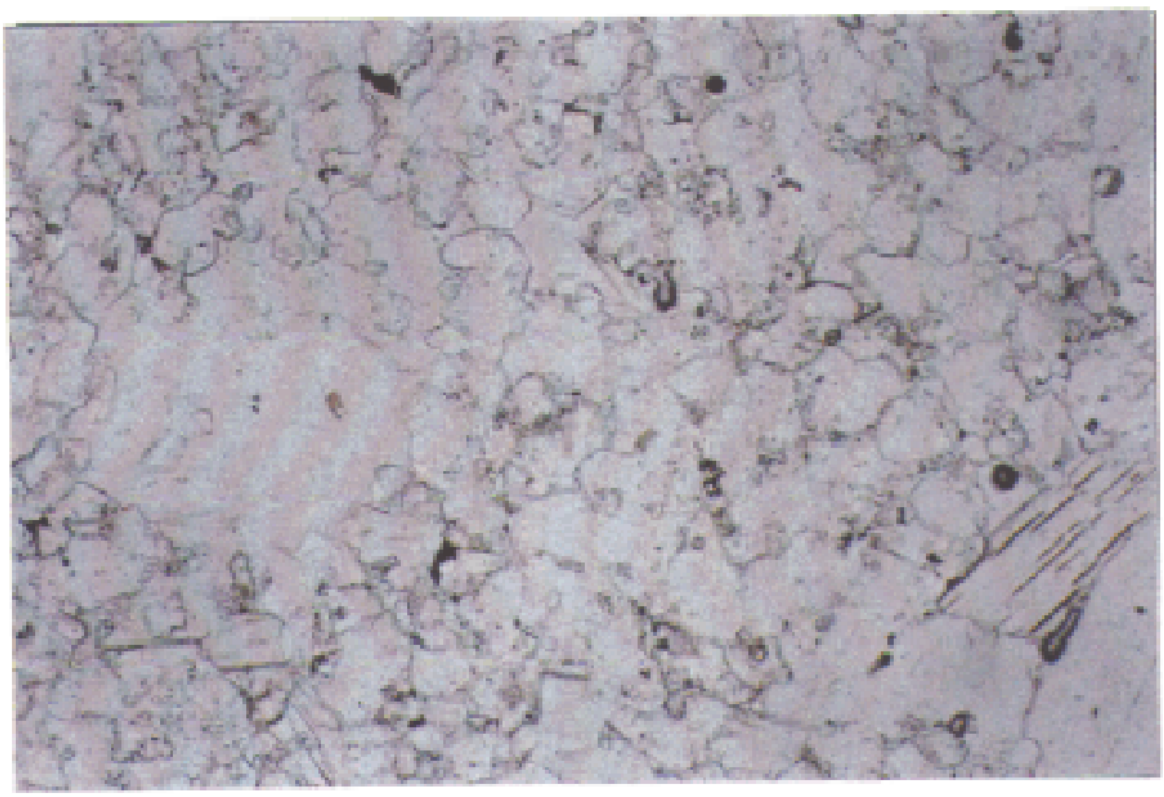


Bragg 1: Same as above Field of view = 2.5mm. XPL.

Audrey Robitaille
Anne J.B. Thompson, P.Geo.



Bragg1: Overview: quartz, topaz, muscovite, ?amblygonite, hematite, and sulfide. Field of view = 5mm. XPL.



Bragg 1: Same as above Field of view = 5mm. PPL.

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