

4490

1973 Geophysical Report

TITLE	Spout Lake Copper Property (WC Claims)
AUTHORS	G.M. DePaoli, B.Sc. Geophysicist J.F. Allan, P.Eng. (B.C.)
DATE	July 1973
COMMODITY	Cu
LOCATION-Area	Lac La Hache
-Mining Divisions	Clinton and Cariboo
-Coordinates	Latitude 52°00'N Longitude 121°25'W
-NTS	92 P 14 and 93 A 3

AMAX VANCOUVER OFFICE

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4490 MAP

4490

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SUMMARY

During the period May 30 - June 6, 1973 and June 11 and 12, 1973, 8.6 line miles of induced polarization surveying were completed over the Spout Lake Copper Property. The survey extended previous I.P. data coverage and reduced interline spacing to 400 feet.

The results indicate the presence of several narrow, polarizable bodies. Testing of the anomalies is warranted because of the occurrence of chalcopyrite mineralization in a magnetite skarn assemblage.

INTRODUCTION

The Spout Lake Copper Property consists of 135 WC claims owned by Amax Potash Limited. During the period May 8 to June 13, 1973 eight miles of line refurbishing and nine miles of induced polarization surveying were completed on the property. The following report describes the instrumentation, field procedure and results obtained from the survey.

Location and Access

The property lies adjacent to Spout Lake within the Interior Plateau of south-central British Columbia. It is located fourteen miles north of Lac La Hache at coordinates 52°00'N latitude and 121°25'W longitude, and spans the border between the Clinton and Cariboo Mining Divisions. Access by two wheel drive vehicle is via the Spout Lake Road (see Figure 1).

Grid Control

The grid system used for control was initially established in 1971 as flagged and blazed lines. The baseline strikes south from Spout Lake and east-west cross lines occur every four hundred feet for a distance of 6000 feet from the lake edge.

During May 1973 the eastern extent of cross lines 4+00S, 8+00S, 12+00S, 16+00S, 20+00S, 24+00S and 28+00S were

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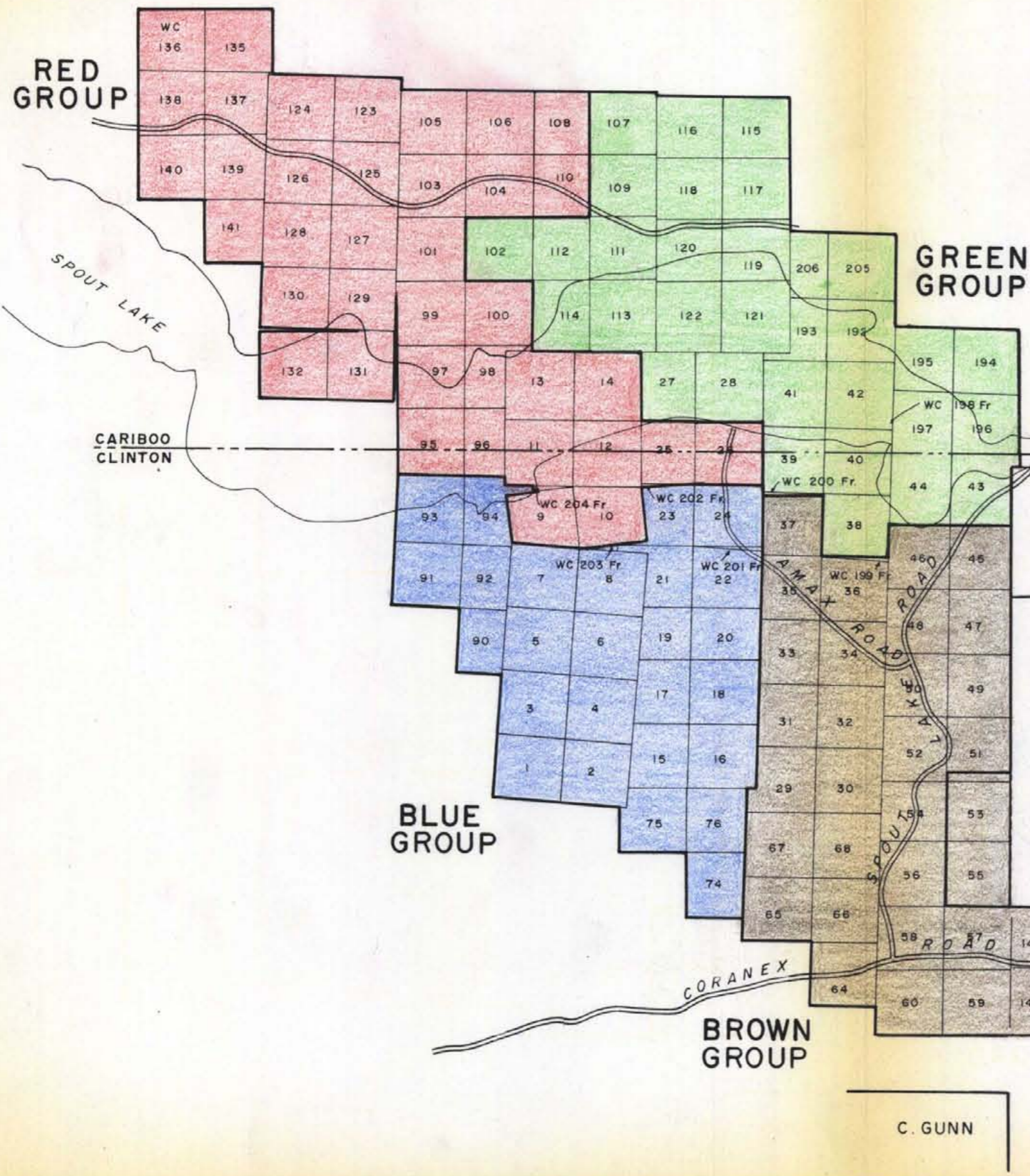
LOCATION MAP Figure 1

RED GROUP

GREEN GROUP

BLUE GROUP

BROWN GROUP



AMAX EXPLORATION INC.
(CORANEX OPTION)

BETHLEHEM
COPPER CORP.
LIMITED

C. GUNN



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ASSESSMENT REPORT
NO. **4490** MAP #2

AMAX POTASH LTD.

SPOUT LAKE COPPER PROPERTY
CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

CLAIM MAP

SCALE — 1" = 1/2 mile

DATE REVISED	9/7/72	DATE PRINTED	Drawn by FJF
	12/1/73		Dec 28, 1971
	17/5/73		N.T.S. File 92 P 14 93A 3

To accompany report "SPOUT LAKE COPPER PROPERTY" by G. M. DePaoli and J. F. Allan.

fig. 2

cut out with a power saw from the baseline.

In addition line 1+00S was added and also segments of lines 28+00S and 32+00S were also added as shown in Figure 3. All the lines mentioned above were rechained.

GENERAL GEOLOGY

The grid area is underlain predominantly by interbedded volcanic flows and related volcanic sediments of Upper Triassic or Jurassic age. Minor amounts of intrusive rock including pink syenite dykes and hornblende monzonite similar to that of the Takomkane batholith have also been noted. Chalcopyrite mineralization associated with a magnetite skarn assemblage is scattered for over 2000 feet on the property.

INDUCED POLARIZATION SURVEY

Introduction and Theory

During the period May 30 to June 6, 1973 eight line miles of induced polarization/resistivity surveying were completed over the property. The survey extended previous I.P. coverage obtained in 1972. A 200 foot dipole-dipole array was employed and measurements were taken to five separations ($n=5$). In an effort to obtain better resolution on some anomalies several lines were resurveyed on June 11 and 12. For this detailed work a 50 foot dipole-dipole array was used. All the surveying was executed by Dennis F. Morrison, an independent geophysical contractor residing in Gravehurst, Ontario.

The term induced polarization means electrical polarization (i.e. 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 (AC 1) to current applied at 5.0 hertz (AC 2).

Resistivity information is useful in inferring overburden depths, defining abrupt lithological changes, and assessing the importance of any I.P. effects obtained.

Instrument and Procedure

A multiple frequency McPhar induced polarization system Model P660, 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, 2.5 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 amp. while the maximum output voltage is 690 volts.

The receiver employed was the new 1969 A.C. P660 model.

This is a potentiometer type where the amplified and filtered signal is compared with a reference voltage. It is powered by six 8V alkaline transistor batteries and draws 7.5 ma. Total weight including carrying case and batteries is 5 pounds.

Survey procedure required the preparation of a set-up position 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 two hundred 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 aluminum foil electrodes which had been prepared earlier. The receiving dipole consisting of the receiver and a 200 foot "read" wire also utilized the aluminum foil electrodes where possible. However, once the receiving dipole moved past the last foil emplaced for the transmitting set-up, ground connections were made via porous pots containing a solution of copper sulphate. Radio contact between the receiver and transmitter operations coordinated power "on" and "off" periods.

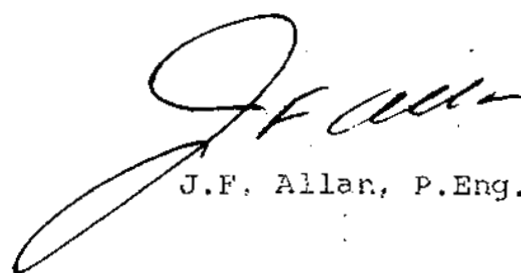
Results and Discussion

The data is plotted on thirteen pseudosections in Appendix I. All the lines were surveyed using a 200 foot dipole length and lines 8+00S, 12+00S and 24+00S were resurveyed in anomalous areas using a 50 foot dipole length. A plan view displaying the interpreted polarizable zones projected to surface is presented in Figure 3.

Anomalies obtained near the main copper sulphide showings are interpreted as being caused by a very narrow dyke-like body. Apparent frequency effects greater than 2% are considered anomalous and true frequency effects as high as 10% are expected. From an analysis of the anomalies one would deduce a dyke-like body 80-150 feet wide having a near vertical dip.

An interpretation has been made filling the plan projections of the anomalies into two continuous zones (see Figure 3). In testing the composition of the polarizable source one should be alert to such generalizations, because of the erratic nature of skarn mineralization.

G.M. DePaoli, B.Sc.

A handwritten signature in cursive script, appearing to read 'J.F. Allan', written in dark ink.

J.F. Allan, P.Eng. (B.C.)

July 1973

SPOUT LAKE - Amax Potash Limited

APPENDIX IISTATEMENT OF COSTS

Claim Name	Record Number	Group	Mining Division	
WC 1-8 incl.	26573-26580 incl.	Blue	Clinton	
9-12 incl.	26581-26584 incl.	Red		
15-24 incl.	26585-26594 incl.	Blue		
25-26	26595-26596	Red		
29-37 incl.	26597-26605 incl.	Brown		
38-40 incl.	26606-26608 incl.	Green		
45-60 incl.	26771-26786 incl.	Brown		
64-68 incl.	26790-26794 incl.	Brown		
74-76 incl.	26800-26802 incl.	Blue		
90-94 incl.	26816-26820 incl.	Blue		
95-96	26821-26822	Red		
146-147	27257-27258	Brown		
WC 198 FR.	29882	Green		
199 FR.	29883	Brown		
200 FR.	29884	Green		
201 FR.	29855	Blue		
202 FR.	29886	Red		
203 FR.	29857	Blue		
204 FR.	29888	Red		
WC 13-14	63318-63319	Red	Cariboo	
27-28	63320-63321	Green		
41-42	63322-63323	Green		
43-44	63691-63692	Green		
97-101 incl.	63693-63697 incl.	Red		
102	63698	Green		
103-106 incl.	63699-63702 incl.	Red		
107	63703	Green		
108	63704	Red		
109	63705	Green		
110	63706	Red		
111-122 incl.	63707-63718 incl.	Green		
123-132 incl.	63719-63728 incl.	Red		
135-141 incl.	63731-63737 incl.	Red		
192-197 incl.	67945-67950 incl.	Green		
205-206	67951-67952	Green		

Period Of Work - May 8 to June 13, 1973

Summary of Work - Refurbishing and Line Cutting-7.5 line miles
Induced Polarization Survey - 8.6 line miles

Spout Lake Statement of Costs

Page Two

Personnel

G.M. DePaoli - 601-535 Thurlow Street, Vancouver 5, B.C. Geophysicist	9 days @ \$54.00/day	486.00
F.J. Ferguson - 601-535 Thurlow Street, Vancouver 5, B.C. Geological Technician	11 days @ \$43.00/day	473.00
B.W. Munday - Box 54, Avola, B.C. Labourer	17 days @ \$23.94/day	406.98
Nick Sworyk - Box 235, Houston, B.C. Labourer	13 days @ \$26.49/day	344.37
T.E. Gilchrist - 7210-112 Street, North Delta, B.C. Jr. Assistant	19 days @ \$17.10/day	324.90
D.S. Brooks - 1144 Cloverley Street, North Vancouver, B.C. Jr. Assistant	13 days @ \$17.96/day	233.48
D.R. Morrison - Box 418, Gravenhurst, Ontario IP Contractor	10 days @ \$220.00/day	2,200.00
Marcel Arsenault - Box 28, R.R.#3, Abrams Village, P.E.I. IP Helper	10 days @ \$20.00/day	200.00
<u>Board</u> - 102 man days @ \$10.00/day		1,020.00
<u>Vehicle</u> - 15 days @ \$12.00/day		180.00
<u>Report Preparation and Drafting</u>		200.00
		<u>\$6,068.73</u>
		=====

The work is to be applied for one year on

WC 6-8, 15, 53, 55, 57, 59, 60, 54, 65, 74-76,
90, 94, 107-110, 115-118, 146, 147, 192-
197, 198-204 FR., 205 and 206.

Declared before me at the City
Manowau, in the
Province of British Columbia, this 31st
July, 1973, A.D.

Elizabeth & Boyd

JP Phelps
A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

J. Allen

Sub - mining Recorder

DENNIS F. MORRISON

INDUCED POLARIZATION SURVEYS

DATE JUNE 13, 1973

AMAX EXPLORATIONS INC.
601-535 THURLOW STREET,
VANCOUVER, BRITISH COLUMBIA.

516

In account with D.F. MORRISON, BOX 418, GRAVENHURST, ONT.
TO I. P. SURVEY: W.C. CLAIMS SPOUT LAKE B.C.

6A OPERATING DAYS.

6B STANDBY AND TRAVEL DAYS.

NUMBER OF OPERATING DAYS 10 @ \$220.00 per day = 2200.00

NUMBER OF TRAVEL AND
~~STANDBY~~ DAYS 2 @ \$100.00 per day = 200.00

SUB TOTAL OF BASIC FEES

7A EXPENSES RECEIPTS ATTACHED

Plus 10% Overhead

TOTAL EXPENSES

0

7B SALARIES RECEIPTS ATTACHED

SUBTOTAL OF EXPENSES
PLUS 20% Overhead

AMOUNT DUE AND PAYABLE

P.O. BOX 418, GRAVENHURST, ONT.

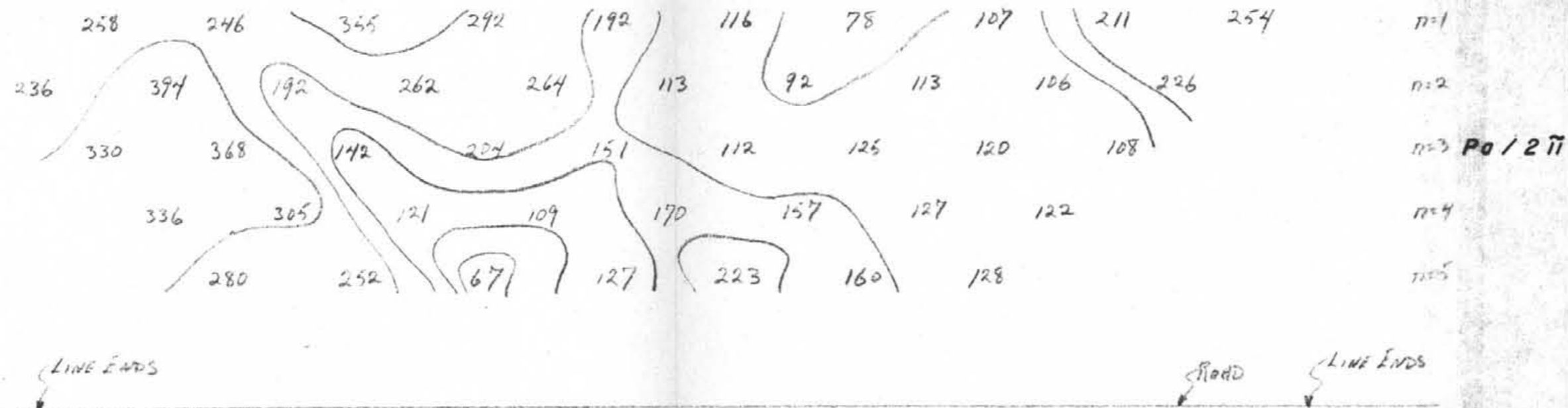
APPROVED		DATE
Project	Exp. Code	AMOUNT
516	8682	2400.00
CR. 13294		JUN 21 '73

\$2400.00 ✓

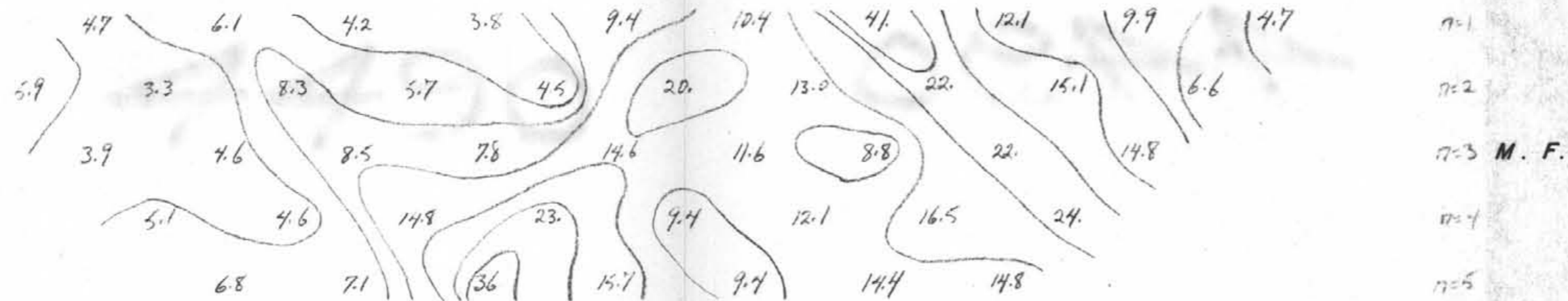
PHONE 705-687-2009

O.K.

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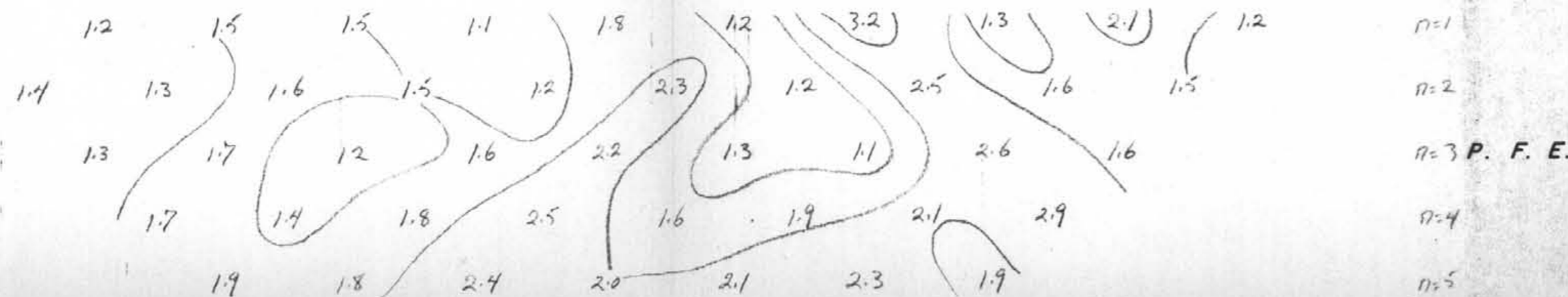


INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



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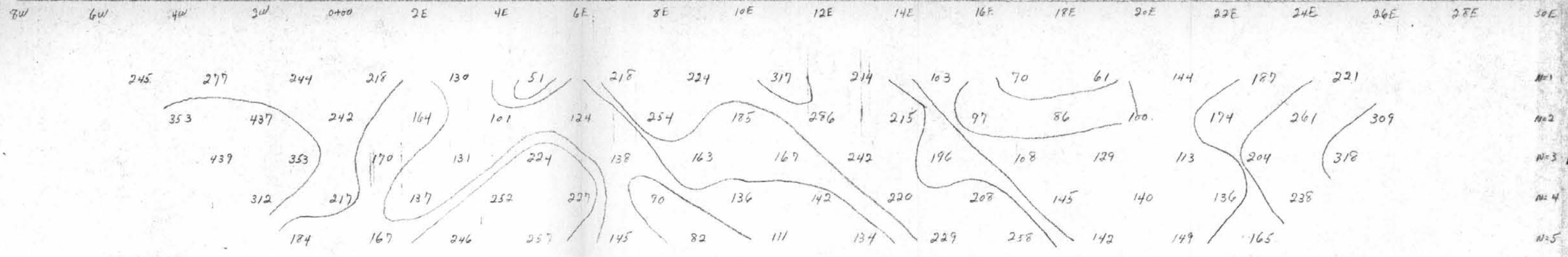


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 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE I + 00 S

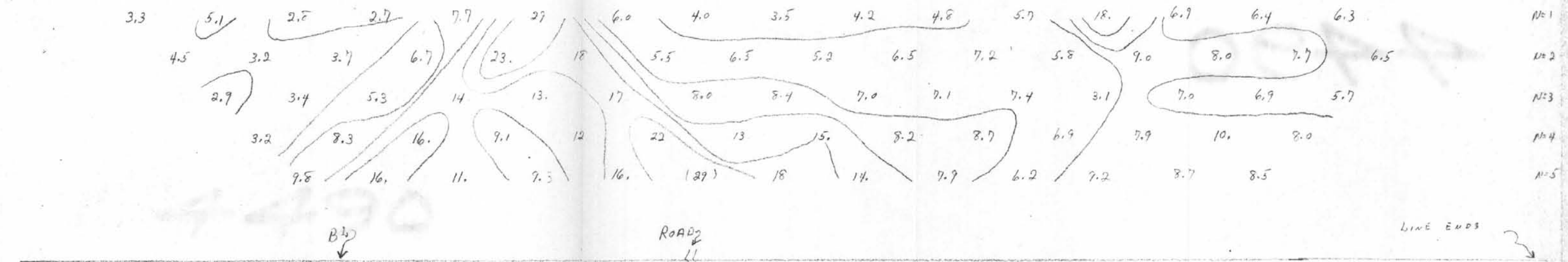
SCALE 1" = 200'
 To accompany report "SPOUT LAKE COPPER PROPERTY"
 by G. M. DePaoli and J. F. Allan.

APPENDIX I



N=1
N=2
N=3 Pa / 2 ii
N=4
N=5

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



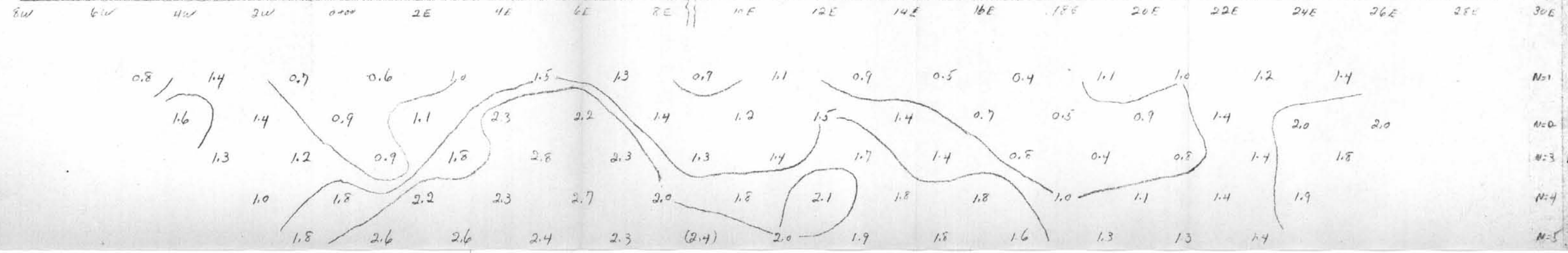
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N=3 M. F.
N=4
N=5

(2.4) Noisy reading

4490

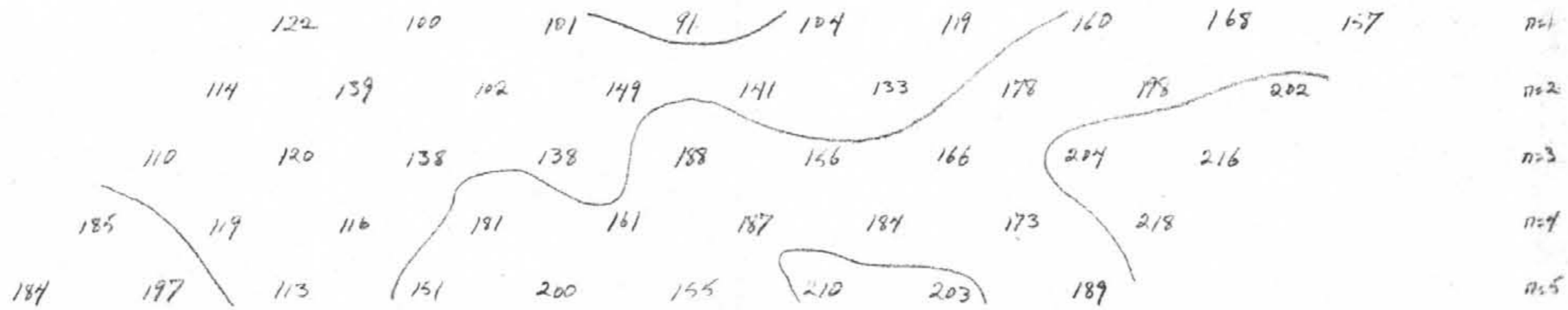
Department of
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AMAX POTASH LIMITED
 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA
INDUCED POLARIZATION SURVEY
 LINE 4+00 S
 SCALE 1" = 200'
 To accompany report "SPOUT LAKE COPPER PROPERTY"
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APPENDIX I



N=1
N=2
N=3 P. F. E.
N=4
N=5

8E 18E 19E 14E 16E 18E 20E 22E 24E 26E 28E 30E 32E 34E 36E 38E



Po / 27

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



M. F.

NOTE -

Line rechaind from Base Line (e.g. old chaining station 38+00 E is new chaining station 37+00 E)

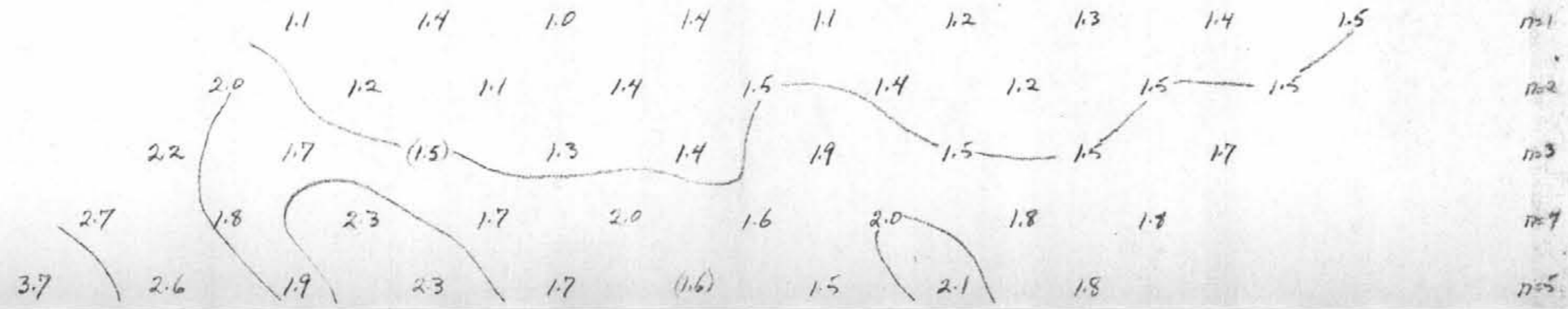
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SPOUT LAKE COPPER PROPERTY
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INDUCED POLARIZATION SURVEY
 LINE 8 + 00 S

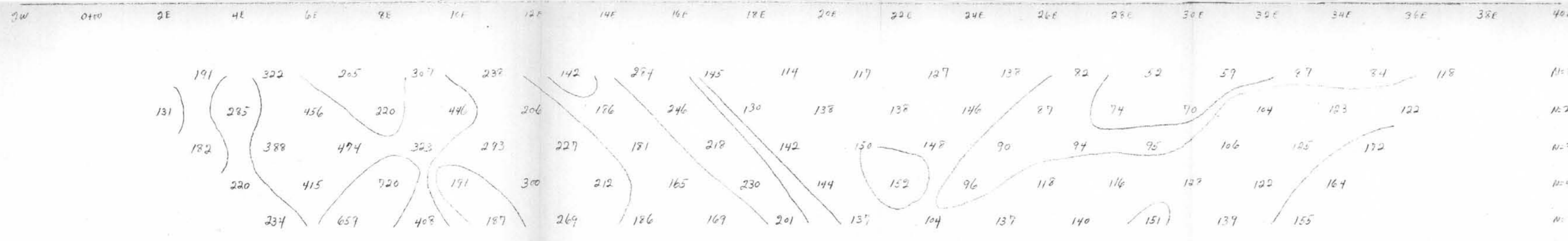


P. F. E.

SCALE 1" = 200'

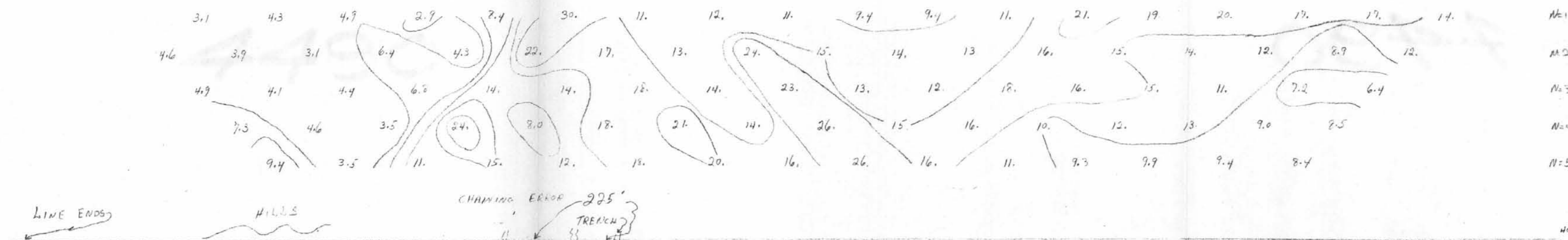
To accompany report "SPOUT LAKE COPPER PROPERTY"
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APPENDIX I



Pa / 2 ii

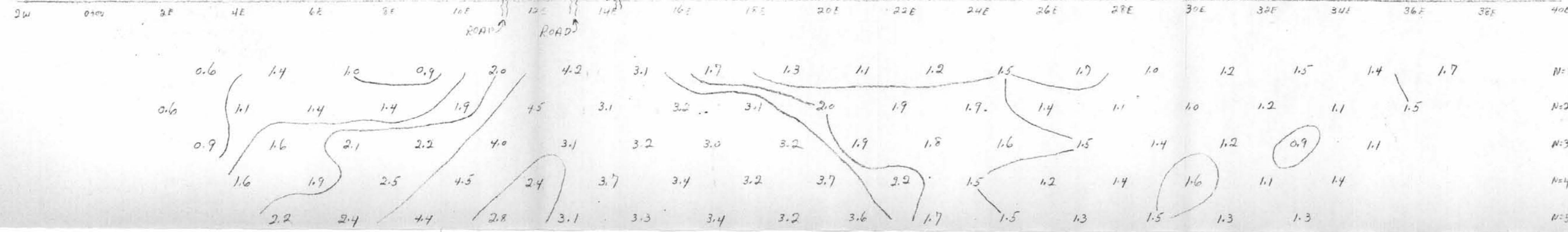
INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
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M. F.

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P. F. E.

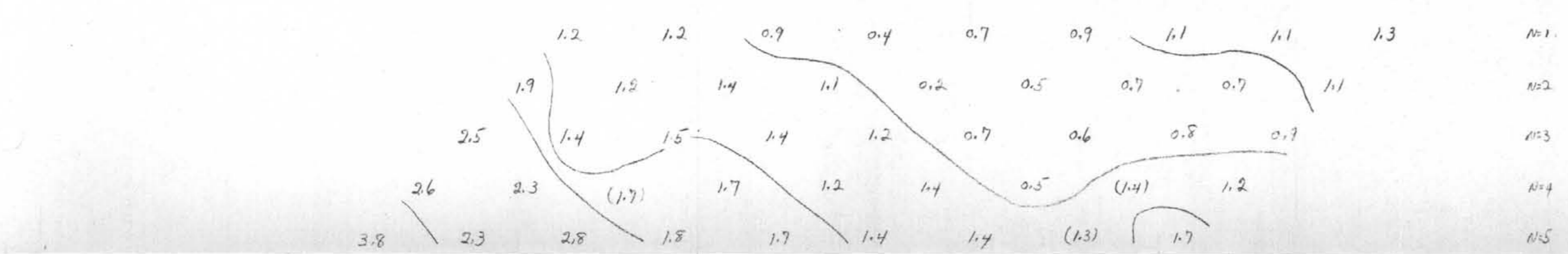
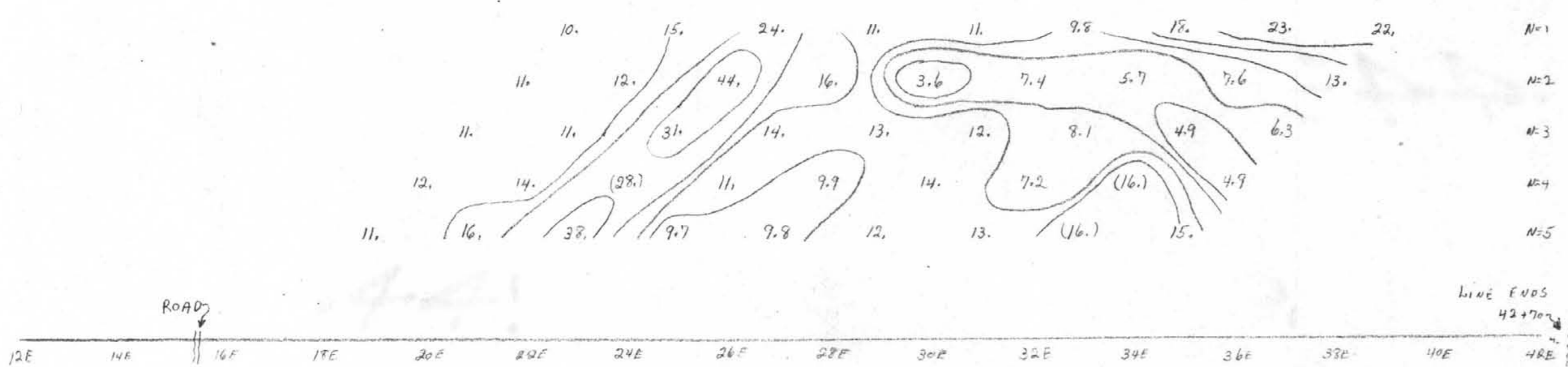
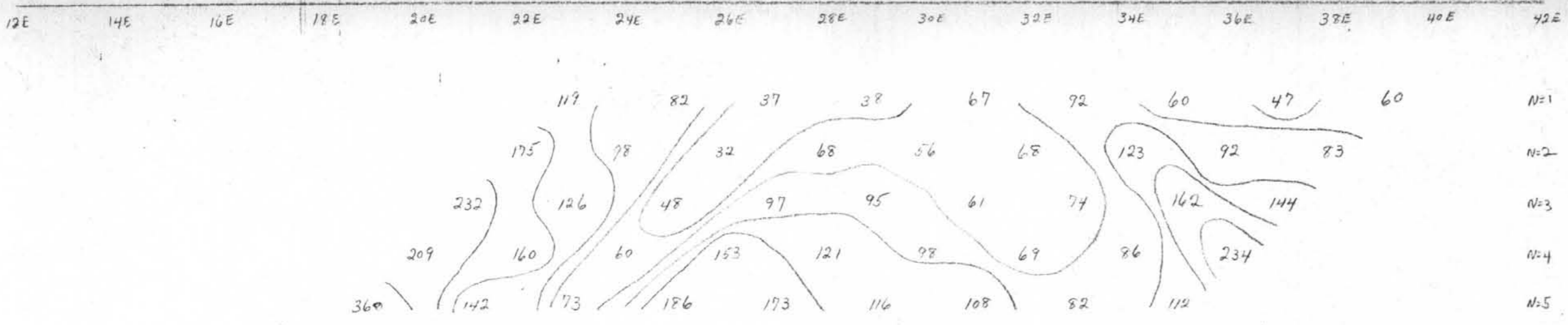
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 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 12 + 00 S

SCALE 1" = 200'

To accompany report "SPOUT LAKE COPPER PROPERTY"
 by G. M. DePaoli and J. F. Allan.

APPENDIX I



Po / 2 II

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
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M. F.

(14) Noisy reading

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SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

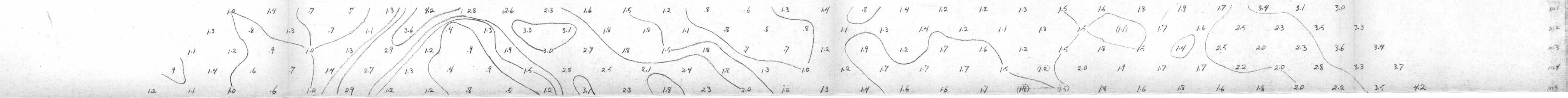
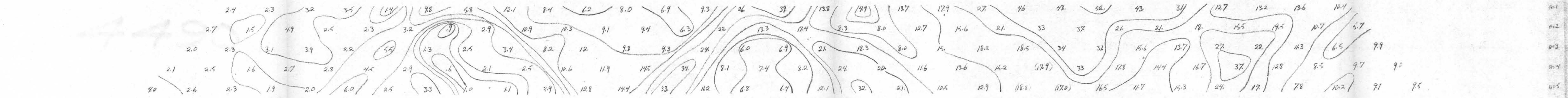
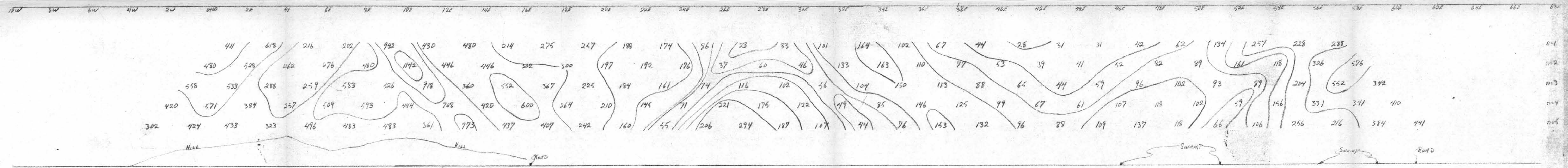
INDUCED POLARIZATION SURVEY
 LINE 16 + 00 S

P. F. E.

SCALE 1" = 200'

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Pa/27

M. F.

P. F. E.

INSTRUMENT High Power I.P. (Dipole - Dipole)
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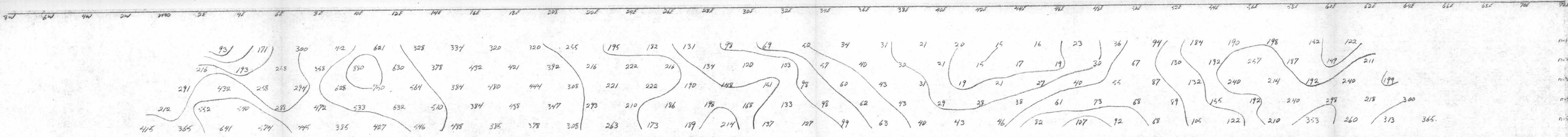
SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 20+00 S

SCALE 1" = 200'

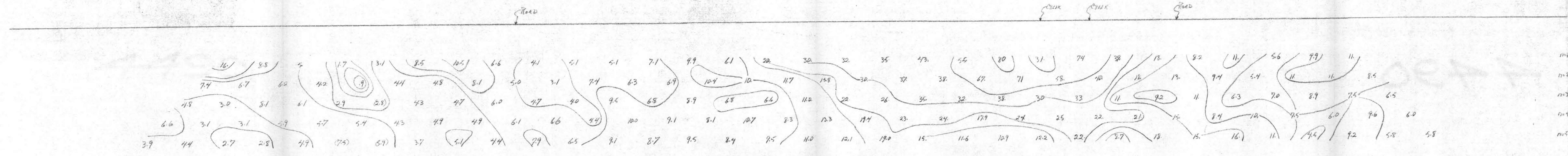
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APPENDIX I



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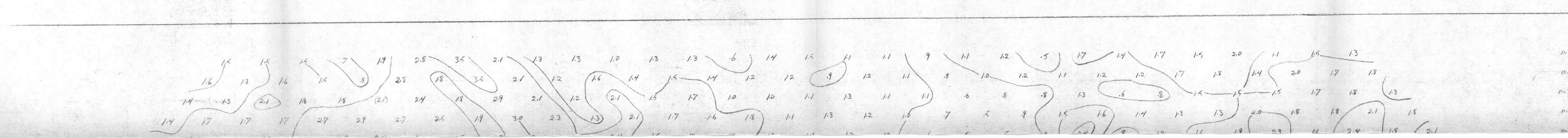
INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
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M. F.

4490

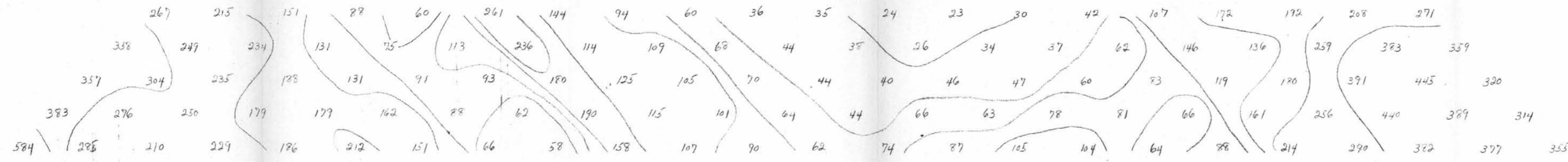
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P. F. E.

AMAX POTASH LIMITED
 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA
 INDUCED POLARIZATION SURVEY
 LINE 28 + 00 S
 SCALE 1" = 200'
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10E 12E 14E 16E 17E 20E 22E 24E 26E 28E 30E 32E 34E 36E 38E 40E 42E 44E 46E 48E 50E 52E 54E 56E 58E 60E 62E 64E 66E 68E 70E



n=1
n=2
n=3
n=4
n=5

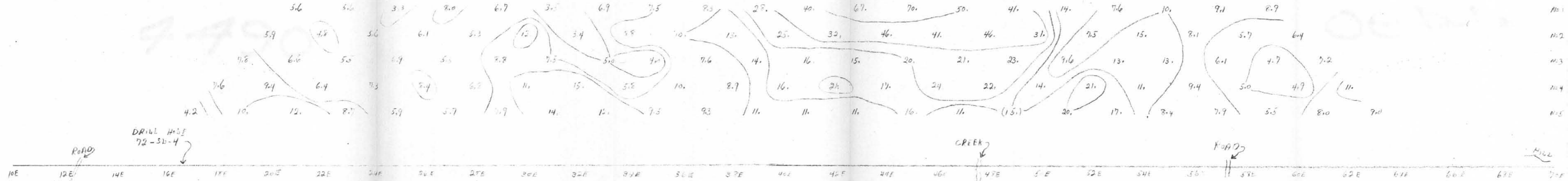
Pa / 2 ii

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973

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Department of
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(16) Noisy reading



n=1
n=2
n=3
n=4
n=5

M. F.

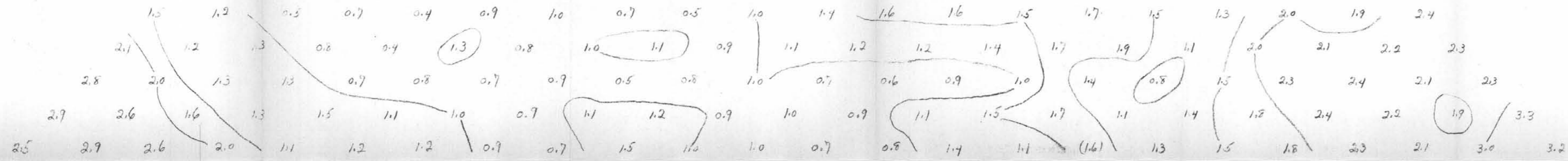
AMAX POTASH LIMITED
 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 24 + 00 S

SCALE 1" = 200'

To accompany report "SPOUT LAKE COPPER PROPERTY"
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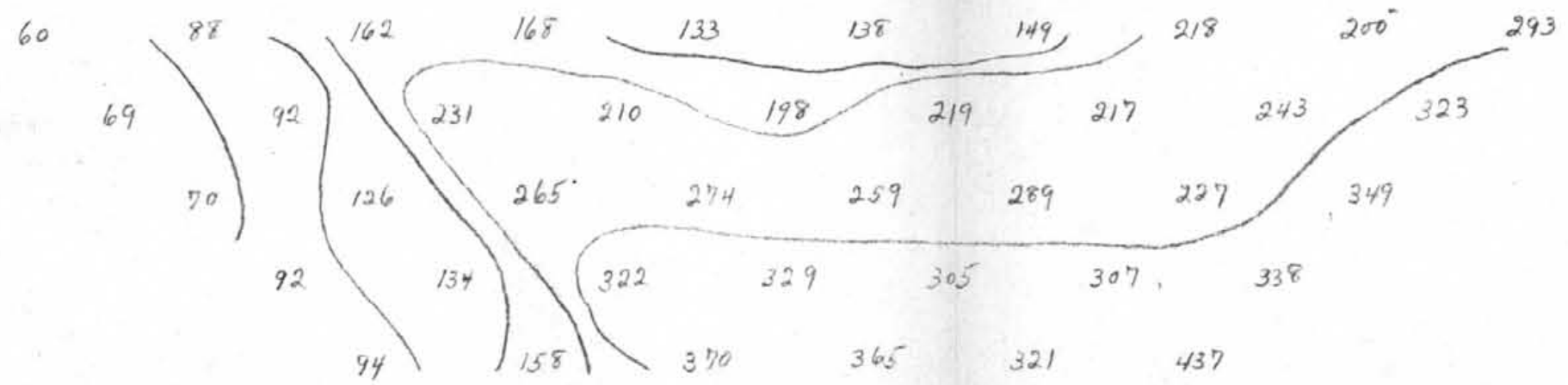
APPENDIX I



n=1
n=2
n=3
n=4
n=5

P. F. E.

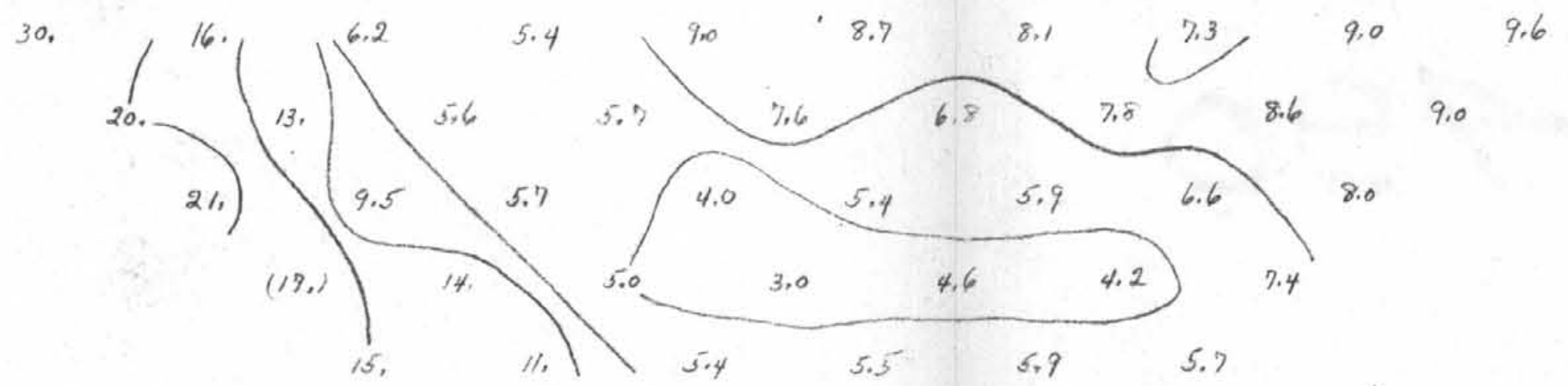
48E 50E 52E 54E 56E 58E 60E 62E 64E 66E 68E 70E 72E



N=1
N=2
N=3
N=4
N=5

Po / 2π

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



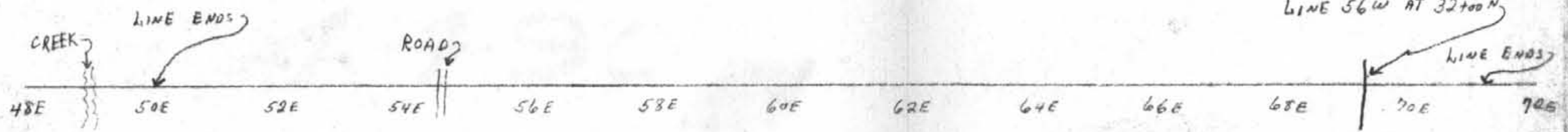
N=1
N=2
N=3
N=4
N=5

M. F.

4490

(16) Noisy reading

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. **4490** MAP



N=1
N=2
N=3
N=4
N=5

P. F. E.

AMAX POTASH LIMITED
 SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 26 + 00 S

SCALE 1" = 200'

To accompany report "SPOUT LAKE COPPER PROPERTY"
 by: G. M. DePaoli and J. F. Allan.

J. F. Allan

APPENDIX I

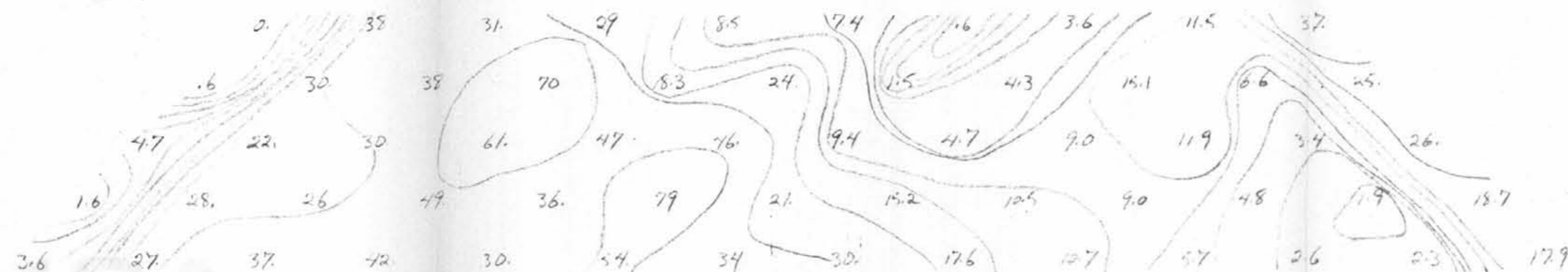
4E 4450E 6E 5450E 6E 6450E 7E 7450E 8E 8450E 9E 9450E 10E 10450E 11E 11450E 12E 12450E 13E 13450E 14E



m1
m2
m3
m4
m5

Pa / 2 ii

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



m1
m2
m3
m4
m5

M. F.

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 AMAX POTASH LIMITED

SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 8+00 S

P. F. E.

SCALE 1" = 50'

To accompany report "SPOUT LAKE COPPER PROPERTY"
 by: G. M. DePaoli and J. F. Allan.

APPENDIX I

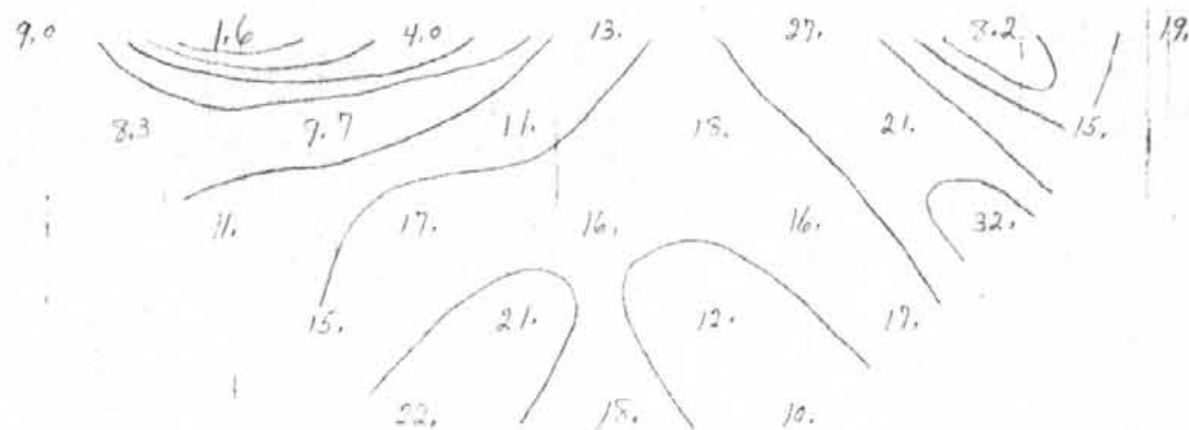
11E 11+50E 12E 12+50E 13E 13+50E 14E 14+50E 15E 15+50E



11+1
11+2
11+3
11+4
11+5

Pa / 2 II

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



11+1
11+2
11+3
11+4
11+5

M. F.

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4490
 AMAX POTASH LIMITED

SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 12+00 S

SCALE 1" = 50'

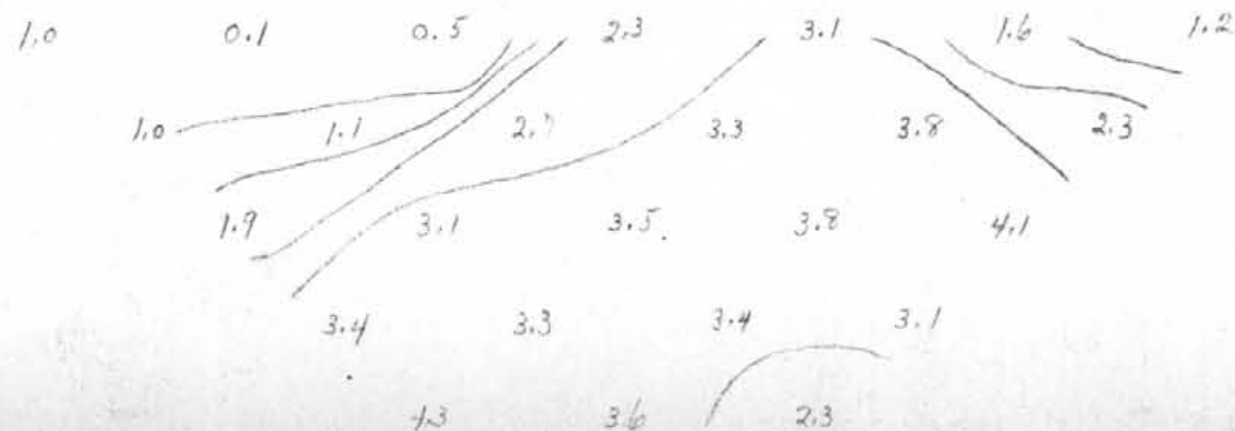
11+1
11+2
11+3
11+4
11+5

P. F. E.

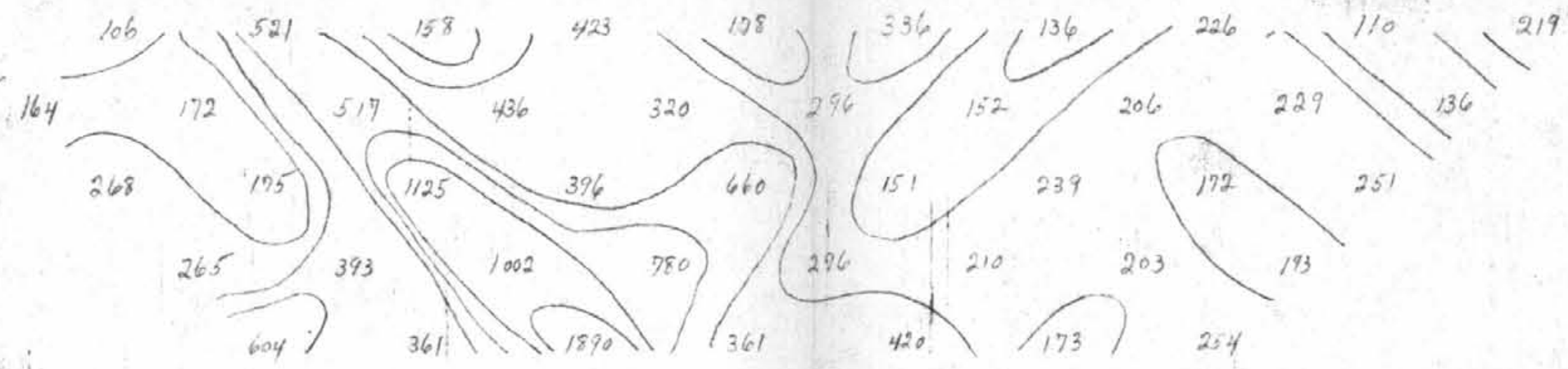
To accompany report "SPOUT LAKE COPPER PROPERTY"
 by: G. M. DePaoli and J. F. Allan.

APPENDIX I

11E 11+50E 12E 12+50E 13E 13+50E 14E 14+50E 15E 15+50E



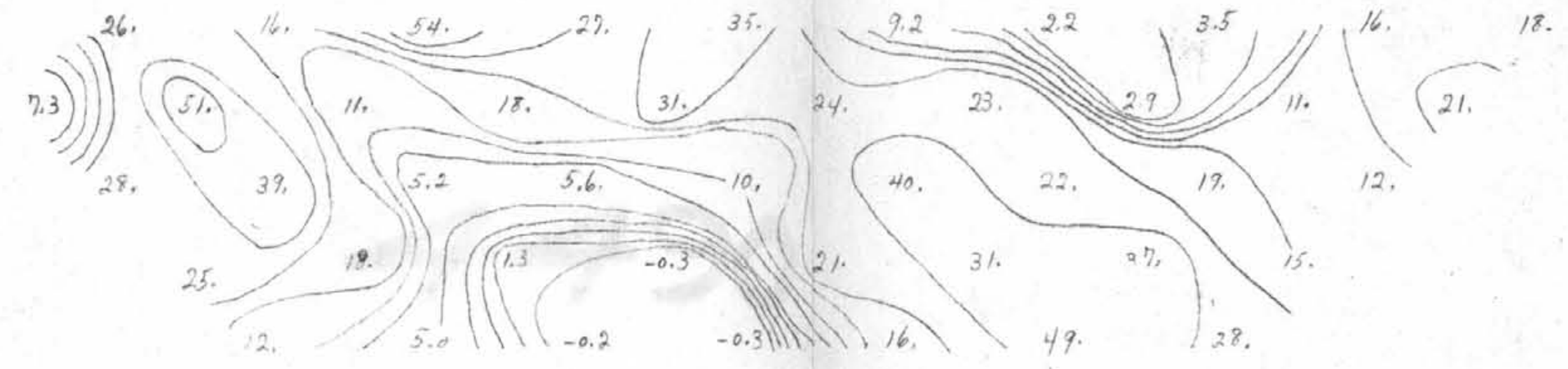
9450E 10E 10+50E 11E 11+50E 12E 12+50E 13E 13+50E 14E 14+50E 15E 15+50E 16E



N=1
N=2
N=3
N=4
N=5

Pa / 2 ii

INSTRUMENT High Power I.P. (Dipole - Dipole)
FREQUENCY 0.3 and 5 Hz
OPERATOR D. F. Morrison
DATE May - June 1973

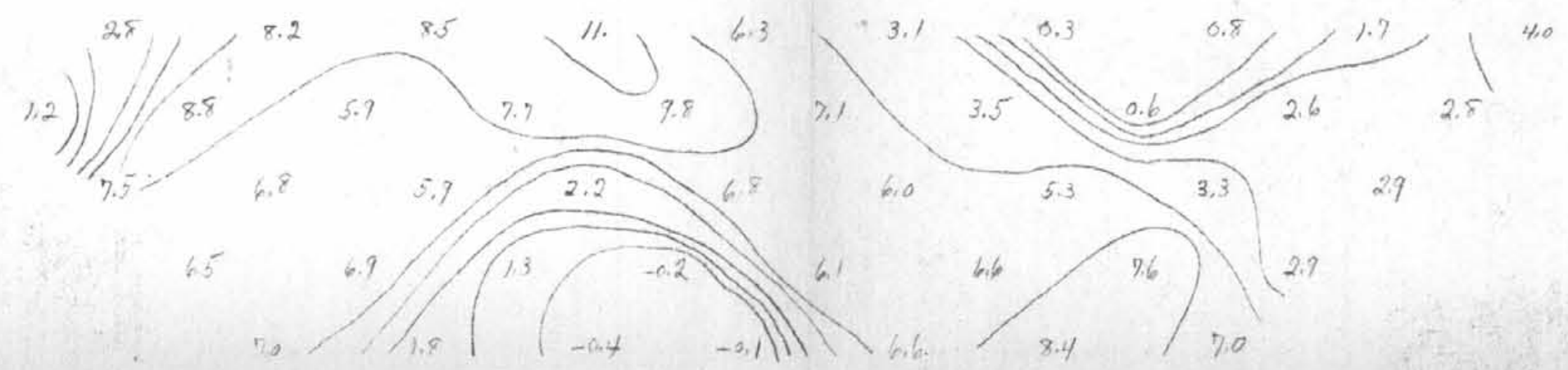


N=1
N=2
N=3
N=4
N=5

M. F.

ELECTRODE IS AT 11+50E
GULLY

9450E 10E 10+50E 11E 11+50E 12E 12+50E 13E 13+50E 14E 14+50E 15E 15+50E 16E



N=1
N=2
N=3
N=4
N=5

P. F. E.

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AMAX POTASH LIMITED

SPOUT LAKE COPPER PROPERTY
CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
LINE 20+00 S

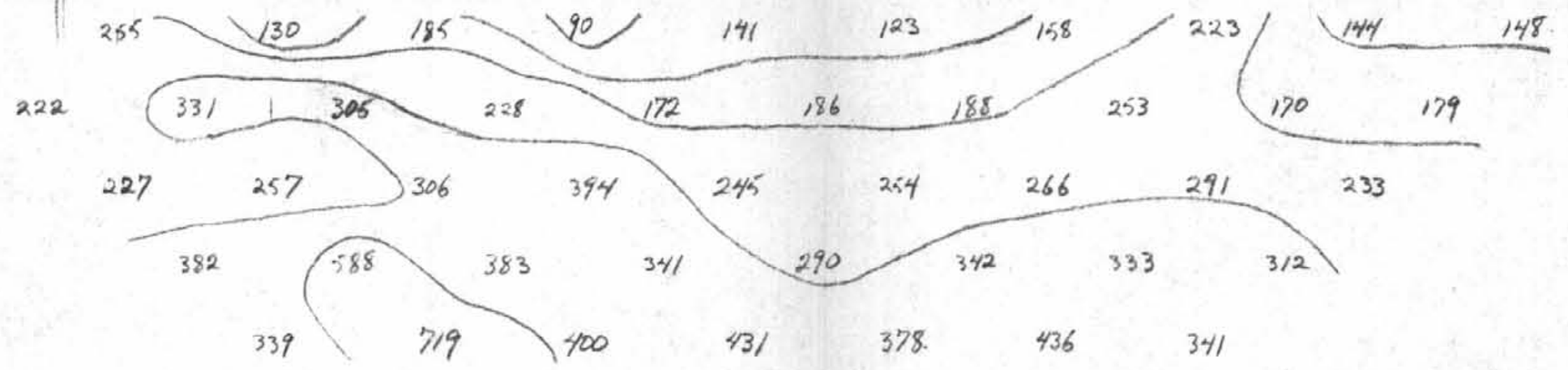
SCALE 1" = 50'

To accompany report "SPOUT LAKE COPPER PROPERTY"
by: G. M. DePaoli and J. F. Allan.

J. F. Allan

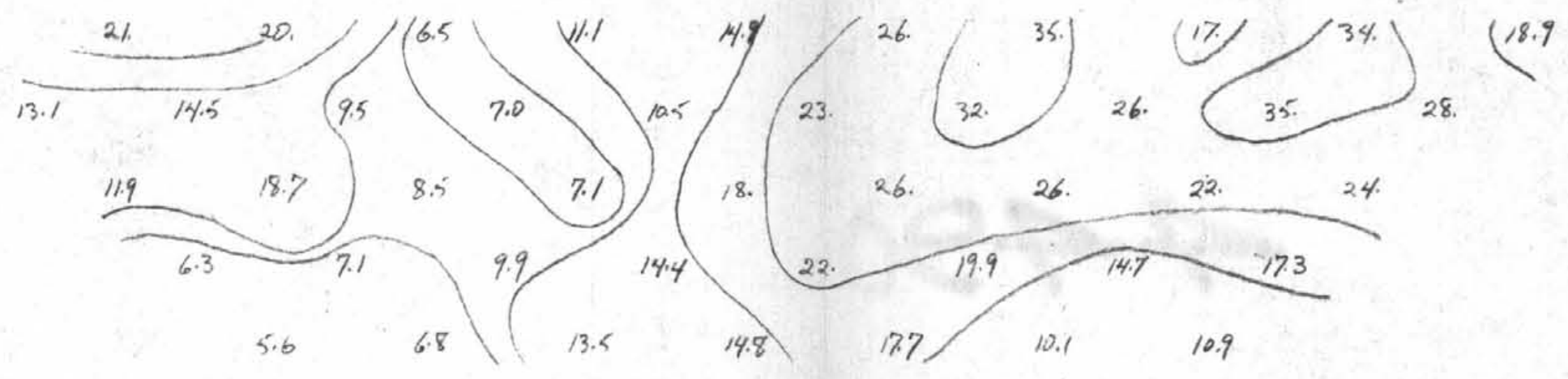
APPENDIX I

9+DE 10E 10+DE 11E 11+DE 12E 12+DE 13E 13+DE 14E 14+DE 15E 15+DE 16E



n=1
n=2
n=3 Pa/2ii
n=4
n=5

INSTRUMENT High Power I.P. (Dipole - Dipole)
 FREQUENCY 0.3 and 5 Hz
 OPERATOR D. F. Morrison
 DATE May - June 1973



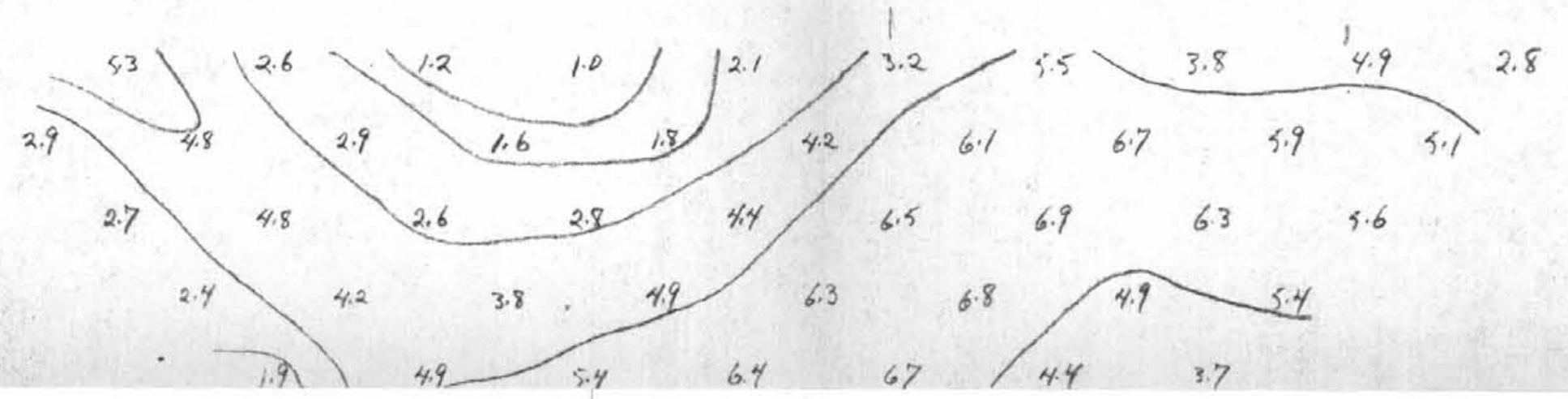
n=1
n=2
n=3 M.F.
n=4
n=5

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 Mines and Petroleum Resources
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AMAX POTASH LIMITED

SPOUT LAKE COPPER PROPERTY
 CLINTON AND CARIBOO MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION SURVEY
 LINE 24 + 00 S



n=1
n=2
n=3 P.F.E.
n=4
n=5

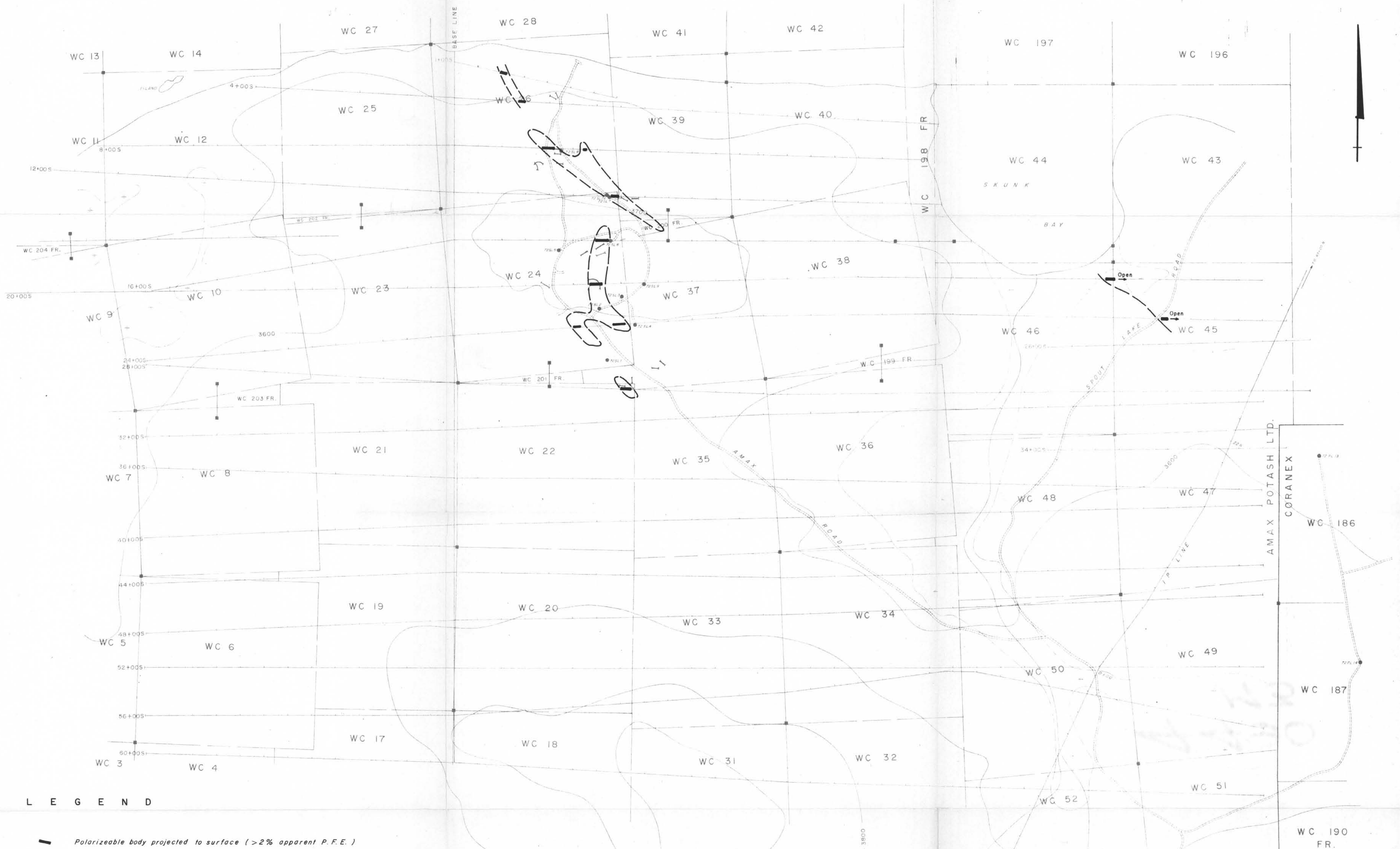
SCALE 1" = 50'

To accompany report "SPOUT LAKE COPPER PROPERTY"
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J. F. Allan

APPENDIX I

SPOUT LAKE
(Elev. 3535')



L E G E N D

- Polarizeable body projected to surface (>2% apparent P.F.E.)
- Interpreted boundary of polarizeable body
- Percussion drill hole (vertical).
- Claim post, claim location line.
- Claim boundary.
- Topographic contour (contour interval 100').
- Trench.
- Road.
- Swamp, swamp boundary.
- Stream.

INSTRUMENT
CONFIGURATION

McPhar P 660
Dipole - Dipole a = 200'
a = 50' (Detail work)

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4490
M3

WC 181 WC 183

AMAX POTASH LIMITED

SPOUT LAKE COPPER PROPERTY
CARIBOO AND CLINTON MINING DIVISIONS - BRITISH COLUMBIA

INDUCED POLARIZATION PLAN

SCALE 1" = 400'

DATE REVISION	DATE PRINTED	Drawn by Date 26/7/73	FIG. 3
		N.T.S. File 92 P 14, 93 A 3	

To accompany report "SPOUT LAKE COPPER PROPERTY"
by: G.M. De Paoli and J.F. Allan.