

1975 GEOPHYSICAL REPORT ON  
THE BRO PROPERTY (MINERAL CLAIMS #1-#99 INCLUSIVE)

LOCATED IN  
NORTH CENTRAL BRITISH COLUMBIA

IN THE  
OMINECA MINING DIVISION

APPROXIMATELY

30 MILES NORTHEAST OF SMITHERS

AT COORDINATES

54°53' N. LAT.; 126°25' W. LONG.

WORK FOR

CITIES SERVICE MINERALS CORP.

WORK BY

MORRISON & DEPAOLI

GEOPHYSICAL CONTRACTORS & CONSULTANTS

WORK PERIOD

JUNE 13 - JULY 2, 1975.

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT

NO. 5620 MAP

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ILLUSTRATIONS

*MAP*

1 LOCATION MAP

FIGURE 1

AFTER PAGE 1

2 CLAIM MAP

FIGURE 2

AFTER PAGE 12

L.P. PSEUDOSECTIONS

FIGURES 3a-k

AFTER PAGE 13

3 PLAN RESISTIVITY, N=2

FIGURE 4

IN POCKET

4 PLAN PFE, N=2

FIGURE 5

IN POCKET

5 GEOPHYSICAL  
INTERPRETATION

FIGURE 6

IN POCKET

#### INTRODUCTION

The BRO Copper Prospect is located in north-central British Columbia and consists of 99 mineral claims owned by Cities Service Minerals Corp. The property is currently being explored for the possibility of a Tertiary Porphyry Copper Deposit similar to those of Granisle and Newman some 12 miles to the northeast. During the period June 13 to July 2, 1975, a total of 20.2 line miles of induced polarization/resistivity surveying were completed over the property. The following report describes the instrumentation, field procedure and results obtained from the survey.

The work was executed by Morrison & DePaoli, Geophysical Contractors and Consultants, upon the request of Cities Service Minerals Corp. and under the supervision of D. A. Silversides.

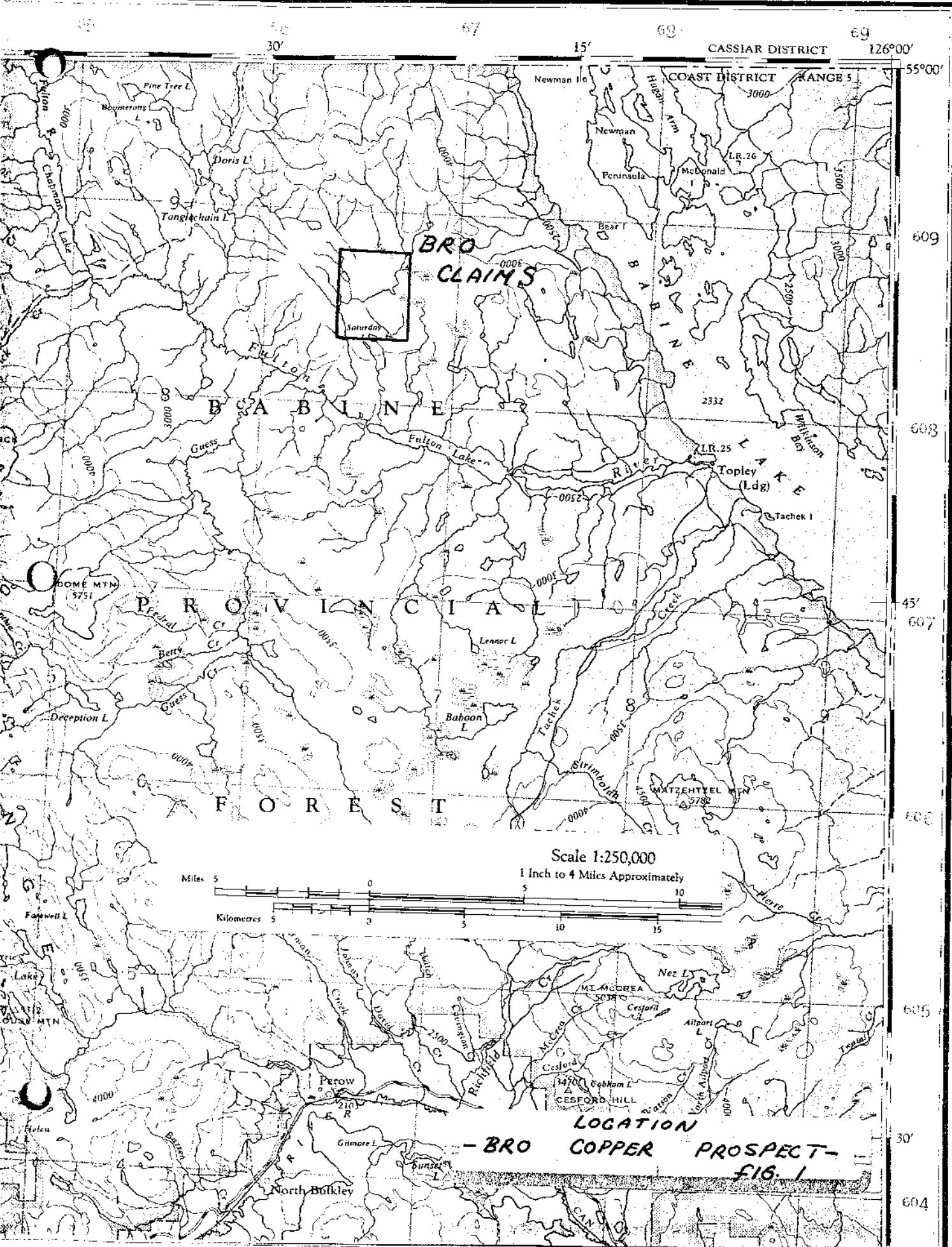
#### LOCATION & ACCESS

The property is located in north-central B.C. approximately 12 miles southwest of Granisle or 30 miles northeast of Smithers, the nearest supply center. It lies within the Omineca Mining Division at coordinates  $54^{\circ}53'$  N. Latitude,  $126^{\circ}25'$  W. Longitude.

Two wheel access is available to within 3 miles of the property via the Smithers Landing Road. A winter road established by Amoco Petroleum Company Ltd. continues to the grid area, but is inaccessible during the summer months.

#### GRID CONTROL

Grid control for the property consists of 54.3 line miles of cut, flagged and chained line which were established in 1972 by Amoco



Petroleum Company Ltd. Most of the induced polarization survey was executed on the western half of this large grid, on north-south trending lines approximately 800 feet apart.

#### GENERAL GEOLOGY

The area of interest is underlain by andesite tuffs and argillites assigned to the Hazelton Group of Jurassic Age. Intrusions into the Hazelton consist of hornblende and biotite feldspar porphyry dykes and small stocks and the extrusive equivalent of these porphyries. The porphyries are equivalent to the Eocene intrusions which are significant in the Babine Lake porphyry copper deposits.

The property was first staked by Amoco Petroleum Company Ltd. During 1972 and 1973, Amoco completed 16 diamond drill holes on the property.

#### INDUCED POLARIZATION SURVEY

##### INTRODUCTION AND THEORY

An induced polarization/resistivity survey was executed over the property to determine the lateral and subsurface sulphide distribution. Knowing the total sulphide distribution and intensity is an important input into determining mineral zoning patterns of major porphyry mineral deposits. Apparent resistivity data taken concurrently is useful in inferring overburden depths, defining abrupt lithological changes and assessing the importance of any I.P. effects obtained.

The term induced polarization means the electrical separation (ie. separation of charges) induced by an applied electric field.

The cause of this polarization is changes in the mobilities of ions within a rock. At the interfaces between zones of different mobilities,

excesses or deficiencies of ions occur; the concentration gradients developed oppose the current flow and cause a polarizing effect. When mineral grains block the pore passages of rocks and a current is applied, a concentration of ions builds up at the electrolyte (water) - metal interface while awaiting an electrochemical reaction which must occur before the electric charge can be transferred from an ion in the electrolyte to a free electron in the metal. The forces which oppose the current flow are said to polarize the interface and the added voltage necessary to drive the current across this barrier is known as "overvoltage".

It takes a finite time to build up overvoltages and one finds that the impedances of these zones (Warburg Impedance) decreases with increasing frequency. In the frequency domain system that was employed, the decrease in the Warburg Impedance was measured between current applied at 0.3 hertz to current applied at 5.0 hertz.

#### INSTRUMENT AND PROCEDURE

A multiple frequency McPhar induced polarization system Model P-660, was employed in measuring the polarization and resistivity parameters. The transmitter is a manually variable voltage source. The output current can be selected from both polarities and varies from direct current to automatically alternating output frequencies of 0.05, 0.1, 0.3, 1.25 and 5.0 hertz.

On this survey, the low and high frequencies employed were 0.3 and 5.0 hertz. Power was obtained from a 2½ KW - 400 hertz motor generator. The maximum output current for the transmitting system is 5.0 amp. while the maximum output voltage is 690 volts.

The receiver employed was the A.C. P-660 Model. This is a potentiometer type where the amplified and filtered signal is compared with a reference voltage. It is powered by six 9 volt alkaline transistor batteries and draws 7.5 ma. Total weight including carrying case and batteries is 5 pounds.

An in line dipole - dipole array was employed in the survey. The dipole length was 300 feet and measurements were taken to 4 separations ( $N = 1, 2, 3, 4$ .). Survey procedure required the preparation of a "set-up" station near the center of each line. The transmitter and its motor generator power supply remained stationary at the set-up position and wires in increasing 200 foot intervals were strung out in both directions. Care was taken to ensure that the wires were well separated to prevent inductive coupling effects. The ends of the wires were connected to 4 foot stainless steel rods which had been hammered into the ground. Where possible the receiving dipole also utilized the stainless steel rods for electrode connections. Once the receiver dipole moved past the last steel rod ground connections were made via porous pots. Radio contact between the receiver and transmitter operators coordinated power on and off periods.

#### PRESENTATION OF DATA

The data is plotted in 11 pseudosections, Figures 3a-k after page 13. The pseudosections are vertical profile plots displaying apparent resistivities in  $\frac{f\alpha}{\pi}$  ohm-feet, calculated metal factors and percent frequency effect values. Contoured plan maps of the second separation ( $N=2$ ), apparent resistivity and percent frequency effect data have also been prepared in Figures 4 and 5 respectively. An interpretation of the data is presented in Figure 6. Location of Bro claims with respect to the IP survey is also shown in Figure 6.

## RESULTS

The percent frequency effects obtained indicate (See contoured plan PFE Map Figure 5) that a large sulphide mass with a complex distribution is present on the grid area. The largest concentration of sulphides is centered about lines 80+00 E and 88+00 E at 71+00 N. PFE values here indicate a total average sulphide content of up to 5.0% by volume. More linear and less intense sulphide concentrations appear to extend both northwest and southwest from the western edge of the main sulphide mass. A second linear sulphide concentration trending northeast is present in the northern portion of the map. This sulphide concentration may or may not be connected to the rest of the indicated sulphides.

Relatively low apparent resistivities are present throughout the whole survey area (See Figure 4). All of the indicated sulphide zones have coincident apparent resistivity anomalies lower than 50 ohm-feet. The northeast trending resistivity low between coordinates 88+00 E; 85+00 N and 95+00 E; 80+00 N is attributed to creek drainage. The large resistivity low in the southeast corner of the map area is unexplained but is in part due to low swampy ground associated with Saturday Lake.

## INTERPRETATION

A detailed interpretation of the sulphide distribution is presented in Figure 6. An analysis was made of each pseudosection profile and conservative estimates of sulphide boundaries projected to surface were made. Indicated sulphide dips and % total sulphide content by volume are shown. It is understood that the interpreted values for total sulphide content shown in Figure 6 are representative

of the entire sulphide mass and that higher localized sulphide concentrations also exist. The interpreted interline sulphide boundaries are displayed in heavy solid line and where some doubt exists as to the continuity of sulphides between the lines the interpreted boundaries are displayed by dashed lines.

Where coincident resistivity and PFE trends occur possible faults have been indicated. The two most prominent directions of faulting appear to be northwest and northeast.

#### CONCLUSIONS

A complex and interesting sulphide distribution has been mapped on the Bro Property by means of induced polarization surveying. The central and main mass of indicated sulphides has been extensively tested by 12 diamond drill holes completed during 1972 & 73 by Amoco Petroleum Company, Ltd. Abundant pyrite, some pyrrhotite and minor chalcopyrite mineralization was encountered in a biotite feldspar porphyry, andesitic tuff and argillite complex. Two of the three linear sulphide zones remain untested by diamond drilling. One diamond drill hole 72-14 tested the northwest trending sulphide zone extending from the main mass and encountered graphite in argillite.

Examination of the core on the property leaves one with a favorable impression. Several of the criteria necessary for a Babine Porphyry Copper Deposit are present. To date, the most favorable sulphide target has been tested by Amoco's drilling, however, it is felt that several key holes are necessary to eliminate the remaining potential provided by the narrower sulphide zones. In particular, the

northeast trending zone in the northern portion of the grid is interesting because of the importance of this structural direction in Granisle and Bell Copper. Malachite has also recently been mapped near this zone.

The zone extending south from the main sulphide mass is still open on two lines in a southerly direction and would appear to be widening. Its linearity is generally indicative of argillite.

#### RECOMMENDATIONS

1. Complete ground magnetometer, soil sampling and geological mapping over the entire grid.
2. Reassessment of the induced polarization data based on the results of the above work and information obtained from available drill core.
3. If no coincident targets emerge, drill holes on the basis of the sulphide distribution only are suggested at the following coordinates.
  - a) 64+00 E; 52+00 N 400 feet @ -90°
  - b) 80+00 E; 109+00 N 400 feet @ -90°.

Respectfully Submitted,

*Gerry DePaoli*  
G. M. DEPAOLI  
Geophysicist, B.Sc.

Smithers, B.C.  
July 4, 1975.

CERTIFICATION

I Garry M. DePaoli, of the city of Burnaby, in the Province of British Columbia, HEREBY CERTIFY AS FOLLOWS:

1. That I am a graduate of the University of British Columbia, Vancouver, B.C. with a Bachelor of Science Degree in Combined Honours Geophysics and Geology. (1969)
2. That I have practiced my profession as a Geophysicist continuously for the past 6 years in Northern Ontario, Quebec, Manitoba, Western USA, Yukon Territories, and British Columbia.
3. That I am a member in good standing of the Society of Exploration Geophysicists, The Geological Association of Canada, The Canadian Institute of Mining and Metallurgy, and the B.C. Society of Exploration Geophysicists.
4. That I have no interest directly or indirectly in the Bro Property nor do I expect to receive any.
5. That the information contained herein was compiled under my direction and supervision during the period June 13 to July 2, 1975.

G.M. DEPAOLI,  
GEOPHYSICIST, B.Sc.

Smithers, B.C.  
July 4, 1975.

CERTIFICATION

I Dennis F. Morrison, of the Village of Washago, in the Province of Ontario, HEREBY CERTIFY AS FOLLOWS:

1. That I have attended the University of Waterloo for 2 years enrolled in the Faculty of Science.
2. That I was employed with Bell Canada as an electronic technician during the period 1964 - 1967.
3. That I was employed with McPhar Geophysics as an Induced Polarization Operator during the period 1967 - 1970.
4. That I have operated as an independent Induced Polarization Contractor from 1970 to the present.
5. That I have induced polarization operating experience in Newfoundland, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, British Columbia, Yukon and Northwest Territories and the Republic of Panama.
6. That I have no interest directly or indirectly in the Bro Property nor do I expect to receive any.

D.F. MORRISON

Smithers, B.C.  
July 4, 1975.

APPENDIX - ASSESSMENT DETAILS

ASSESSMENT DETAILSWORK SUMMARY

20.2 line miles of induced polarization/resistivity surveying.

Dates Worked: June 13 to July 2, 1975.

PERSONNEL

Dennis F. Morrison  
Box 418, Gravenhurst, Ontario

I.P. Contractor

Garry M. DePaoli  
5305 E. Georgia, Burnaby 2, B.C.

Geophysicist

Blair Taylor  
122 West 43th Avenue, Vancouver, B.C.

Geophysicist

Chris Crowley  
312 Carnarvan St., New Westminster

Geophysical Assistant

Mitch McLellan  
11274 Kendale View, North Delta, B.C.

Geophysical Assistant

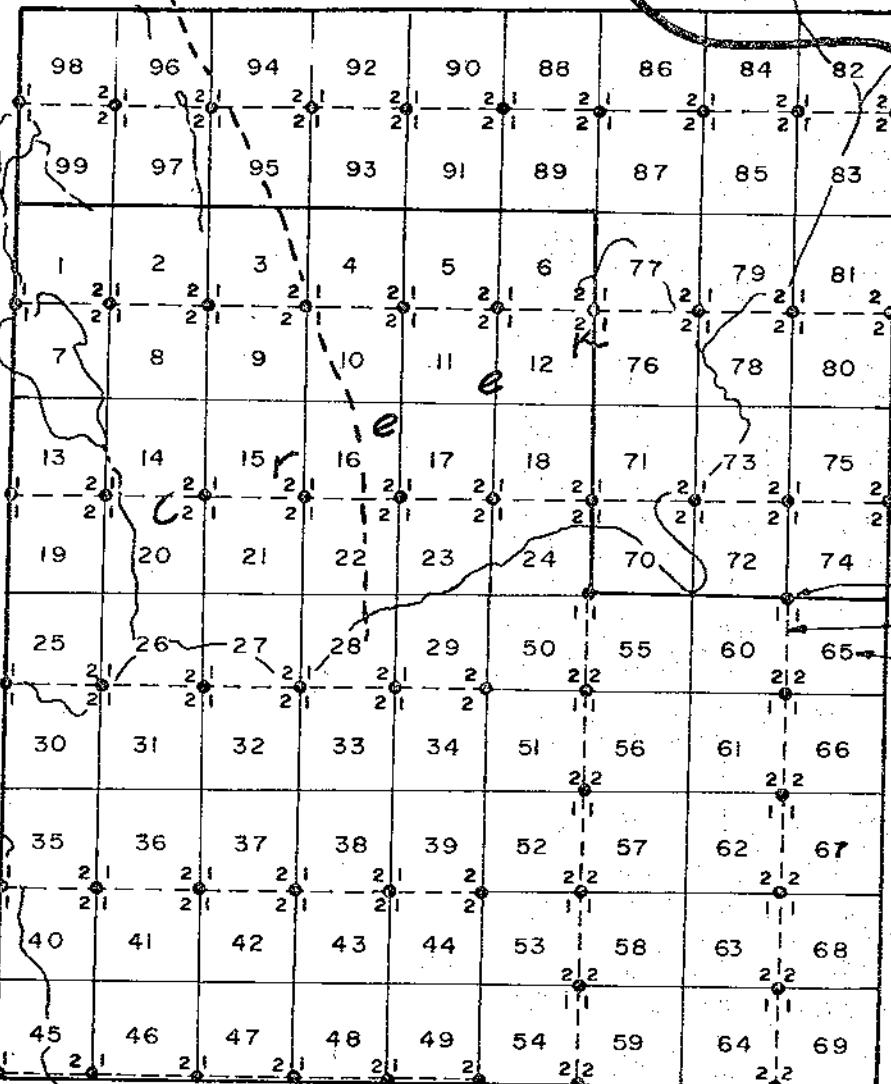
COSTS

a)	Billing from Morrison & DePaoli	\$ 8,642.80
b)	Truck Rental for transport of I.P. crews, standby while on job -	750.00
c)	Helicopter transport and Camp Supply -  Northern Mountain Helicopters Inc. Bell 47G 3B-2, 8 hrs. @ \$160/hr. -	1,280.00
d)	Room & Board -  5 Men x \$15/man/day x 23 days -	<u>1,725.00</u>
	Total -	\$12,397.80 VVVVVVVVVV

List of BRO Claims

<u>Claim</u>	<u>Date Staked</u>	<u>Staked By</u>	<u>Tag Number</u>	<u>Date Recorded</u>	<u>Record Number</u>	<u>Date Claims Lapse</u>
BRO 1	Sept 1/74	C.R. Hallwood	474101 M	Sept 5/74	132003	Sept 5/75
2	"	"	2 M	"	4	"
3	"	"	3 M	"	5	"
4	"	"	4 M	"	6	"
5	"	"	5 M	"	7	"
6	"	"	6 M	"	8	"
7	"	"	7 M	"	9	"
8	"	"	8 M	"	10	"
9	"	"	9 M	"	11	"
10	"	"	10 M	"	12	"
11	"	"	11 M	"	13	"
12	"	"	12 M	"	14	"
13	"	"	13 M	"	15	"
14	"	"	14 M	"	16	"
15	"	"	15 M	"	17	"
16	"	"	16 M	"	18	"
17	"	"	17 M	"	19	"
18	"	"	18 M	"	20	"
19	"	"	19 M	"	21	"
20	"	"	20 M	"	22	"
21	"	"	21 M	"	23	"
22	"	"	22 M	"	24	"
23	"	"	23 M	"	25	"
24	"	"	24 M	"	26	"
25	Sept 2/74	"	25 M	"	27	"
26	"	"	26 M	"	28	"
27	"	"	27 M	"	29	"
28	"	"	28 M	"	30	"
29	"	"	29 M	"	31	"
30	"	"	30 M	"	32	"
31	"	"	31 M	"	33	"
32	"	"	32 M	"	34	"
33	"	"	33 M	"	35	"
34	"	"	34 M	"	36	"
35	Sept 1/74	I. Flanagan	35 M	"	37	"
36	"	"	36 M	"	38	"
37	"	"	37 M	"	39	"
38	"	"	38 M	"	40	"
39	"	"	39 M	"	41	"
40	"	"	40 M	"	42	"
41	"	"	41 M	"	43	"
42	"	"	42 M	"	44	"
43	"	"	43 M	"	45	"
44	"	"	44 M	"	46	"
45	"	"	45 M	"	47	"

<u>Claim</u>	<u>Date Staked</u>	<u>Staked By</u>	<u>Tag Number</u>	<u>Date Recorded</u>	<u>Record Number</u>	<u>Date Claims Lapse</u>
BRO 46	Sept 1/74	I. Flanagan	474146 M	Sept 5/74	132048	Sept 5/75
47	"	"	47 M	"	49	"
48	"	"	48 M	"	50	"
49	"	"	49 M	"	51	"
50	"	"	50 M	"	52	"
51	"	"	51 M	"	53	"
52	"	"	52 M	"	54	"
53	"	"	53 M	"	55	"
54	"	"	54 M	"	56	"
55	"	"	55 M	"	57	"
56	"	"	56 M	"	58	"
57	"	"	57 M	"	59	"
58	"	"	58 M	"	60	"
59	"	"	59 M	"	61	"
60	Sept 2/74		60 M	"	62	"
61	"	"	61 M	"	63	"
62	"	"	62 M	"	64	"
63	"	"	63 M	"	65	"
64	"	"	64 M	"	66	"
65	"	"	65 M	"	67	"
66	"	"	66 M	"	68	"
67	"	"	67 M	"	69	"
68	"	"	68 M	"	70	"
69	"	"	69 M	"	71	"
70	Nov 25/74	D.A.Silversides	70 M	Dec 13/74	133503	Dec 13/75
71	"	"	71 M	"	04	"
72	"	"	72 M	"	05	"
73	"	"	73 M	"	06	"
74	"	"	74 M	"	07	"
75	"	"	75 M	"	08	"
76	"	"	76 M	"	09	"
77	"	"	77 M	"	10	"
78	"	"	78 M	"	11	"
79	"	"	79 M	"	12	"
80	"	"	80 M	"	13	"
81	"	"	81 M	"	14	"
82	Nov 23/74	N. Jorgensen	82 M	"	15	"
83	"	"	83 M	"	16	"
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85	"	"	85 M	"	18	"
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87	"	"	87 M	"	20	"
88	"	"	88 M	"	21	"
89	"	"	89 M	"	22	"
90	"	"	90 M	"	23	"
91	"	"	91 M	"	24	"
92	"	"	92 M	"	25	"
93	"	"	93 M	"	26	"
94	"	"	94 M	"	27	"
95	"	"	95 M	"	28	"
96	"	"	96 M	"	29	"
97	"	"	97 M	"	30	"
98	"	"	98 M	"	31	"
99	"	"	99 M	"	133532	"



Saturday  
Lake

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT

NO. 5620 MAP 2

BRO CLAIMS

scale : 1" = 1/2 mile

Fig. 2

APPLICATION OF COSTS TO CLAIMS

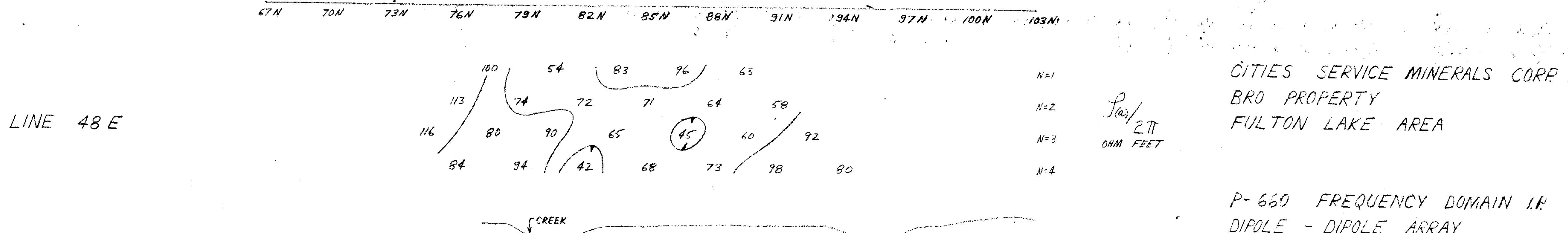
Costs of this I.P. survey were applied to the following minerals claims.

One years work to each of:

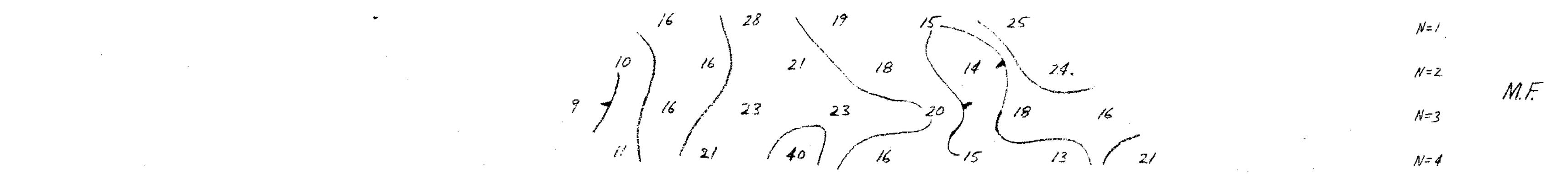
BRO 1-56 - Valid to Sept. 5/76 upon acceptance of this report.

BRO 70,71,76,77 - Valid to Dec. 13/76 upon acceptance of this report.

Notice to Group and Affidavit on Application to Record Work forms were filed in the Smithers Mining Recorder's Office. ~~Copies of these are on the following pages.~~



P-660 FREQUENCY DOMAIN I.R.  
 DIPOLE - DIPOLE ARRAY  
 0.3 AND 5.0 HERTZ  
 OPERATORS: MORRISON & DEPAOLI



SCALE: 1" = 300'  
 DATE: JUNE 23, 1975

LINE: 48 + 00E

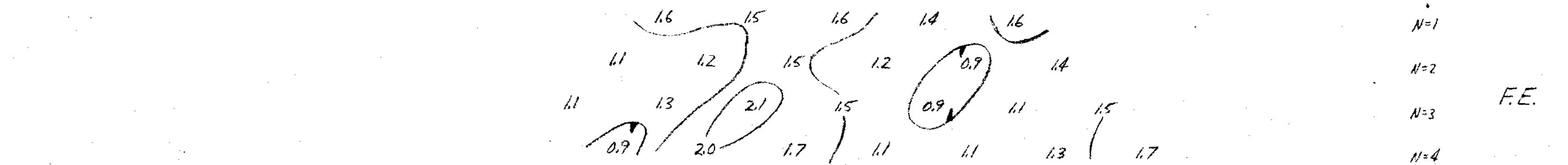
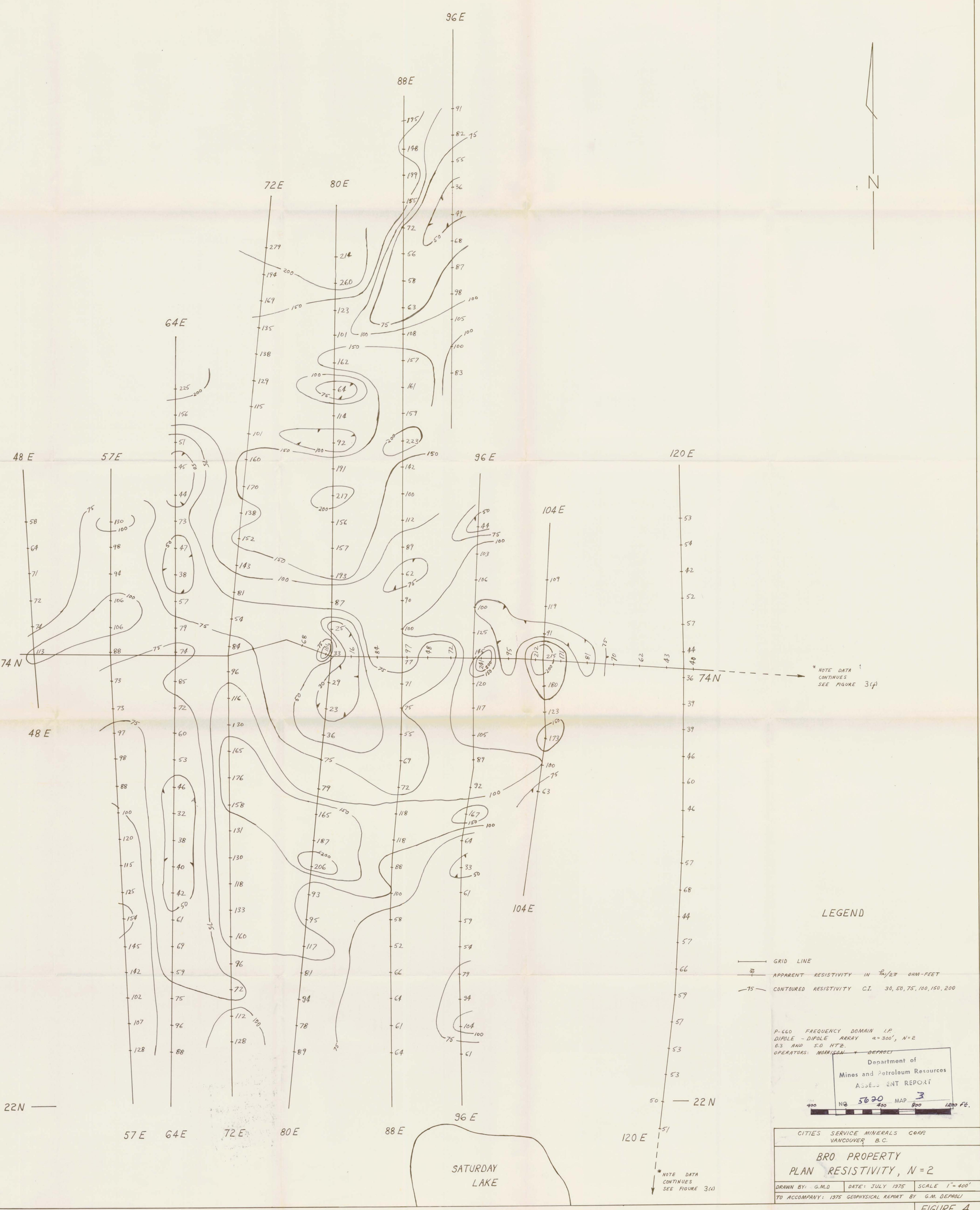
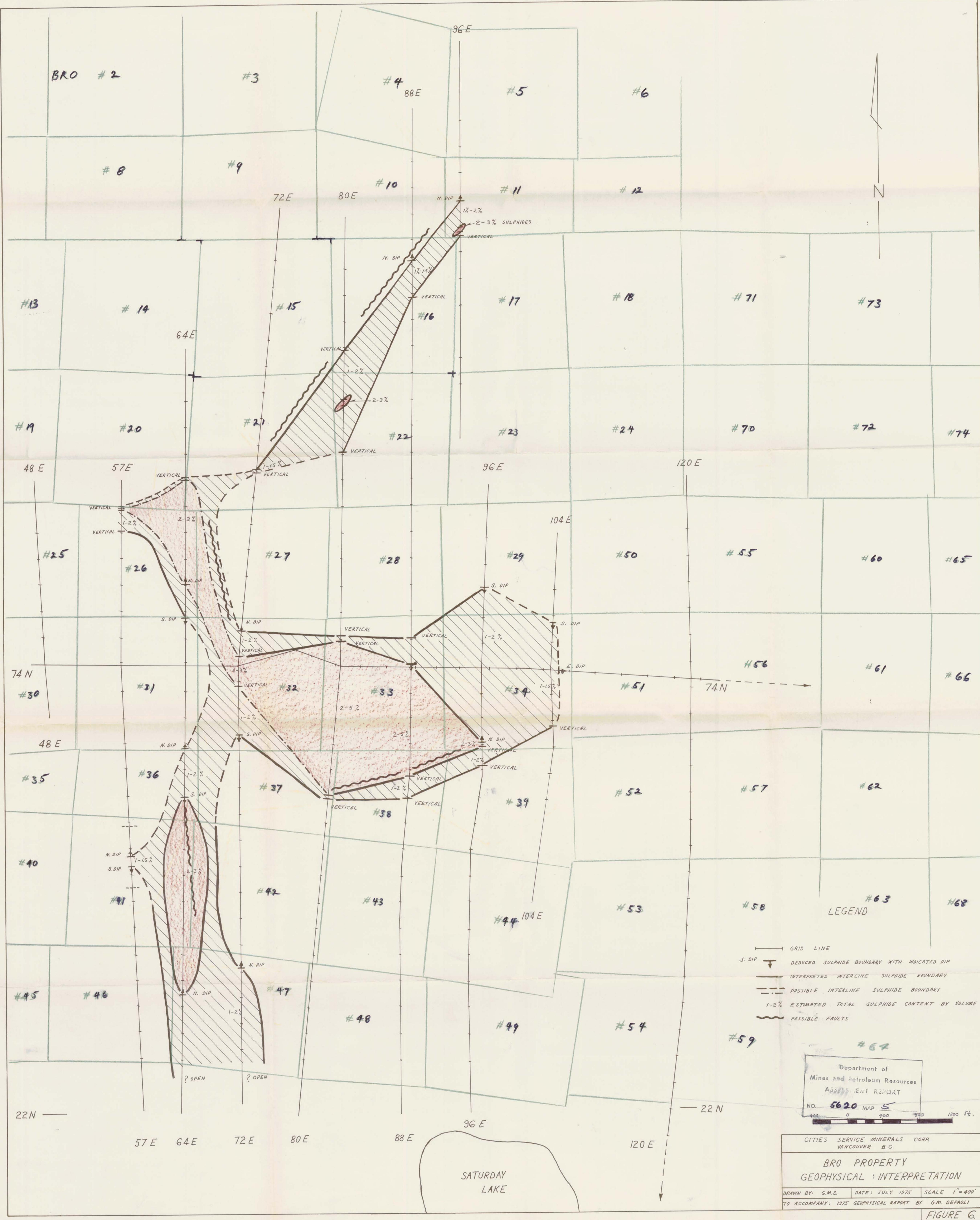
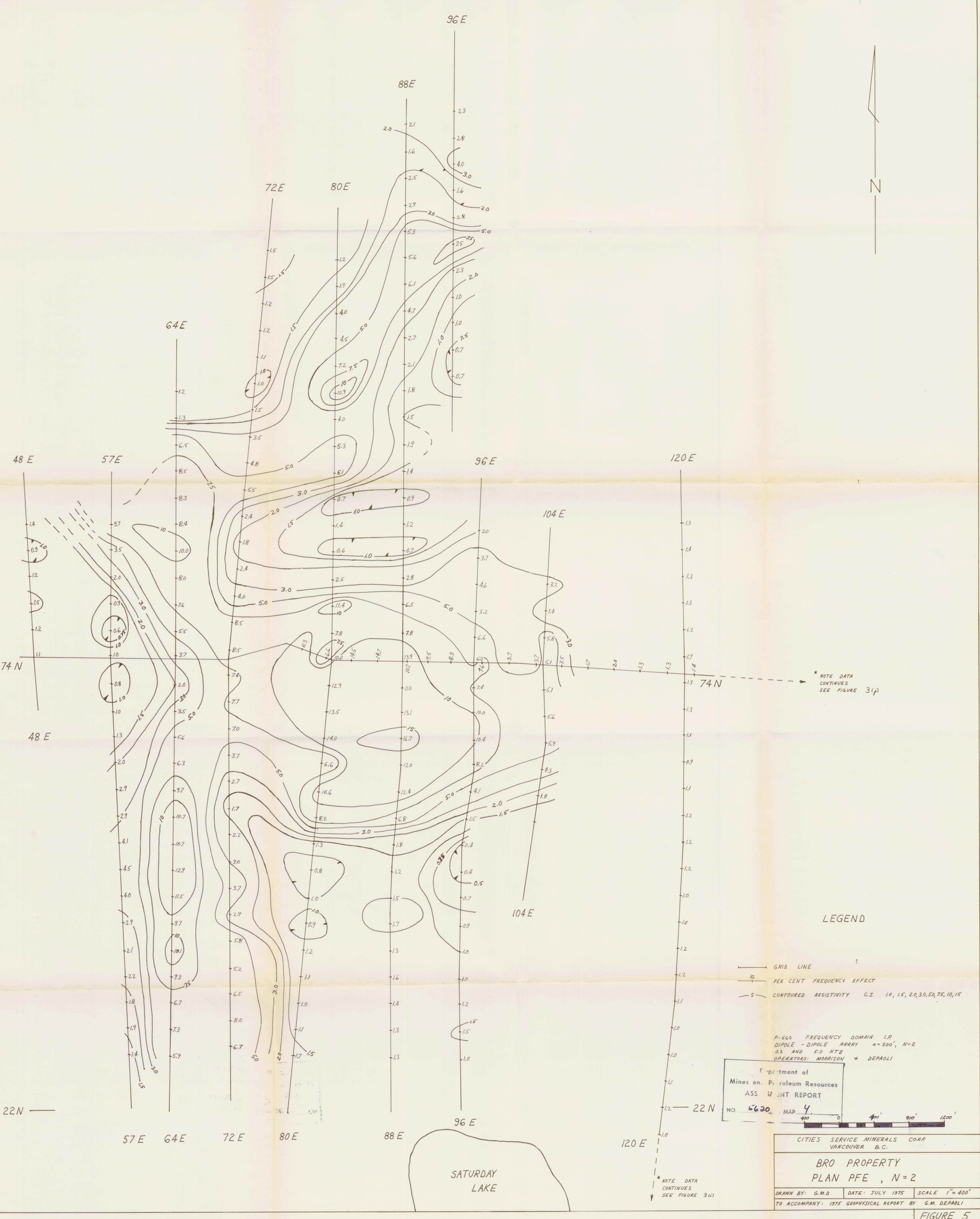


FIGURE 3 (a)

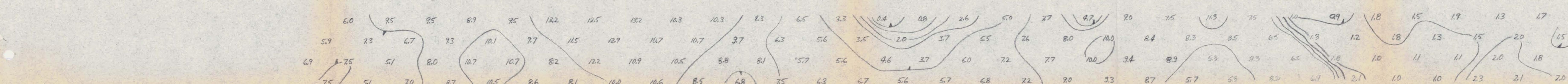
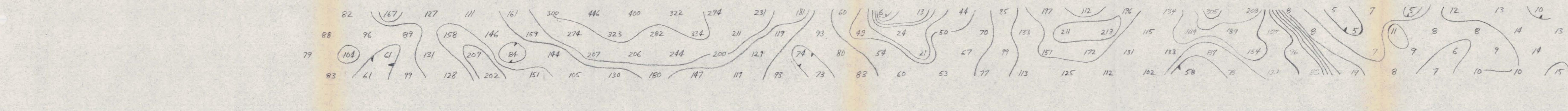
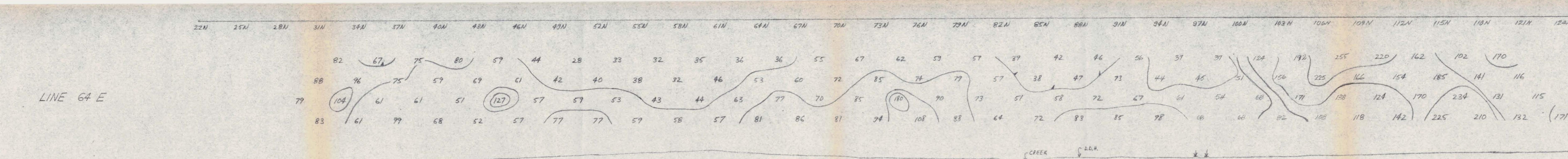
5620

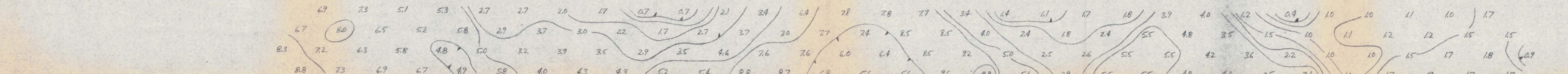
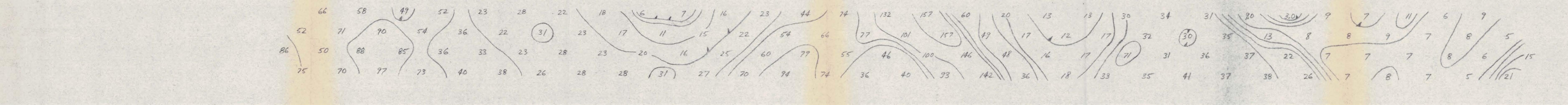
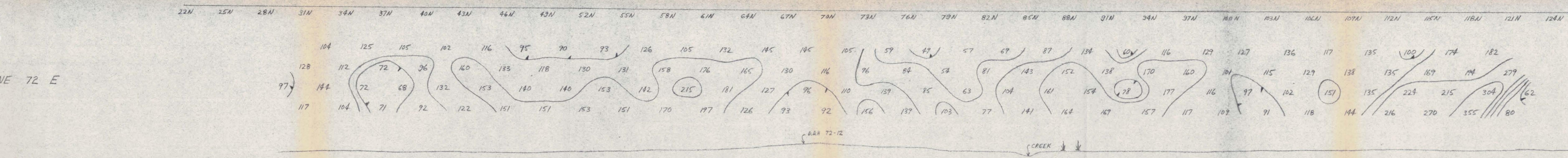






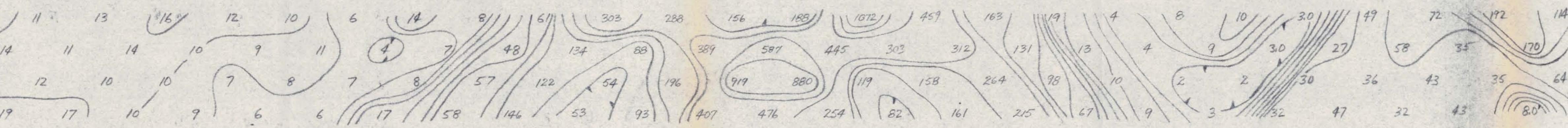






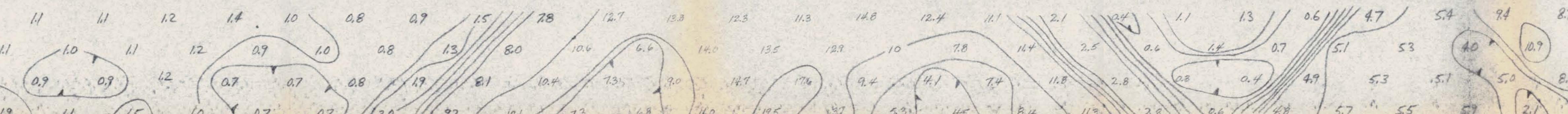
N=1 CITIES SERVICE MINERALS CORP.  
N=2 BRO PROPERTY  
FULTON LAKE AREA  
N=3  $\rho(a)/2\pi$  OHM FEET

P-660 FREQUENCY DOMAIN IM  
DIPOLE - DIPOLE ARRAY  
0.3 AND 5.0 HZ.  
OPERATORS: MORRISON & DEI



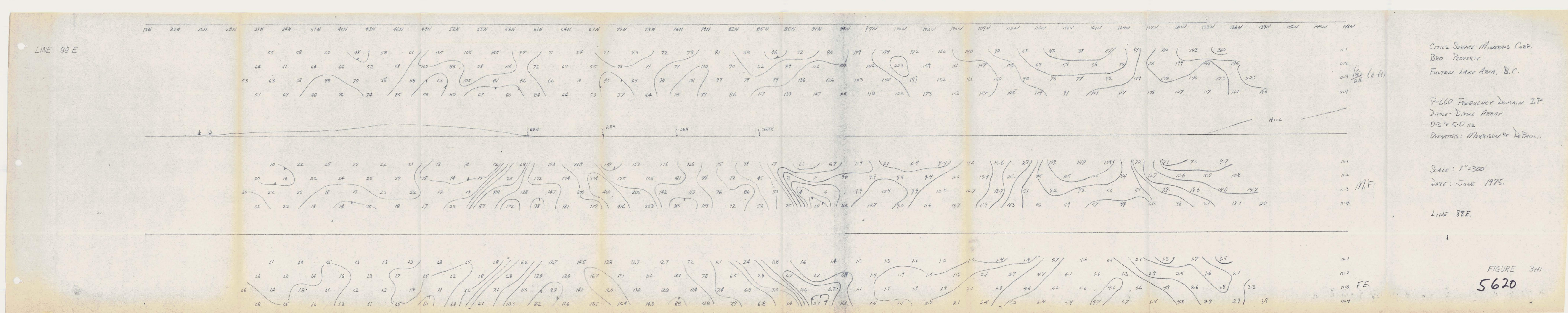
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N=2 DATE: JUNE 27, 28, 197

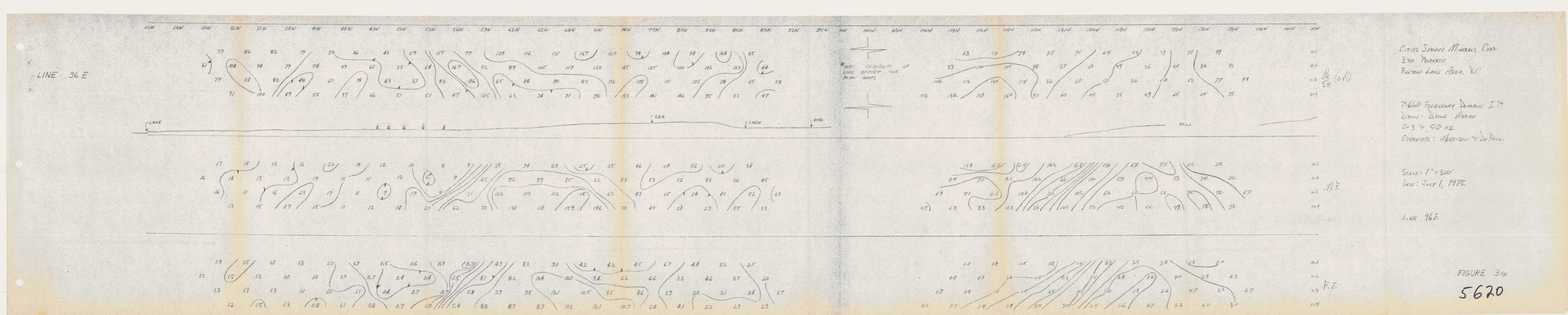
LINE



## FIGURE

56

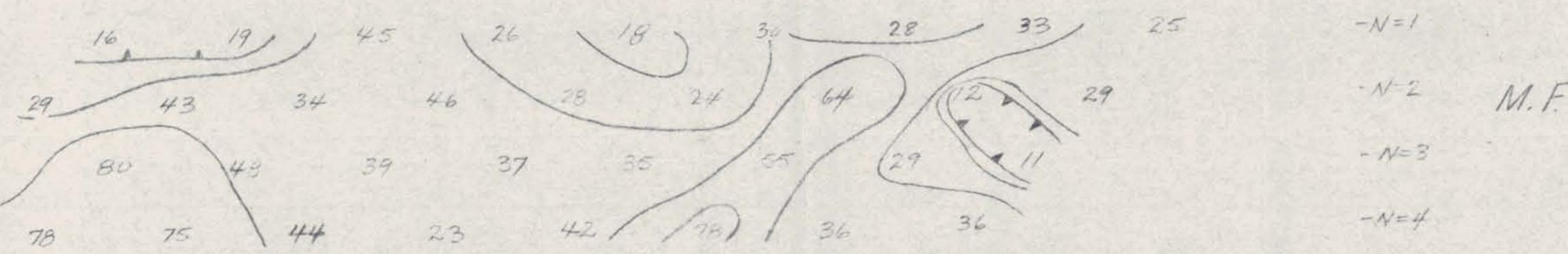




LINE 104 E

CITIES SERVICE MINERALS CORP.  
BRO PROPERTY  
FULTON LAKE AREA

P-660 FREQUENCY DOMAIN I.P.  
DIPOLE-DIPOLE ARRAY  
0.3 & 5.0 HZ.  
OPERATORS : MORRISON & DEPAOL



SCALE: 1" = 300'  
DATE: JULY 1, 1975

LINE: 104 E

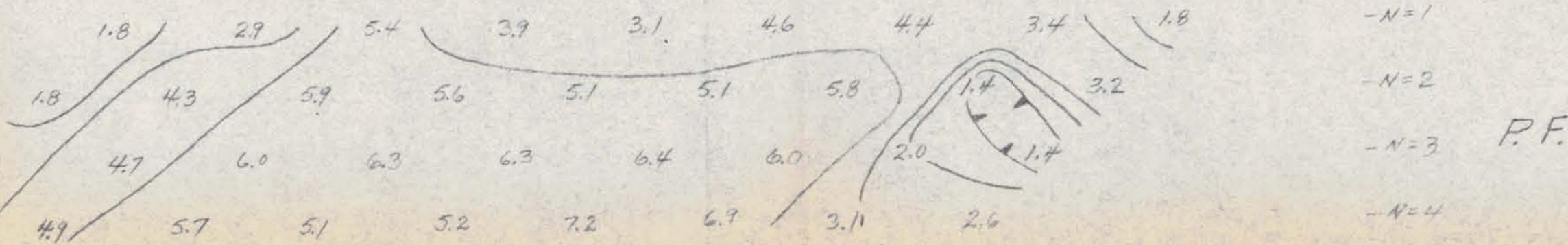


FIGURE 3(h)

5620

N=1 CITIES SERVICE MINERALS CORP.  
N=2  $\frac{f(a)}{2\pi}$  BRO PROPERTY  
N=3 OHM FEET FULTON LAKE AREA

P-660 FREQUENCY DOMAIN I.P.  
DIPOLE-DIPOLE ARRAY  
0.3 & 5.0 HERTZ  
OPERATORS: MORRISON & DEPAC

2  
M.F. SCALE: 1" = 300'  
DATE: JUNE 15, 16, 17 1975

LINE 1

FIGURE 3u  
5620

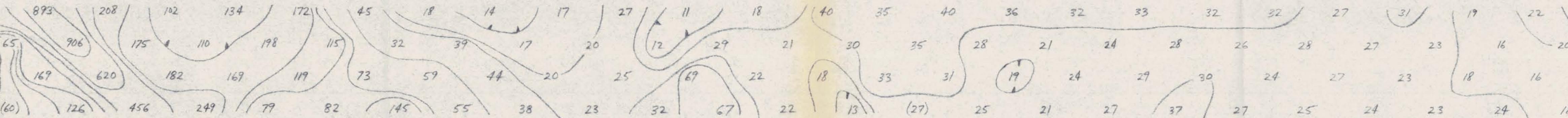
JUNE 74

CITIES SERVICE MINERALS CORP.  
BRO PROPERTY  
FULTON LAKE ARFA

P-660 FREQUENCY DOMAIN I.P.  
DIPOLE - DIPOLE ARRAY  
0.3 AND 5.0 HERTZ  
OPERATORS: MORRISON + DEPA

SCALE : 1" = 300'  
DATE : JUNE 13, 14 197

LINE 74 +

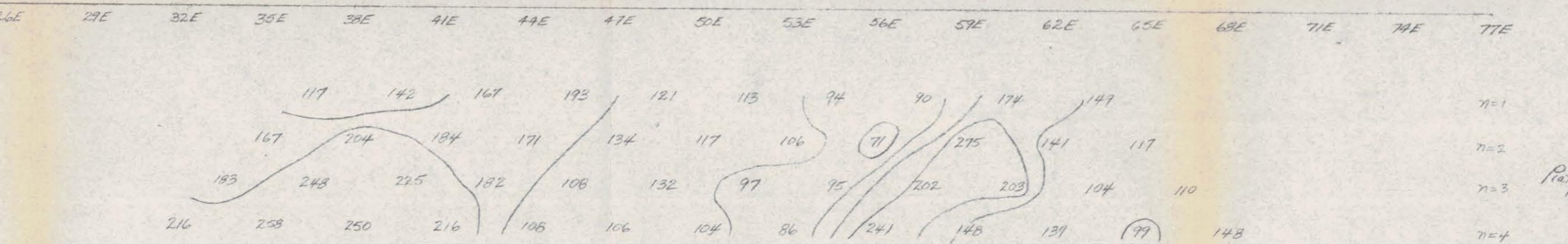


A complex network diagram showing connections between various nodes labeled with numerical values. The nodes are arranged in several clusters, with some nodes having dashed outlines. Arrows indicate the direction of connections between nodes.

FIGURE 3

562

LINE 136N



CITIES SERVICE MINERALS CORP.  
BRO. PROPERTY  
FULTON LAKE AREA

P-660 FREQUENCY DOMAIN I.P.  
DIPOLE-DIPOLE ARRAY  
0.3 & 5.0 HZ.

OPERATORS: MORRISON & DEPAOLI

