1035

PRELIMINARY GEOCHEMICAL
& GEOLOGICAL INVESTIGATION
OF
THE HAIL 'A' AND HAIL 'C'
CLAIM GROUPS
KAMLOOPS MINING DIVISION
B. C.

51°00'N - 119°00'W - N.W.

6 Miles SW of Vavenby, B.C.

For

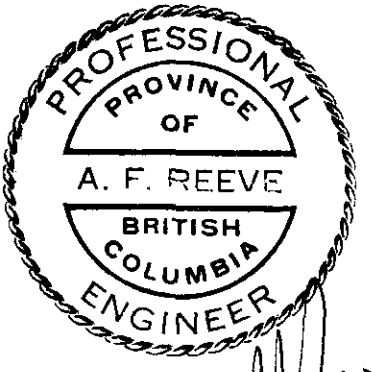
QUEBEC CARTIER MINING COMPANY

By

Albert F. Reeve, P.Eng.

Geological Engineer

July 23, 1966 -- July 12, 1967



CONTENTS

INTRODUCTION

This report is based on preliminary geological and geochemical investigations carried out on the Hail 'A' and Hail 'C', claim groups. This work, accompanied by access road construction and improvement is submitted to the British Columbia Department of Mines to satisfy assessment requirements for 1 year on the 66 claims.

Geological and geochemical investigations were based on the discovery of float mineralized with chalcopyrite. Most of this work was supported by helicopter. Late in the season ground access was established by improving and extending existing logging roads.

PROPERTY

HAIL 'A' GROUP

Claim Name	Record No.	Record Date
Hail #89 to #118 inclusive	58814 to 58843	July 22, 1966
Hail #29	58433	July 13, 1966
Hail #35	58439	July 13, 1966
Hail #36	58440	July 13, 1966

HAIL 'C' GROUP

Hail #8	58412	July 13, 1966
Hail #10	58414	July 13, 1966
Hail #12	58416	July 13, 1966
Hail #17 to #22	58421 to 58426	July 13, 1966
Hail #43 to #54	58441 to 58452	July 13, 1966
Hail #56	58454	July 13, 1966
Hail #71 to #74	58465 to 58468	July 13, 1966
Hail #77 to #79	58469 to 58471	July 13, 1966
Hail #63 to #66	58461 to 58464	July 13, 1966

The above claims are held by A.F. Reeve, F.M.C. #58116, 400 - 837 West Hastings Street, Vancouver 1, B.C.

LOCATION, LOCAL GEOGRAPHY AND ACCESS

The property lies on the rounded top of a hill which rises to about 6500' ASL. The entire hill is heavily wooded with spruce, balsam, and pine on the lower slopes. Jones, Baker and Lute Creeks drain the area northward into the North Thompson river between Vavenby and Birch Island; Harper Creek drains southward to Barriere Lakes.

Initially, helicopter landings were made in marshy meadows on the summit. Later in the season a local logging road was extended 3 miles from 5000' ASL to 6000' ASL and a camp was established at 5500' on the west side of the property. The camp is 14 road miles from Vavenby. Four wheel drive is required for the last 2 miles.

WORK DONE

Method

1. Stream sediment samples (85) were taken from all of the water courses in the general vicinity of the property, and analyzed for copper, zinc and molybdenum. Samples were taken at a maximum of 2500 foot intervals where possible. Sampling crews were placed on the upper parts of the drainage systems by helicopter each day, and picked up at lower elevations after completing down-stream traverses. The purpose of this work was to broadly confine the area of interest and ascertain whether or not it was adequately covered by the property.

   The results are plotted on 3, 4, and 5 in Appendix D.

2. Soil Sampling was done as preliminary follow-up to 1. 184 soil samples were taken on 7 lines, 1 mile each in length. This work was done in selected areas to investigate Cu and Zn anomalies indicated by stream sampling. Field crews worked from 2 campsites serviced by helicopter.

3. Preliminary geological traverses were run across the property at average intervals of 1500' in a North South direction. This was done in conjunction with 2 above. The object of this was to investigate the occurence of float mineralized with chalcopyrite and relate it to the local geology.

   The results of geological traversing are shown on the geochemical plans in Appendix D.

Personnel and Contractors

The following were employed between July 23, 1966 and July 12, 1967 on preliminary geochemical and geological evaluation, road repair and construction work on the Hail 'A' and Hail 'C' claim groups.

- Richard J. Schroeder, Geologist,
  c/o Geology Department,
  University of Iowa,
  Iowa City, Iowa, U.S.A.

- R. A. Harper, Field Assistant,
  3003 - 23rd Street,
  Vernon, B.C.

- L. LeRoy, Geochemical Technician,
  c/o Bondar Clegg & Co. Ltd.,
  1481 Michael Street,
  Ottawa, Ontario

- M. W. Crist, Field Assistant,
  401 S. Gilmer,
  Burnaby 2, B.C.

- A. F. Reeve, Geological Engineer,
  400 - 837 West Hastings Street,
  Vancouver 1, B.C.

- W. F. Bondar, Consulting Geochemist,
  Bondar Clegg & Co. Ltd.,
  1481 Michael Street,
  Ottawa, Ontario

- Jean Alix Company Ltd., Line Cutting Contractors,
  Val'dor, Quebec

- L. P. Duquette, Labourer,
  2794 Trinity Street,
  Vancouver, B.C.

- H. Rottacker, Road Contractor,
  Clearwater, B.C.

GEOLOGY

Regional

The general geology of the area is described on Map #48 - 1963, Adams Lake, by R. B. Campbell. The Hail group lies on the northern edge of a large plutonic mass of intermediate felsic composition. Locally this intrusive cuts phyllitic sedimentary and volcanic rocks which Campbell estimates to be of late Paleozoic age. This sequence is similar in appearance to rocks which have been named "Cache Creek" in other parts of the province. It is overlain to the west by Triassic volcanic rocks and underlain eastward by precambrian paragneiss.

Local

Geological work on the property accounts for a very small part of the work done to date. The locations of mineralized float and gross geological features were mapped and are shown as supplementary information on the geochemical maps in Appendix D.

There are only a few small scattered outcrops (less than 1%) on the property. It is thickly wooded and is covered by a relatively thin mantle of glacial debris and semi-residual rubble having an average thickness of not more than 10'. Road work and trenching on the Hail 'B' group suggests that local occurences of float are fairly representative of the underlying bed rock.

The major geological feature on the property is the contact of a large batholith which crosses the southern part of the claims in an ENE direction. The intrusive is composed of coarse granite and monzonite. The contact consists of a siliceous gneissic zone which grades northward into a schistose and phyllitic rocks and southward to massive intrusive.

The major members of the intruded rock sequence on the property are:

- 1. Buff and grey colored sericite schist.
- 2. Buff and grey colored quartz sericite schist.
- 3. Green limey schist.

1 and 2 probably originated from silty sedimentary rocks and 3 from a volcanic tuff of andesitic to balsatic composition.

The attitude of these foliated rocks is consistently ENE with moderate dips to the north. Irregular quartz veins and lenses frequently containing buff colored iron carbonate are wide-spread in the sedimentary-volcanic sequence. Pyrite, chalcopyrite, and occasionally magnetite are common accessory minerals.

A thick bed of limestone outcrops immediately east of the property.

Mineralization

A large zone or series of zones of copper mineralization is suggested by float occurences and the results of geochemical sampling. One exposure, a trench on the Hail 'A' group, near the campsite, yielded values of .32% Cu in a sample cut 55' long. Float and rubble mineralized with chalcopyrite and malachite occurs predominantly near the west boundary of the property. The mineralized material consists of pyritic grey, buff and green schist, which carries copper in the following ways:

- 1. As disseminated chalcopyrite mixed with fine grained pyrite.
- 2. As coatings of chalcopyrite and malachite on schist planes.
- 3. As coating of chalcopyrite on N-S oriented cross fractures.
- 4. As coarse masses and blebs of chalcopyrite in quartz lenses and veinlets.

Occasional galena and sphalerite has been observed, but there is no evidence to date that it occurs in significant quantities. Silver values are erratic and apparently related to galena.

GEOCHEMISTRY

Sampling and Analytical Procedures

(a) Sampling

The following data was recorded in the field at each sample point:

Stream Sediments	Soil
Sample No.	Sample No.
Location	Location
Physiography	Slope
Stream size (c.f.s.)	Physiography
Stream gradient	Soil type
Sample distribution	Horizon and depth
Colour	Colour
Texture	Texture

Particular care was taken to exclude organic matter from samples. Soil Samples were taken from the 'B' horizon wherever possible. Each stream sediment sample was composed of the finest possible material selected from several random locations on a sediment bar or trap.

(b) Analytical Procedures

Total heavy metals determinations were made in the field by scooping a constant volume of the finest sediment and leaching with cold, dilute ammonium citrate. The heavy metals removed were then determined by reaction with 0.001% w/v dithizone in benzene to form a colored product.

For copper, zinc, and molybdenum the samples were dried and sieved in a laboratory to - 80 mesh.

Copper and zinc were determined directly by atomic absorption methods after leaching the sample with a mixture of 1½ ml. concentrated nitric acid and ½ ml. concentrated hydrochloric acid in a hot water bath for 2½ hours and adjusting the final volume to 10 ml.

Molybdenum was determined colorimetrically by a stannous chloride - thiocyanate method using a pyrosulphate fusion. The molybdenum - thiocyanate complex was extracted into isoprople ether.

All metal values are expressed in parts per million.

Results

Analytical data from stream sediment sampling is shown on figures 3, 4, and 5, Appendix D.

1. Molybdenum:

Six to less than 1 parts per million of Mo were detected in stream sediment samples. These results are relatively low and have no apparent anomalous distribution of values.

2. Zinc:

Zn values ranged from 18 to 380 ppm in the stream sediment samples. Three values of over 200 ppm on the west side of the property can be considered moderately anomalous. However, in view of the common occurence of zinc in the area, and its relatively high geochemical dispersion mobility, these results are not exceptional.

3. Copper:

Excepting four sample points copper values in stream sediments ranged from 10 to 145 ppm. The remaining 4 samples ranged from 620 to 1180 ppm Cu. These occur in streams which drain the west $\frac{1}{2}$ of the property and indicate a very substantial copper anomaly in that area. A stream which drains the SE part of the property yielded several samples having values over 100 ppm. This may be considered a moderately anomalous result.

Soil sampling was carried out in selected areas to follow up anomalies indicated by stream sediment sampling. The results of this work are shown in figures 6 and 7.

No anomalous zinc results were obtained. A copper anomaly was outlined on the west side of the property. It occurs in claims 51, 18, 54, 20, 19, 21 and 22 and occupies a NE trending area of 5000' x 3000' in which copper values range from 100 to 1620 ppm.

SUMMARY AND CONCLUSIONS

An exploration programme consisting of preliminary helicopter supported geochemical surveys, geological reconnaissance, and access road improvement was carried out on the Hail claim group, located near Vavenby, B.C. This work was done between July 23, 1966 and July 12, 1967.

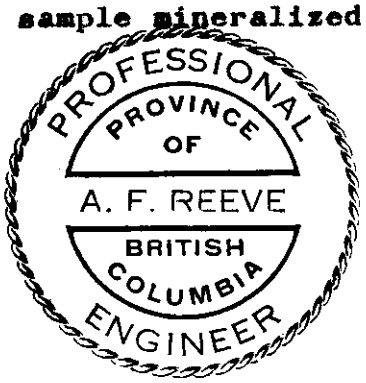
A strong geochemical anomaly has been partially outlined on the western part of the property. Numerous occurences of float and rock rubble mineralized with chalcopyrite have been mapped in the same general area. There is less substantial evidence that some significant copper mineralization occurs on the eastern part of the property. Since there is very little rock exposure on the claims and the over-burden is relatively thin, a detailed soil sampling programme over the entire group, followed by selective bull-dozer stripping would be an effective method of outlining and evaluating the targets suggested by preliminary work.

This occurence is geologically unlike any other copper deposit which has been a producer or developed substantially recently in British Columbia. However, the results of stream sediment sampling and the pervasive nature of the mineralization observed to date suggests the possibilities for a large volume of low grade material.

RECOMMENDATIONS

It is suggested that the following exploration programme be carried out on the Hail group in 1967:

1. Establish a base camp on the property to accomodate at least 15 men.
2. Cut a line grid consisting of EW base lines, with picket lines at 800' intervals in a N-S direction (100 miles).
3. Take soil samples at 200' intervals along the NS lines and analyze for copper. Close line spacing to 400' and sample interval to 100' where anomalous results are obtained.
4. Do a magnetometer survey over the entire grid system. This will be an economical means of developing structural fabric since there is very little outcrop.
5. Trench geological anomalies by bulldozing map and sample mineralized areas in the trenches.



Respectfully submitted

August 10, 1967

Albert F. Reeve, P.Eng.

NOTE

At this date the above programme is 50% complete.

APPENDIX A

STATEMENT OF EXPENDITURES

APPENDIX A

Statement of Estimated Expenditures

Hail 'A' and 'C' Claim Groups

1. Road Work

Bull dozer D-6 Caterpillar 57 hrs @ $16.00	$312.00	
Labour, 16 days @ $25.00	400.00	
		$1,312.00

2. Line Cutting

7 miles @ $100.00	$700.00	
		$ 700.00

3. Salaries and Fees

2 Geochemical Technicians 2 x 16 days @ $20.00	$640.00	
Geologist - 7 days @ $30.00	210.00	
Geologist Assistant - 7 days @ $20.00 ...	140.00	
Geological Engineer @ $50.00 per day		
Field Supervisor -- 3 days Office -- 4 days		
Total 7 days	350.00	
Consulting Fees		
Geochemist - 3 days @ $100.00	300.00	
Stenographic Service - 6 hrs. @ $4.00 ...	24.00	
Drafting Service - 70 hrs. @ $4.00	280.00	
		$1,944.00

APPENDIX A

(continued)

4. Supplies and Miscellaneous

Printing and Office Supplies	$ 30.00	
Geochemical Analysis		
269 Cu Zn @ $175.00	470.00	
85 Mo @ $1.00	85.00	
Food, 100 man-days @ $4.00	400.00	
Miscellaneous Supplies (fuel, hardware and tools)	50.00	
		$1,035.00

5. Transportation

4 wheel drive truck rental 8 days @ $20.00	$ 160.00	
Helicopter Bell SG-2 16 hrs. @ $110.00 (including fuel)	1760.00	
		$1,920.00
TOTAL EXPENDITURES		$6,911.00

Apply $6,600.00 to Hail 'A' and 'C' Claim groups to cover 1 years assessment requirements.

APPENDIX B

STATUTORY DECLARATION

IN

SUPPORT OF EXPENDITURES

APPENDIX B

CANADA

Province of British Columbia

TO WIT:

) IN THE MATTER OF the statement
) of Expenditures for geological
) mapping of the Hail Mineral
) Claims in the Kamloops Mining
) Division.

I, ALBERT F. REEVE, Geological Engineer, of 400 - 837 West Hastings Street, in the City of Vancouver, in the Province of British Columbia, DO SOLEMNLY DECLARE:

1. THAT the preliminary geological and geochemical investigation of the Hail 'C' and 'A' groups was carried out under my direction.

2. THAT the Statement of Expenditures set out in Appendix "A" of my report "Geological and Geochemical Investigation of the Hail Claim Group", dated July 23 to July 12, 1967, truly represents the amounts expended on geological mapping of the said claim group.

AND I make this solemn Declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of the Canada Evidence Act.

DECLARED before me at the
City of Vancouver, in the
Province of British Columbia,
this 14th day of August
A.D. 1967.

A. F. Reeve

J. T. Lam

A Commissioner for taking
Affidavits for British Columbia

APPENDIX C

WRITERS CERTIFICATE

OF

QUALIFICATIONS

CERTIFICATE

I, ALBERT F. REEVE, of Vancouver, B.C., hereby certify that:

1. I am a geological engineer residing at #4, 2475 West 1st Avenue, with an office at 400, 837 West Hastings Street.

2. I am a graduate of the Provincial Institute of Mining, Haileybury, Ontario, 1958; and received a Bachelor of Science degree from Michigan College of Mining and Technology, Houghton, Michigan, 1961.

3. I am a certified member of the associations of Professional Engineers in the provinces of Ontario and British Columbia.

4. I am the author of this report.

5. I supervised geological and geochemical investigation of the Hail 'A' and 'C' claim groups which are described herein.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. REEVE

Signed _____
Albert F. Reeve, P.Eng.,
Geological Engineer

August 10, 1967

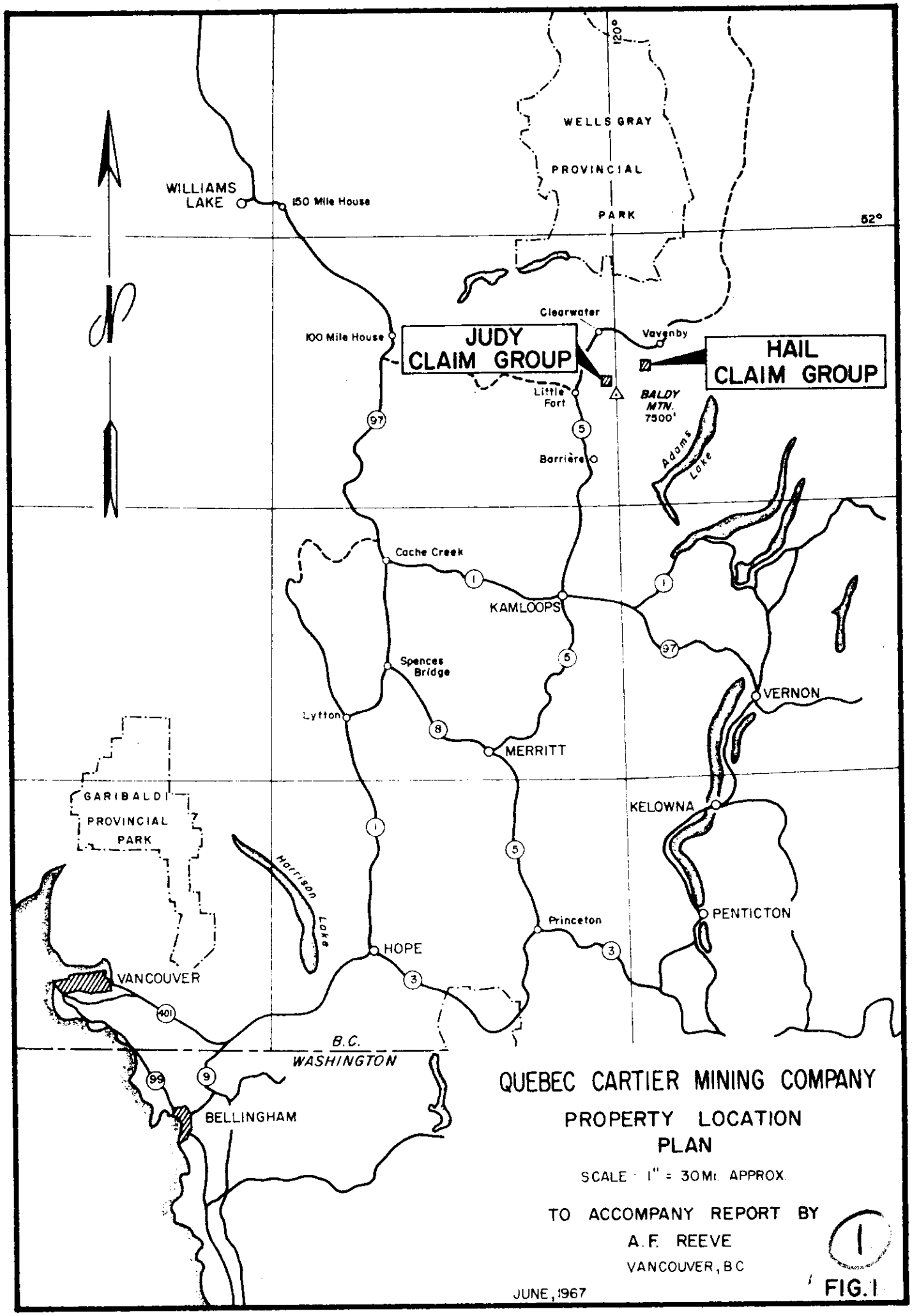
Vancouver, B.C.

APPENDIX B

MAPS

1. Location Map, 1" = 4 miles

2. Grouping Sketch, 1 " = 3000'



QUEBEC CARTIER MINING COMPANY

PROPERTY LOCATION PLAN

SCALE 1" = 30Mi. APPROX.

TO ACCOMPANY REPORT BY

A.F. REEVE

VANCOUVER, B.C.

JUNE, 1967

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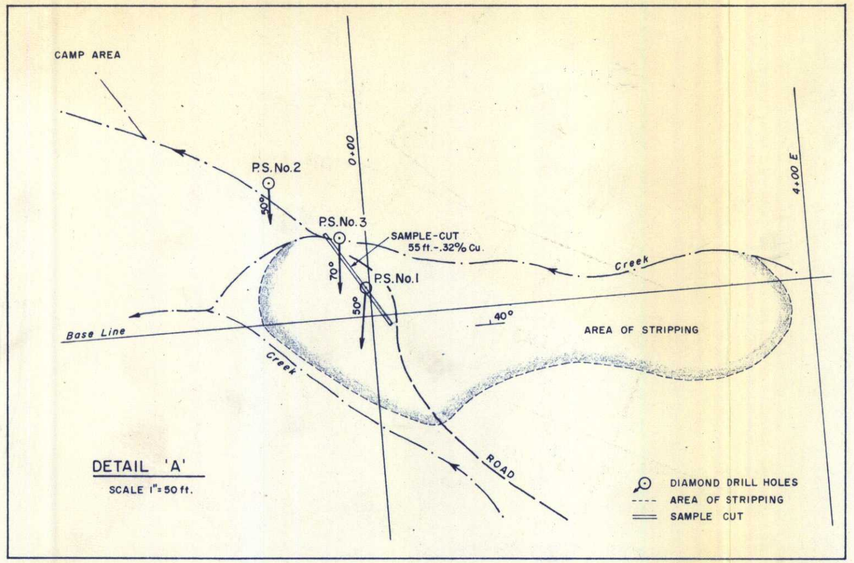
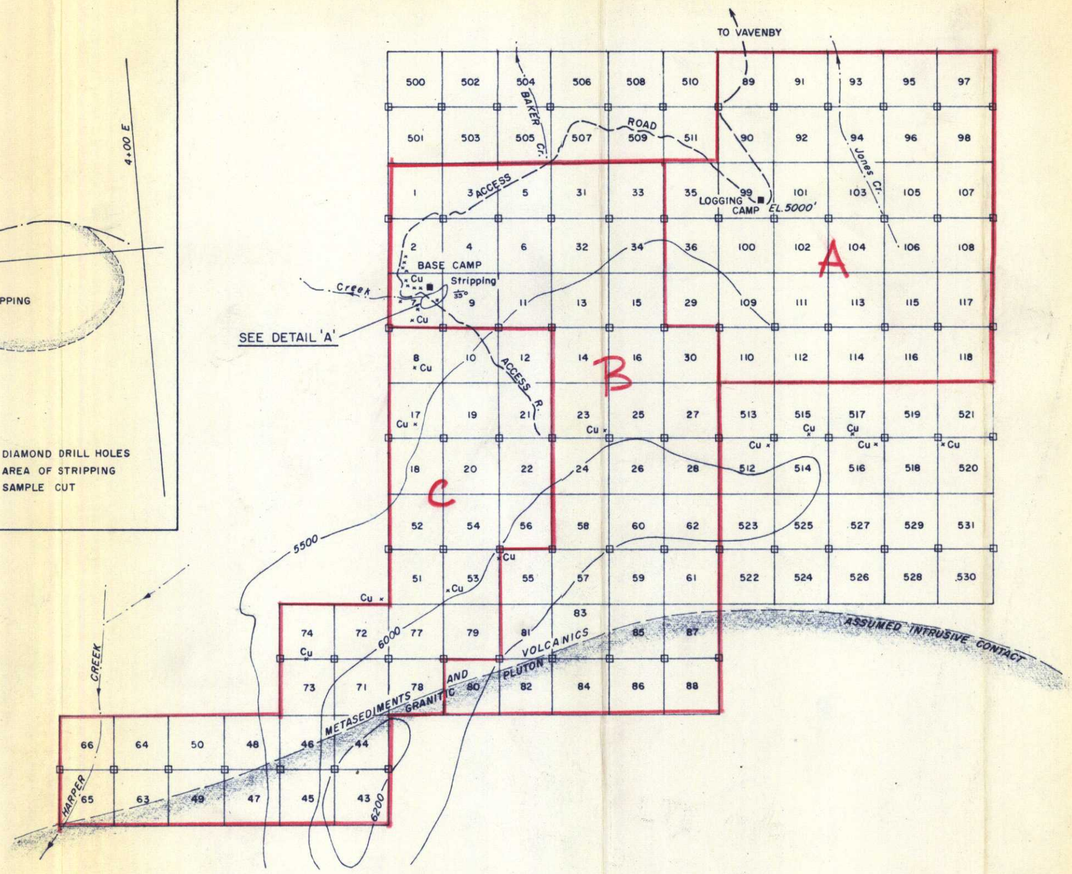
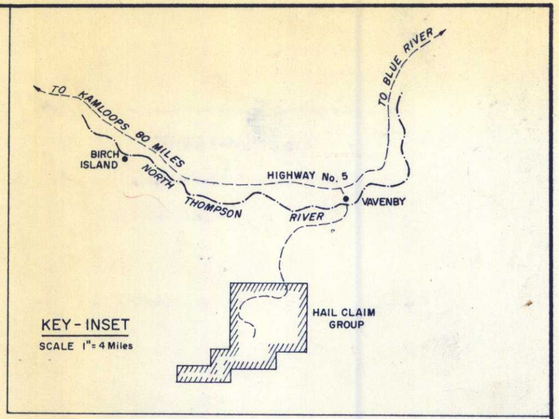
FIG. 1

Grouping Sketch







LEGEND

- X Cu — FLOAT MINERALIZED WITH CHALCOPYRITE
- □ — CLAIM POSTS
- ■ — CAMP

FIGURE 16

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QUEBEC CARTIER MINING COMPANY	
HAIL CLAIM GROUP VAVENBY AREA	
KAMLOOPS M.D.	BRITISH COLUMBIA
TO ACCOMPANY REPORT BY A.F. REEVE	
SCALE 1" = 3000'	DATE OCT., 1966.

CANADIAN NATIONAL RAILWAY

Thompson River

Baker Creek

Jones Creek

TO VAVENBY

ROAD

ACCESS

LOGGING CAMP EL. 5000'

BASE CAMP

Stripping

Creek

ACCESS

INTRUSIVE CONTACT

METASEDIMENTS AND VOLCANICS

GRANITIC PLUTON

Harper Creek

N

QUEBEC CARTIER MINING COMPANY

GEOCHEMICAL PLAN

HAIL CLAIM GROUP

COPPER CONTENT OF STREAM SEDIMENT SAMPLES

SCALE: 1" = 3000'

TO ACCOMPANY REPORT BY:
A.F. REEVE. AUGUST 10, 1967

3

LEGEND

- □ CLAIM POSTS
- ×Cu MINERALIZED FLOAT
- ○ STREAM SEDIMENT SAMPLE POINTS

COPPER CONCENTRATION

- 0 - 30 p.p.m.
- 31 - 55 p.p.m.
- 56 - 80 p.p.m.
- OVER 80 p.p.m.

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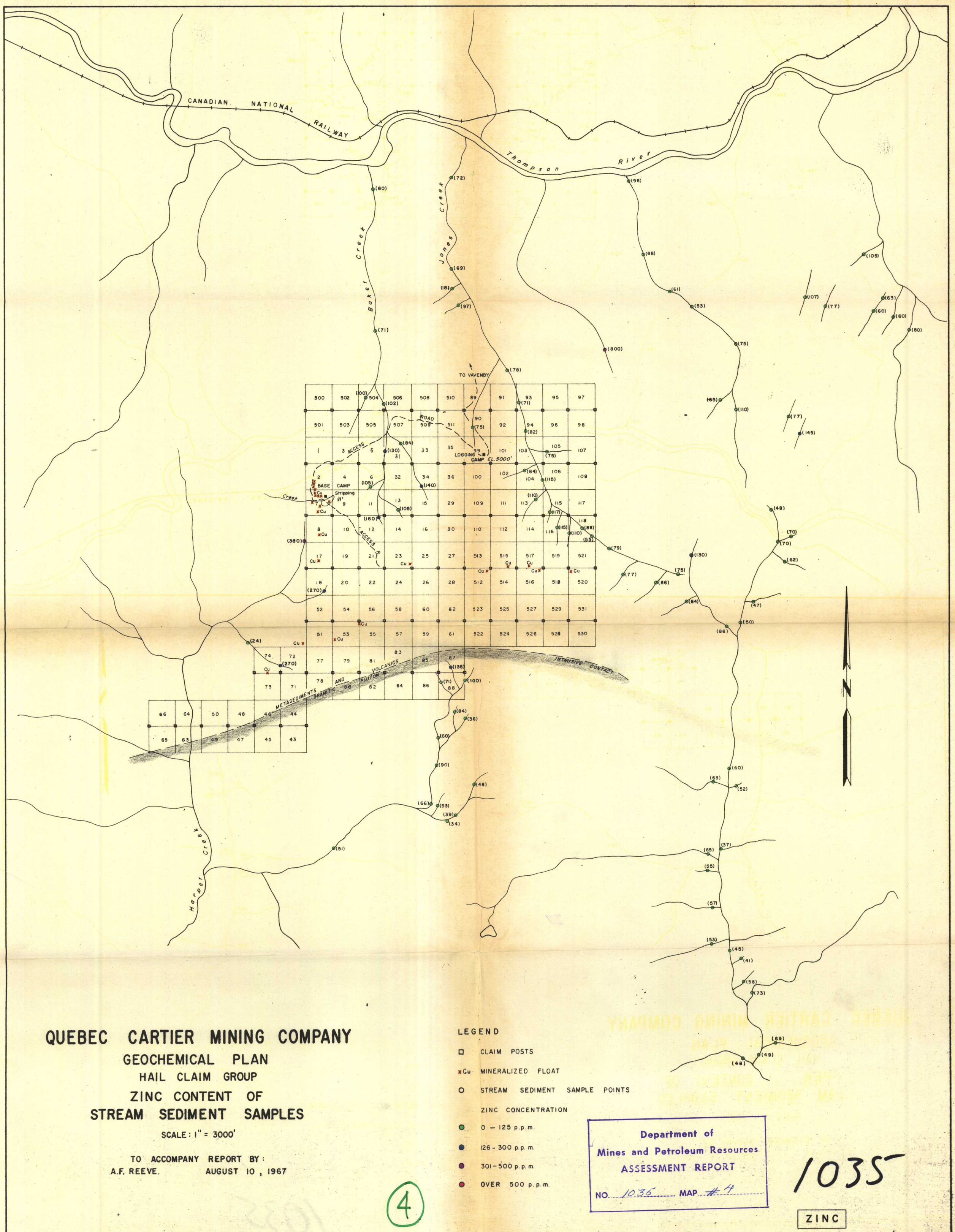
COPPER



QUEBEC CARTIER MINING COMPANY

GEOCHEMICAL PLAN

HAIL CLAIM GROUP

ZINC CONTENT OF STREAM SEDIMENT SAMPLES

SCALE: 1" = 3000'

TO ACCOMPANY REPORT BY:
A.F. REEVE. AUGUST 10, 1967

4

LEGEND

- □ CLAIM POSTS
- ×Cu MINERALIZED FLOAT
- ○ STREAM SEDIMENT SAMPLE POINTS

ZINC CONCENTRATION

- 0 – 125 p.p.m.
- 126 – 300 p.p.m.
- 301 – 500 p.p.m.
- OVER 500 p.p.m.

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ZINC

CANADIAN NATIONAL RAILWAY

Thompson River

Baker Creek

Jones Creek

Harper Creek

TO VAVENBY

ROAD

ACCESS

ACCESS R

LOGGING CAMP EL. 5000'

BASE CAMP

Stripping

Creek

INTRUSIVE CONTACT

METASEDIMENTS AND VOLCANICS

GRANITIC PLUTON

500	502	504	506	508	510	89	91	93	95	97	
501	503	505	507	509	511	90	92	94	96	98	
1	3	5	31	33	35	99	101	103	105	107	
2	4	6	32	34	36	100	102	104	106	108	
7 Cu	9	11	13	15	29	109	111	113	115	117	
8 Cu	10	12	14	16	30	110	112	114	116	118	
17 Cu	19	21	23 Cu	25	27	513	515 Cu	517 Cu	519	521	
18	20	22	24	26	28	512	514	516	518	520	
52	54	56	58	60	62	523	525	527	529	531	
51 Cu	53 Cu	55	57	59	61	522	524	526	528	530	
74 Cu	72	77	79	81	83	85	87				
73	71	78	80	82	84	86	88				
66	64	50	48	46	44						
65	63	49	47	45	43						

QUEBEC CARTIER MINING COMPANY

GEOCHEMICAL PLAN

HAIL CLAIM GROUP

MOLYBDENUM CONTENT OF STREAM SEDIMENT SAMPLES

SCALE: 1" = 3000'

TO ACCOMPANY REPORT BY:
A.F. REEVE. AUGUST 10, 1967

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LEGEND

- □ CLAIM POSTS
- Cu MINERALIZED FLOAT
- ○ STREAM SEDIMENT SAMPLE POINTS

MOLYBDENUM CONCENTRATION

- 0 - 4 p.p.m.
- 5 - 8 p.p.m.
- 9 - 12 p.p.m.
- OVER 12 p.p.m.

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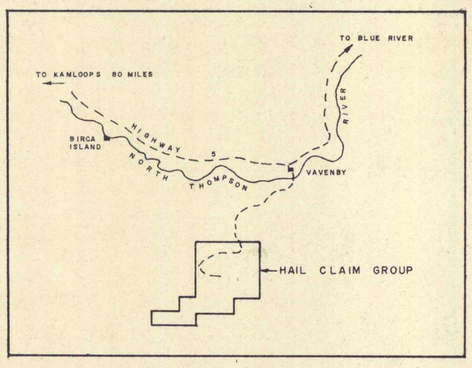
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT

NO. 1035 MAP # 5

MOLYBDENUM



LOCATION PLAN
SCALE: 1" = 4 MI.

LEGEND:

- SLIGHT SLOPE – ARROW INDICATES DIRECTION OF DRAINAGE
- MODERATE SLOPE – ARROW INDICATES DIRECTION OF DRAINAGE
- STEEP SLOPE – ARROW INDICATES DIRECTION OF DRAINAGE
- Cu MINERALIZED FLOAT
- 6000 ELEVATION CONTOUR
- GEOLOGICAL CONTACT (ASSUMED)

COPPER CONCENTRATION

- 0 - 50 p.p.m.
- 51 - 75 p.p.m.
- 76 - 100 p.p.m.
- 101 OR GREATER

ANALYSIS BY: BONDAR – CLEGG & COMPANY LTD.

ACCESS ROAD
TO VAVENBY
BAKER CREEK
JONES CREEK
LOGGING CAMP
CLAIM BOUNDARY
NORANDA
BASE CAMP
FLY CAMP (WILSON)
FLY CAMP (SCHRAEDAR)
5500'
6000'
HARPER CREEK
ASSUMED INTRUSIVE CONTACT
METASEDIMENTS & VOLCANICS
GRANITIC PLUTON

SCALE: 1" = 1000'

(6)

[redacted]

QUEBEC CARTIER MINING COMPANY

COPPER CONTENT OF [redacted] SOIL SAMPLES

HAIL CLAIM GROUP

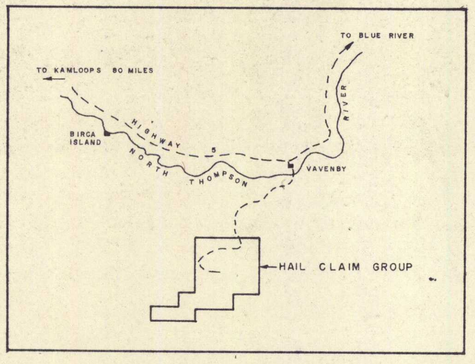
ADAMS LAKE – BONAPARTE RIVER AREA

BRITISH COLUMBIA

1035

"TO ACCOMPANY REPORT BY A.F. REEVE AUG. 10, 1967"

BONDAR – CLEGG AND COMPANY LTD.
OTTAWA CANADA



LOCATION PLAN
SCALE: 1" = 4 MI.

LEGEND:

- SLIGHT SLOPE - ARROW INDICATES DIRECTION OF DRAINAGE
- MODERATE SLOPE - ARROW INDICATES DIRECTION OF DRAINAGE
- STEEP SLOPE - ARROW INDICATES DIRECTION OF DRAINAGE
- X Cu MINERALIZED FLOAT
- 6000 ELEVATION CONTOUR
- GEOLOGICAL CONTACT (ASSUMED)

ZINC CONCENTRATION

- 0 - 90 p.p.m.
- 91 - 150 p.p.m.
- 151 - 225 p.p.m.
- 226 OR GREATER

ANALYSIS BY: BONDAR-CLEGG & COMPANY LTD.

N O R A N D A

CLAIM BOUNDARY

ACCESS ROAD

TO VAVENBY

BAKER CREEK

JONES CREEK

HARPER CREEK

BASE CAMP

FLY CAMP (WILSON)

FLY CAMP (SCHRAEDAR)

LOGGING CAMP

5500'

6000'

6200'

METASEDIMENTS & VOLCANICS

GRANITIC PLUTON

ASSUMED INTRUSIVE CONTACT

SCALE: 1" = 1000'

[redacted]

QUEBEC CARTIER MINING COMPANY

ZINC CONTENT OF [redacted] SOIL SAMPLES

HAIL CLAIM GROUP

ADAMS LAKE - BONAPARTE RIVER AREA

BRITISH COLUMBIA

7

"TO ACCOMPANY REPORT BY A.F. REEVE AUG. 10, 1967"

1035

BONDAR - CLEGG AND COMPANY LTD.
OTTAWA CANADA