

GEOPHYSICAL REPORT

on the

MM 1 FR., MM 2 FR., MM 4 FR. and M 8 MINERAL CLAIMS

and

MINERAL LEASE M-33 R

MAGGIE MINE AREA - CACHE CREEK, B.C.

KAMLOOPS MINING DIVISION

---

NTS Sheet - 92I/14W	UTM Grid - Zone 10
Latitude 50° 55.4'	North - 5642400
Longitude 121° 25.1'	East - 611000

---

BETHLEHEM COPPER CORPORATION  
Suite 2100 - Guinness Tower  
1055 West Hastings Street  
Vancouver, B.C. V6E 2H8

November 18, 1977

R. E. Anderson, P.Eng.

TABLE OF CONTENTS

SECTION A

- SUMMARY OF WORK

Introduction  
Location and Access  
Topography and Physical Environment  
Mineral Title  
Geophysical Survey  
Discussion of Results

SECTION B

- GEOPHYSICAL DATA

Report by Glen E. White dated May 31, 1977  
Instrument Specifications and Survey Method  
Profiles - 86 N  
          116 N

SECTION C

- STATEMENT OF EXPENDITURES

SECTION D

- SCHEDULE OF MINERAL CLAIMS

SECTION E

- ILLUSTRATIONS

Drawing No. MM-77-1 - General Location Plan  
Scale 1:125,000

Drawing No. MM-77-2 - Mineral Claims Plan  
Scale 1:24,000

Drawing No. MM-77-3 - 1977 I.P. Survey  
Scale 1:2,400

SECTION A - SUMMARY OF WORK

Introduction:

The Maggie copper-molybdenum deposit was discovered in 1969 and 1970 by percussion and diamond drilling and the present indicated geologic reserves are set at 181,440,000 tonnes grading 0.28% Cu and 0.029% Mo.

The limited geophysical survey detailed in this report was initiated in May 1977 in order to test a specific Induced Polarization method over a known deposit prior to its use on some other Bethlehem claim holdings.

Location and Access:

The Maggie deposit is centred in the Bonaparte River valley some 14.5 km N 28° W of the highway junction in the Village of Cache Creek. The geographic co-ordinates are 50° 55.4' latitude and 121° 25.1' longitude with the UTM grid reference being Zone 10, 5642400 N and 611000 E. The NTS sheet designation is 92I/14W. Access from Cache Creek is via Highway 97 for 10.5 km, highway 12 for 0.6 km and then north on the old Cariboo road for some 4.5 km (see drawing MM-77-1).

Topography and Physical Environment:

The main zone lies on the floor of the Bonaparte River valley, a major valley trending NNW from the Thompson River valley at Ashcroft. The elevation in the area of the deposit is 520 metres A.S.L. To the west, moderately sloped valley walls rise to a height of 1300 m A.S.L. While to the east, the valley is flanked by steep rocky slopes which moderate rapidly toward the east and gradually rise to heights between 1500 and 1675 m A.S.L.

Forest cover is comprised of stands of cottonwood trees paralleling the Bonaparte River, with moderately spaced ponderosa pine and douglas fir located on the slopes of the valley.

Vegetation consists of various grasses in the forested areas with sagebrush and scrub cactus appearing on open slopes on the lower elevations.

Mineral Title:

Bethlehem's mineral property holdings in the Maggie area total 231 claim units which are comprised of 1 mineral lease (M-33 R) of 12 claims, 5 modified grid claims of 30 units and 189 two-post claims. The claims on which the geophysical work was performed are listed in Section D and are shown on drawing nos. MM-77-2 and 3.

Geophysical Survey:

The firm of Glen E. White Geophysical Consulting and Services Ltd. was engaged to carry out the induced polarization survey on the two test lines. A Hunttec I.P. system was used, the details of which are set out in Section B.

Two grid lines were established parallel to the existing drill hole grid. Line 86N was 762 m in length while line 116N was 458 m. The locations of these grid lines are shown on drawing no. MM-77-3.

The results of the survey are detailed in Section B in a letter report by Glen E. White, P.Eng. dated May 31, 1977.

Discussion of Results:

As stated earlier, the purpose of the survey was to test the response of the I.P. unit over a known deposit. Line 86N was located between two parallel drilled sections (84N and 88N) over the southern

portion of the deposit. Line 116N was situated on the northern extremity of the drilling but beyond the main mineralized zone.

The results would appear to indicate that although the survey detected the general area of sulphide mineralization (i.e. pyrite and chalcopyrite) it did not delineate the known areas where higher concentrations of mineralization occurred.

Respectfully submitted,



R. E. Anderson, P.Eng.  
Exploration Manager

*Gen E. White*

GEOPHYSICAL CONSULTING & SERVICES LTD.

HGE ✓  
RFA ✓  
File - Maggie Project.  
Geophysical Surveys.

9251 Beckwith Road, Richmond, British Columbia, V6X 1V7

Telephone: (604) 273-6962

May 31, 1977

Mr. R. Anderson  
Exploration Manager  
Bethlehem Copper Corporation  
2100 - 1055 W. Hastings St.  
Vancouver, B.C.

Dear Mr. Anderson:

Enclosed please find four (4) copies of detail induced polarization pseudosections of lines 86N and 116N on the Maggie Mine. In order to obtain as much detail as possible, since the response patterns were an unknown, we used a dipole of 200 feet with separations  $n = 1, 2$  and  $3$ , which gave a depth to some 400 feet.

Line 86N, from 94E - 102E, shows a very strong chargeable zone which likely reflects some 10 - 15% chargeable materials per volume. From 102 - 108E, the lower responses may be due to an increase in the overburden depth or possibly a slight decrease in chargeable content. From 108 - 114E there is an increase in chargeability suggesting an increase in chargeable materials per volume.

Line 116N shows a very strong chargeability anomaly at depth from 92E - 98E which reached a high of 56.4 milliseconds. The highly chargeable source seems to be covered by an increase in cap rock to the west and plunges beneath the overburden to the east.

The apparent resistivities on both lines are very low indicating a very high conductive clay content. The low resistivity values on line 86N, from 92 - 99E suggest the alteration zone exposed on the hillside continues at depth, possibly beneath a layer of gravel, from 99E - 104E.

The resistivity values on line 116N at 92E suggest the chargeable zone may be under less conductive cap rock to the west. A strong resistivity low feature was detected in the area of 99E, which may relate to a regional fault zone.

*Glen E. White*

GEOPHYSICAL CONSULTING & SERVICES LTD.

9251 Beckwith Road, Richmond, British Columbia, V6X 1V7

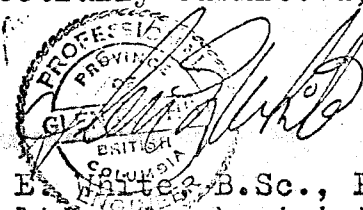
Telephone: (604) 273-6962

May 31, 1977

- 2 -

The Cache Creek series of rocks, in general, will give a higher than normal background chargeability values due to fine grained pyrite and graphite. However, the responses detected by this test survey indicate a strong chargeability body which may possibly contain values of economic mineralization anywhere along its width since values of 10 - 20 milliseconds could relate to 3 - 10% mineralization per volume depending upon the background value of chargeability.

Respectfully submitted,



Glen E. White, B.Sc., P. Eng.  
Consulting Geophysicist

## INSTRUMENT SPECIFICATIONS

### INDUCED POLARIZATION SYSTEM

#### A. Instruments

- (a) Type - pulse
- (b) Make - Huntec
- (c) Serial No. - transmitter #107 - receiver #3016

#### B. Specifications

- (a) Size and Power - 2.5 KW
- (b) Sensitivity - 300 x 10.5 volts
- (c) Power Sources - 2.5 KW 400 cycle - three-phase generator
- (d) Power - 8 H.P. Briggs and Stratton @ 3000 R.P.M.
- (e) Timing - electronic, remote and direct.
- (f) Readings - (i) amps (ii) volts primary and secondary
- (g) Calculate (i) Resistivity - ohm-meters (ohm-feet)  
(ii) Chargeability - milliseconds

#### C. Survey Procedures

- (a) Method - power supplied to mobile probe along TW 18 stranded wire from stationary set-up
- (b) Configuration - Pole-dipole (three electrode array)  
Plot point midway between  $C_1$  and  $P_1$

#### D. Presentation

- Contour Maps (i) Chargeability - milliseconds  
(ii) Resistivity - ohm-meters (ohm-feet)



### Electrode Array

The data was obtained using the "three electrode" array. This array consists of one current ( $C_1$ ) and two potential electrodes ( $P_1$  and  $P_2$ ) which are moved together along the survey line at a fixed distance apart which is known as the "a" spacing. The second current electrode is placed at "infinity". This survey was conducted with an "a" spacing of 300 feet.

### Induced Polarization Unit

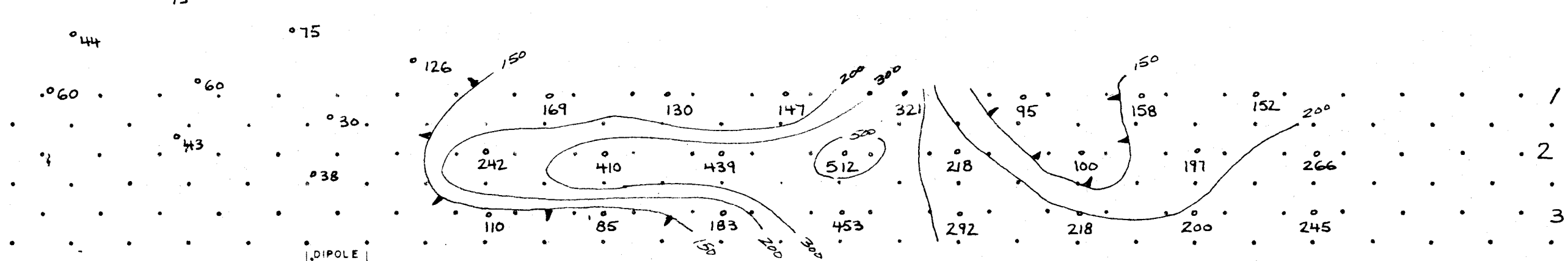
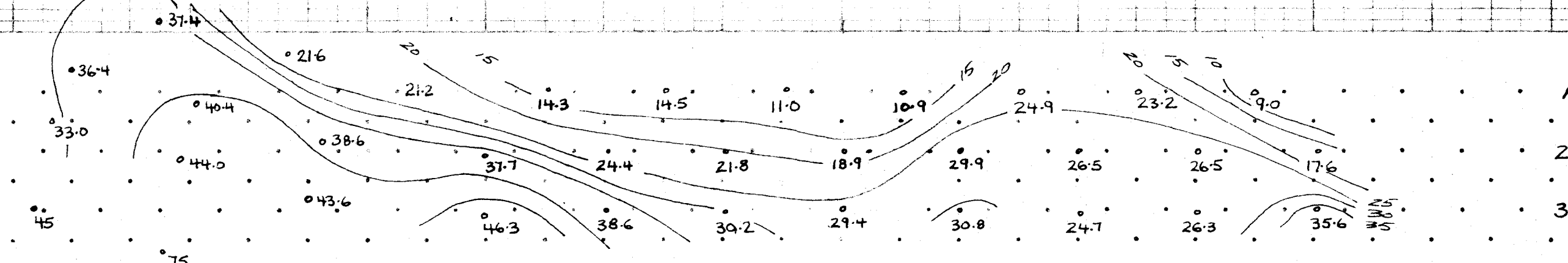
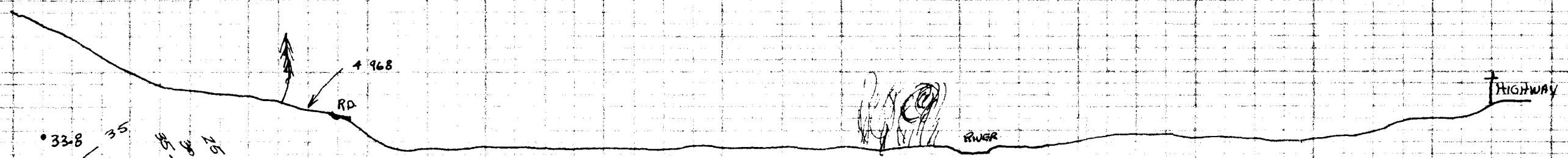
The equipment used on this survey was the Huntec pulse-type unit. Power was obtained from a Briggs and Stratton motor coupled to a 2.5 KW 400 cycle, three phase generator, providing a maximum of 2.5 KW D.C. to the ground. The cycling rate is 1.5 seconds "current on" and 0.5 seconds "current off", the pulse reversing continuously in polarity. Power was transmitted to the ground through two potential electrodes,  $P_1$  and  $P_2$ .

The data recorded in the field consists of careful measurements of the current ( $I$ ) in amperes flowing through electrodes  $C_1$  and  $C_2$ , the primary voltage ( $V_p$ ) appearing between electrodes  $P_1$  and  $P_2$  during the "current on" part of the cycle, and the secondary voltage ratios  $M_1$ ,  $M_2$ ,  $M_3$  and  $M_4$  appearing between electrodes  $P_1$  and  $P_2$  during the "current off" part of the cycle.

The apparent chargeability ( $M'$ ) in milliseconds, is calculated by  $T_p (M_1 / 2M_2 / 4M_3 / 8M_4) = M'$ , where  $T_p$  is the basic integrating time in tenths of seconds.  $M_1$ ,  $M_2$ ,  $M_3$  and  $M_4$  are the chargeability effects at various times on the voltage decay curve during pulse off time, measured as a percentage of the primary voltage  $V_p$  recorded during the "current on" time. By the use of these factors, one can gain an estimate of the decay curve in terms of chargeability for the given time  $T_p$ . This gives a quantitative value to the data measured.

The apparent resistivity, in ohm-feet, is proportional to the ratio of the primary voltage to the measured current, the proportionality factor depending on the geometry of the electrode array used. The chargeability and resistivity obtained are called "apparent" as they are values which that portion of the earth sampled by the array would have if it were homogeneous. As the earth sample is usually inhomogeneous, the calculated apparent chargeability and apparent resistivity are functions of the actual chargeabilities and resistivities of the rocks sampled and of the geometry of the rocks.

92E 94E 96E 98E 100E 102E 104E 106E 108E 110E 112E 114E 116E



Ma (Milliseconds)  
Pa (Ohm m)

1  
2  
3  
1  
2  
3

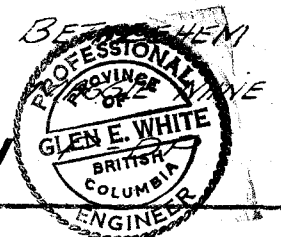
**D.C. PULSE I.P.;** CHARGING TIME  
(CHARGEABILITIES FOR COMPLETE CYCLE) OFF-TIME  
DELAY TIME  
INTEGRATION TIME

Line N° 86N

Glen E. White  
geophysical consulting  
services Ltd.

Job N° TEST  
Date 5/28/77  
Dipole (a) 200'

Client *BETHLEHEM*  
Area  
Survey



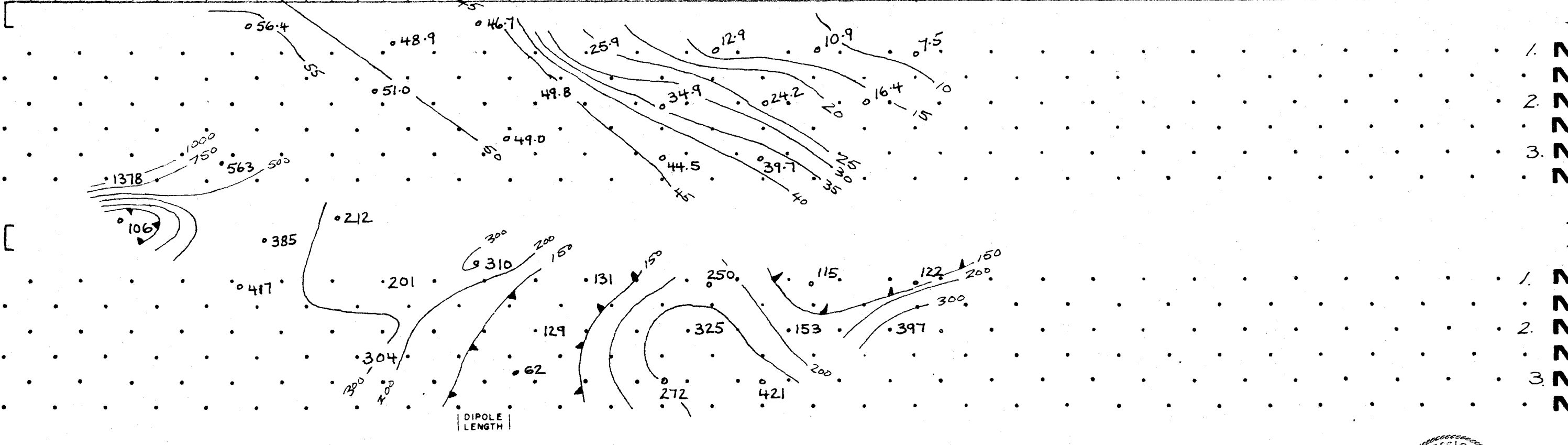
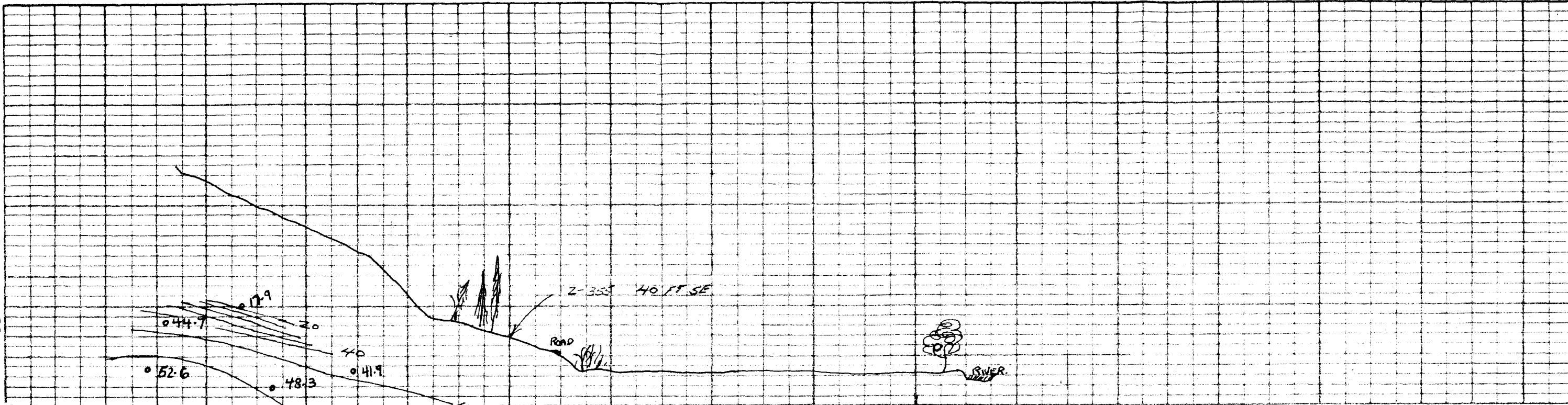
92E 94E 96E 98E 100E 102E 104E 106E 108E

VERTICAL SCALE  
1" = 200 FT.

Ma (MilliSeconds)

Pa (Ohm Feet)

22222  
22222  
22222



**D.C. PULSE I.P.;** CHARGING TIME  
(CHARGEABILITIES FOR COMPLETE CYCLE) OFF-TIME  
DELAY TIME  
INTEGRATION TIME

Line N° 116N

Glen E. White  
geophysical consulting  
services Ltd.

Job N° TEST  
Date 5/27/77  
Dipole (a) 200'

Client  
Area  
Survey



SECTION C - STATEMENT OF EXPENDITURES

Expense period - May 1 to November 15, 1977

A. <u>Consultant's</u> (see accompanying invoice)	
1. Glen E. White Geophysical Consulting and Services Ltd.	
Induced polarization survey conducted on May 27 and 28, 1977	\$ 1,260.00
	<hr/>
Total Consultant	\$ 1,260.00
B. <u>Bethlehem Expenditures</u>	
1. <u>Personnel</u>	
R. E. Anderson - Exploration Manager	
1 day in general supervision and data review	
1 day @ \$174.71/day	\$ 174.71
J. G. Collins - Field Supervisor	
May 10 and 27, 1977	
2 days @ \$75.01/day	150.02
E. Andersen - Property Agent	
1 day in general supervision, data compilation and report preparation.	
1 day @ \$90.09	90.09
A. Parnaby - Secretary	
.5 days @ \$47.83/day	23.92
	<hr/>
Total Personnel	\$ 438.74
2. <u>Transportation</u>	
J. G. Collins - Ford F 250 4WD Pickup	
3 days @ \$35/day	\$ 70.00
	<hr/>
Total Transportation	\$ 70.00

STATEMENT OF EXPENDITURES (continued)

TOTAL BETHLEHEM EXPENSES                   \$ 508.74  
TOTAL PROPERTY EXPENDITURES               \$1,768.74  
TOTAL SURVEY LENGTH - 1220 m (4,000')  
AVERAGE COST/METRE - \$1.45

C. Distribution of Expenditures

Line 86 N:

<u>Claim</u>	<u>Survey Length</u>	<u>% of Total</u>	<u>Expenditure</u>
L. 410	265 m	21.72	\$ 384.20
MM 1 FR.	122 m	10.00	176.87
MM 2 FR.	229 m	18.77	332.00
M 8	146 m	11.97	211.67
	<u>762 m</u>	<u>62.46</u>	<u>\$1,104.74</u>

Line 116 N:

<u>Claim</u>	<u>Survey Length</u>	<u>% of Total</u>	<u>Expenditure</u>
L. 412	229 m	18.77	\$ 332.00
MM 4 FR.	229 m	18.77	332.00
	<u>458 m</u>	<u>37.54</u>	<u>\$ 664.00</u>

MINERAL LEASE M-33 R - \$ 716.20

CLAIMS HELD BY LOCATION \$1,052.54

*Glen E. White* GEOPHYSICAL CONSULTING & SERVICES LTD.

9251 Beckwith Road, Richmond, British Columbia, V6X 1V7

Telephone: (604) 273-6962

May 31, 1977

Mr. R. Anderson  
Exploration Manager  
Bethlehem Copper Corporation  
2100 - 1055 W. Hastings St.  
Vancouver, B.C.

INVOICE

To Professional Services -

Glen E. White Geophysical Consulting & Services Ltd.

Test induced polarization survey

May 27 - 28/77, Maggie Mine @

\$580/day.....\$1160.00 ✓

Glen E. White, P. Eng., geophysicist.....100.00

Total.....\$1260.00 ✓

Amount of this invoice.....\$1260.00 ✓

*116 for Payment*  
*103-848*  
*R.E.*  
*W*

*848-103*  
*110-002*

# BETHLEHEM COPPER CORPORATION

DATE	INVOICE No.	AMOUNT	DATE	INVOICE No.	AMOUNT
June 20 1977	Inv. May 31/77	\$ 1,260.00 *****			

## BETHLEHEM COPPER CORPORATION

SUITE 2100, GUINNESS TOWER, 1055 WEST HASTINGS STREET

No 7060

VANCOUVER, B.C. V6E 2H8

June 20

19 77 ✓

PAY TO THE ORDER OF GREN E. WHITE / \$ 1,260.00 ✓

100 DOLLARS

BETHLEHEM COPPER CORPORATION

NON-NEGOTIABLE

PER \_\_\_\_\_

PER \_\_\_\_\_

TO THE

BANK OF MONTREAL

MAIN OFFICE - THREE BENTALL CENTRE  
595 BURRARD STREET  
VANCOUVER, B.C.  
V7X 1L7

### VOUCHERS PAYABLE

CHARGE	ACCOUNT No.	DR.	CR.
	848-103 ✓ 110-002 ✓	1,260.00 ✓	1,260.00 ✓

VOUCHER ENTERED

APPROVED FOR PAYMENT

*[Handwritten Signature]*



SECTION D

SCHEDULE OF MINERAL CLAIMS

BETHLEHEM COPPER CORPORATION

MINERAL CLAIMS

Property: Maggie

Mining Division: Kamloops

<u>Name of Claim</u>	<u>Record Number</u>	<u>Metal Tag Number</u>	<u>Date Recorded</u>	<u>Expiry Date</u>
MM 1 FR.	96601 D	147041 M	April 23, 1971	2000 *
MM 2 FR.	96602 D	115326 M	April 23, 1971	2000 *
MM 4 FR.	96604 D	115328 M	April 23, 1971	2000 *
M 8	84894 N	59409 M	October 28, 1969	1990 *

\* Rental-paid to 1979.

BETHLEHEM COPPER CORPORATION LTD.

MINERAL CLAIMS

MAGGIE MINE

Page 1.

<u>Name of Claim</u>	<u>Lot No.</u>	<u>Area</u>	<u>Date of Issue</u>
Mineral Lease 33-R	410-421	460.09	March 31, 1967
Avoca	410		
Avon	411		
Amazon	412		
Ankobra	413		
Atrato	414	49.82	
Atarboo	415	49.15	
Arkansas	416	51.60	
Axim	417	51.65	
Alabama Fr.	418		
Athabaska Fr.	419	18.40	
Assiniboine Fr.	420	4.05	
Amoor Fr.	421		

Annual Rental of \$922.00 (\$2.00 per acre or portion thereof) is due on MARCH 31 of each year.

Lease expires MARCH 31, 1988.

RENTAL PAID TO MARCH 31, 1979.

SECTION E

- ILLUSTRATIONS

Drawing No.

Title

Scale

MM-77-1

General Location Plan

1:125,000

MM-77-2

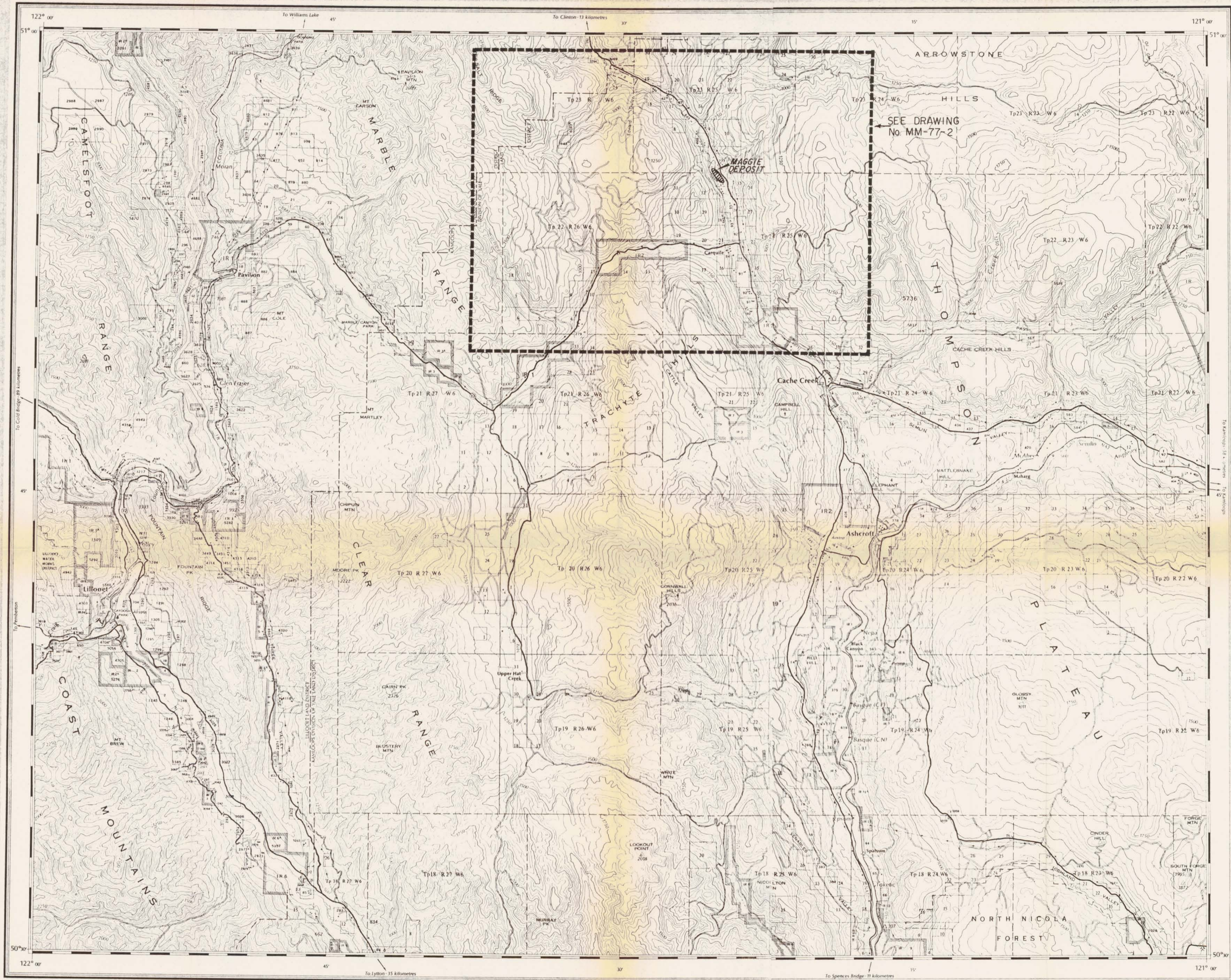
Mineral Claim Plan

1:24,000

MM-77-3

1977 I.P. Survey

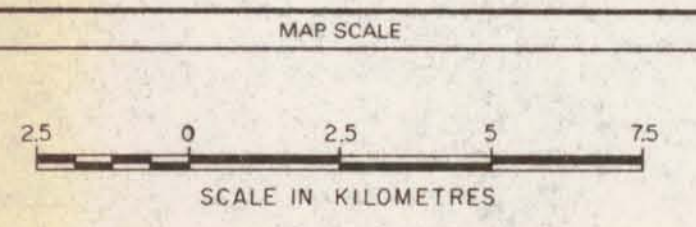
1:2,400



SEE DRAWING  
No. MM-77-2

MINERAL RESOURCES BRANCH  
ASSESSMENT REPORT  
**6537**  
NO.

Drawing No. MM-77-1 to accompany  
"Geophysical Report on the MM and M  
Mineral Claims and M.L. M-33 R", dated  
November 18, 1977 by  
*R.P. Anderson* P.Eng.



No.	Date	MADE BY	DESCRIPTION
1			
2			
3			
4			
5			

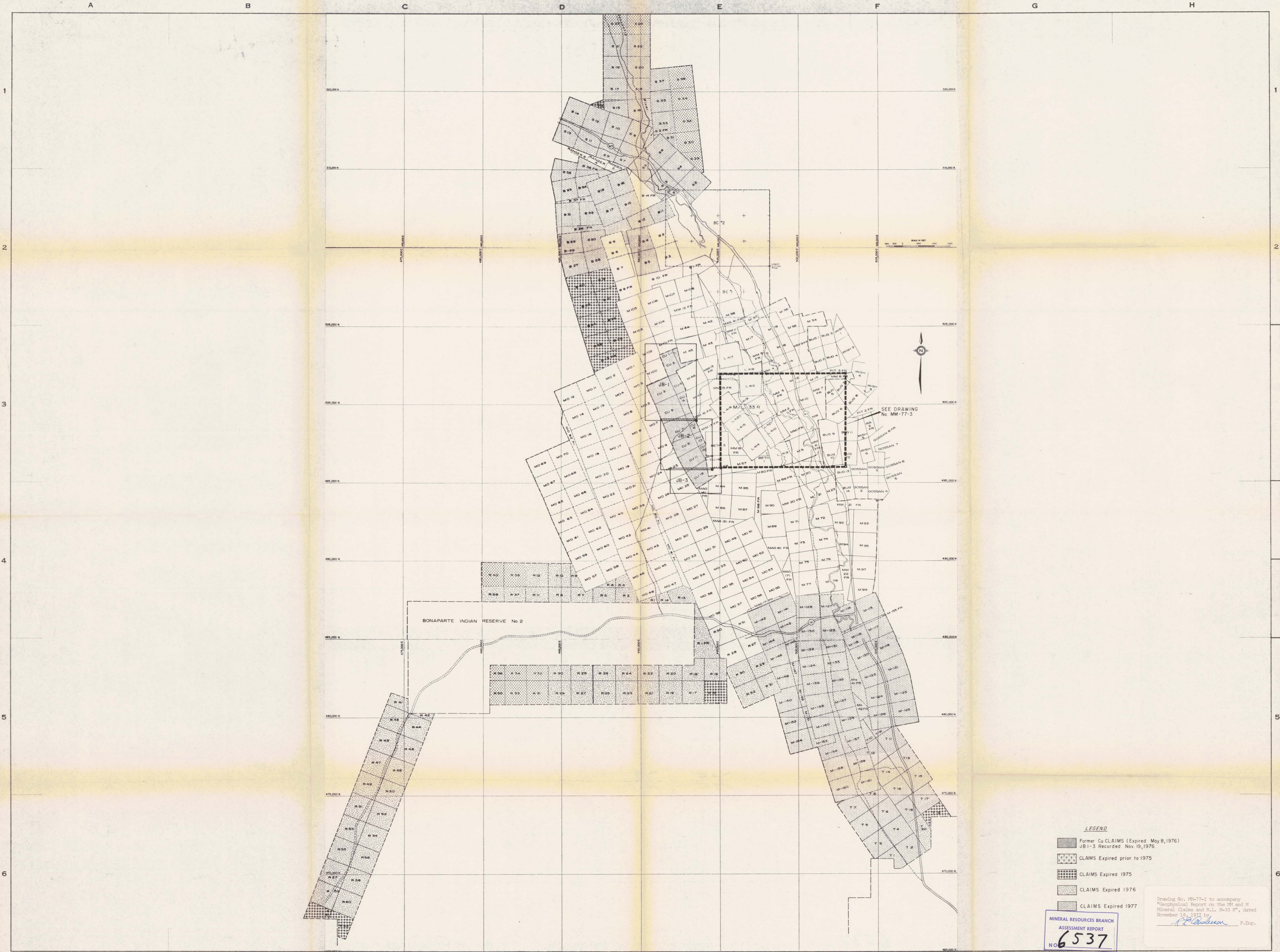
  

DATE	DRAWN BY	CHECKED	APPROVED
NOV 1977		E. A.	

**B** BETHLEHEM  
COPPER  
CORPORATION

MAGGIE MINE PROJECT  
GENERAL LOCATION PLAN

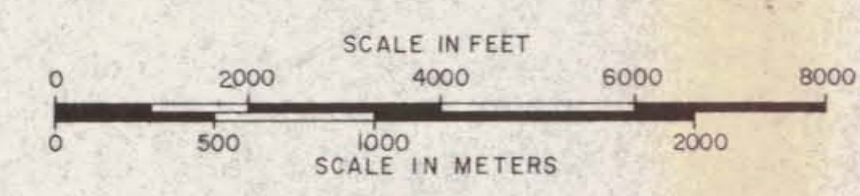
OFFICE	DEPARTMENT	MAP INDEX NUMBER	SCALE	DRAWING NUMBER
VANCOUVER	EXPLORATION	N.T.S. 92 I-NW	1:125,000	MM-77-1



- LEGEND**
- Former Cu CLAIMS (Expired May 8, 1976)
  - JBI-3 Recorded Nov. 19, 1976
  - CLAIMS Expired prior to 1975
  - CLAIMS Expired 1975
  - CLAIMS Expired 1976
  - CLAIMS Expired 1977

MINERAL RESOURCES BRANCH  
ASSESSMENT REPORT  
**6537**

Drawing No. MM-77-2 to accompany  
"Geophysical Report on the MM and M  
Mineral Claims and M.L. M-33 R", dated  
November 18, 1974 by  
*R.P. Anderson* P.Eng.



DATE REVISED	BY	DEPT. - EXPLORATION
NOV. 12 / 1975	m.k.	DRAWN BY - Altir / m.k.
DEC. 7 / 1976	m.k.	CHECKED - E.A.
		APPROVED -
		DATE - APR 1975
		SCALE - 1:24,000 or 1" = 2000'



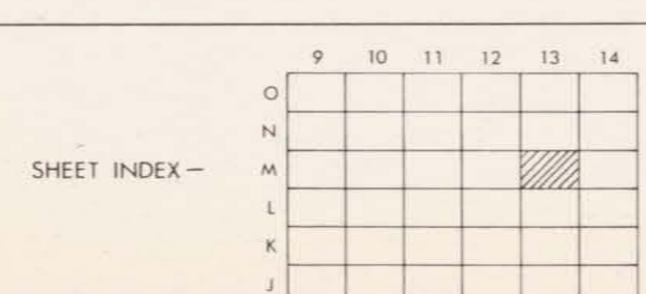
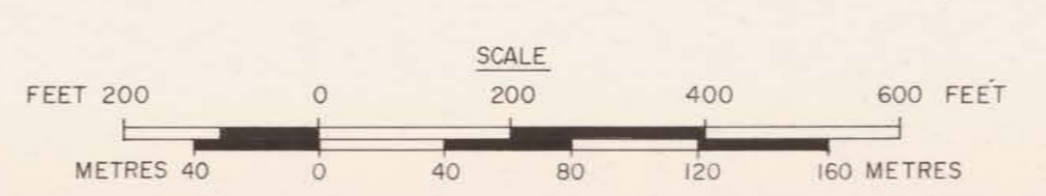
TITLE - MAGGIE MINE PROJECT MINERAL CLAIMS MAP	
FILE NUMBER -	DRAWING NUMBER - MM-77-2



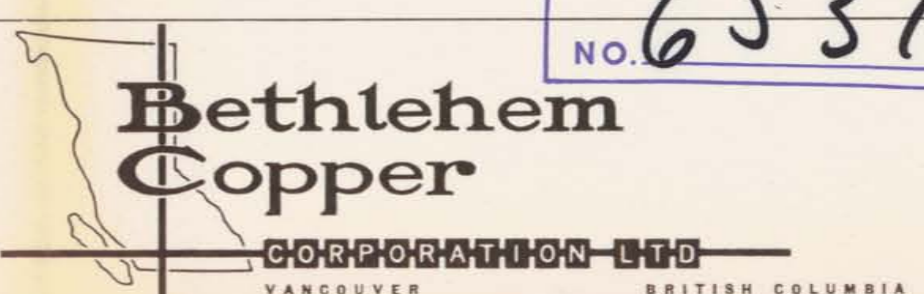
Drawing No. 105-77-3 to accompany  
 "Geophysical Report on the MM and M  
 Mineral Claims and ML M-33 R", dated  
 November 18, 1977 by  
*R. P. Anderson* P. Eng.

MINERAL RESOURCES BRANCH  
 ASSESSMENT REPORT  
 NO. 6537

Lockwood Survey Corporation Limited  
 West Coast Division  
 DATE OF PHOTOGRAPHY, 19 JUNE 1972



DATE	REVISED	BY	DEPT - EXPLORATION
			DRAWN BY - AITG/r.m.k.
			CHECKED - E. A.
			APPROVED -
			DATE - NOV. 1977
			SCALE - 1:2400



FILE -	MAGGIE MINE PROJECT 1977 I. P. SURVEY
FILE NUMBER -	M - 13
DRAWING NUMBER -	MM - 77 - 3