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REPORT ON INDUCED POLARIZATION AND RESISTIVITY SURVEY OF THE AXEL GROUP, McLEESE LAKE AREA CARIBOU MINING DIVISION, BRITISH COLUMBIA FOR ISO EXPLORATIONS LIMITED

BY

DAVID K. FOUNTAIN, P. ENG.
&
ROBERT A. BELL, Ph. D.

NAME AND LOCATION OF PROPERTY:

AXEL CLAIM GROUP, McLEESE LAKE AREA

CARIBOU MINING DIVISION, B. C. 52°N, 122° W; SE

DATE STARTED - June 29, 1969

DATE COMPLETED - July 22, 1969

TABLE OF CONTENTS

McPHAR GEOPHYSICS

NOTES ON THE THEORY, METHOD OF FIELD OPERATION, AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present

in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d. c. current is allowed to flow through the rock; i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d. c. voltage used to create this d. c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M. F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM

anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i. e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of the apparent resistivity, apparent per cent frequency effect, and the apparent metal factor

measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i. e. the depth of the measurement is increased. When the F. E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F. E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage (ΔV) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of (ΔV) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

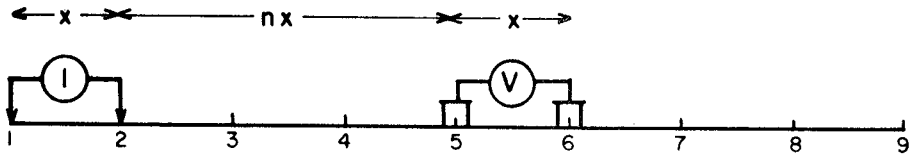
In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisey to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is

indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

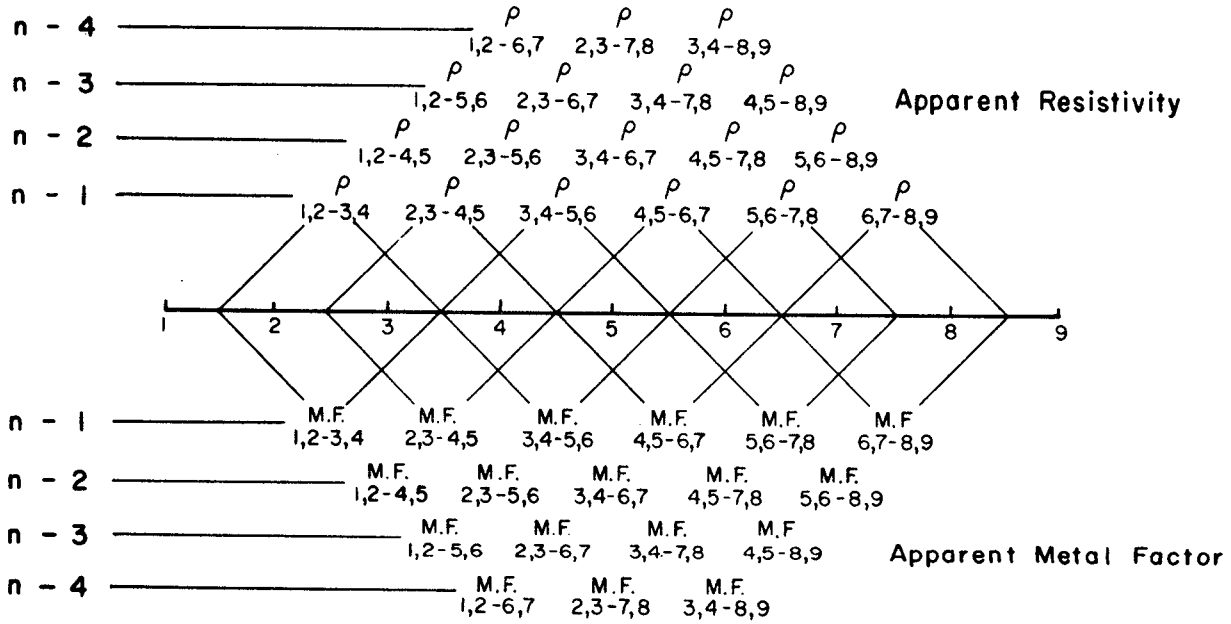
The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS



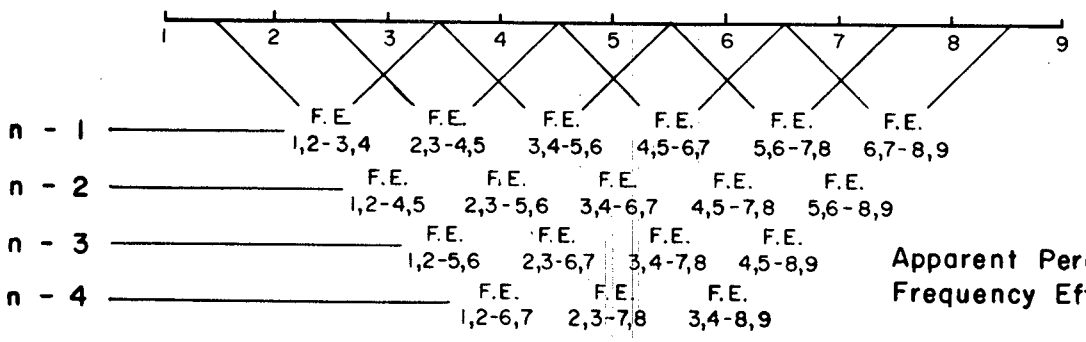
Stations on line

x = Electrode spread length
n = Electrode separation



Apparent Resistivity

Apparent Metal Factor



Apparent Percent Frequency Effect

Fig. A

McPHAR GEOPHYSICS LIMITED

REPORT ON

INDUCED POLARIZATION

AND RESISTIVITY SURVEY

OF THE

AXEL GROUP, McLEESE LAKE AREA

CARIBOU MINING DIVISION, BRITISH COLUMBIA

FOR

ISO EXPLORATIONS LIMITED

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1. INTRODUCTION

At the request of Mr. J. P. Dolan we have carried out a combined induced polarization and resistivity survey of the Axel Group in British Columbia for Iso Explorations Limited. The property is situated 5 miles east of Marguerite in the Caribou Mining Division, in the northeast quadrant of the one degree quadrilateral whose southeast corner is at 52° North, 122° West.

According to information supplied by the Company there are no outcrops on the property, but it is believed to be underlain wholely or largely by Mesozoic granitic rocks. The area is of considerable economic interest because of the discovery of large, low-grade copper deposits. Mineralization consists of chalcopyrite, with only minor pyrite and bornite, in thin veinlets and disseminations. Therefore relatively small amounts of metallic mineralization (i. e. 1.5% - 3%) may be economic and low magnitude IP anomalies may be significant.

The present survey was carried out in July of 1969 on a grid of east-west lines, spaced at varying intervals. A McPhar frequency domain IP system was employed using frequencies of 0.3 and 5.0 Hz. All measurements were taken with a 200-foot dipole-dipole electrode array, with three receiver readings from each transmitter location (i.e. n=1, 2, 3).

2. PRESENTATION OF RESULTS

The induced polarization and resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line 12N	200 foot spreads	Dwg. IP 5317-1
Line 8N	200 foot spreads	Dwg. IP 5317-2
Line 4N	200 foot spreads	Dwg. IP 5317-3
Line 0	200 foot spreads	Dwg. IP 5317-4
Line 4S	200 foot spreads	Dwg. IP 5317-5
Line 16S	200 foot spreads	Dwg. IP 5317-6
Line 18S	200 foot spreads	Dwg. IP 5317-7
Line 20S	200 foot spreads	Dwg. IP 5317-8
Line 22S	200 foot spreads	Dwg. IP 5317-9
Line 24S	200 foot spreads	Dwg. IP 5317-10
Line 26S	200 foot spreads	Dwg. IP 5317-11
Line 28S	200 foot spreads	Dwg. IP 5317-12
Line 32S	200 foot spreads	Dwg. IP 5317-13
Line 36S	200 foot spreads	Dwg. IP 5317-14

Line 40S	200 foot spreads	Dwg. IP 5317-15
Line 44S	200 foot spreads	Dwg. IP 5317-16

Enclosed with this report is Dwg. I. P. P. 4525, a plan map of the grid at a scale of 1" = 400'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i. e. when using 200' spreads the position of a narrow sulphide body can only be determined to lie between two stations 200' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

3. DISCUSSION OF RESULTS

Line 12N

The geophysical results from this traverse are fairly typical

of a large part of the grid in that the resistivity level is low and uniform with very weak background IP effects.

There are no significant anomalous responses on this line. The above background IP effects at 10W to 12W and 16W to 18W, would represent shallow, narrow sources. The increase in Apparent Frequency effect associated with these responses is within the reading error of the instrument. A similar above background response is indicated at 27W to 21W, also shallow but broad with poorly defined edges.

Experience in the Highland Valley Area has indicated that this type of response is typical of that encountered in deep gravel till areas. The depth of gravel till cover in the area of Line 12N should be considered before any further work is carried out on these weak responses.

Line 8N

No anomalies are indicated here, but the data is incomplete because of a small lake and swamp.

Line 4N

There are weak above background responses on this line indicated at 22W to 26W and at 18W to 20W. The comments on the results from Line 12N regarding depth of cover would apply here as well, although the response centered between 26W and 24W may be more significant as the anomaly pattern suggests a source at depth.

Line 0

The possible deep anomaly at 14W to 18W may correlate with

the weak response between 26W and 24W on Line 4N. The suggestion of a source at depth renders these weak anomalies of some significance. On the eastern portion of the line the resistivity values are somewhat higher, as was the case on Line 4N. This would suggest either a decrease in thickness of gravel cover, or a change in rock type, or possibly a change in alteration.

Line 4S

These results are essentially blank.

Line 16S

Weak, shallow, above background response is indicated from about 5E to 15E for which the above comments on Line 12N would apply. There is a definite increase in resistivity on the eastern portion of the line especially east of about 16E.

Line 18S

No anomalous effects were found on this line and the resistivity level is fairly high, except in the interval from about 4E to 12E.

Line 20S

These results are similar to those obtained on the preceding line except for a probable anomaly at the east end. The data should be extended to complete the anomaly pattern.

Line 22S

A zone of variable, weak IP effects occurs from 7E to 21E.

There is also a slight increase in the Metal Factor values at 31E that might represent an extension of the probable anomaly on the east end of Line 20S. This line should also be extended to the east.

Line 24S

Here there are anomalous effects from 6E to 28E; the magnitude is somewhat greater than on Line 22S but is still variable. The weak effects at 32E indicate that this line should be extended to the east as well. The anomaly at depth at 14E, and the broad zone from 18E to 24E would warrant further investigation.

Line 26S

On this line there are three separate anomalies of low magnitude, rather than a single variable zone. The data should be extended to the west to complete the pattern. The response between 15E and 19E would warrant further investigation.

Line 28S

These results are similar to Line 26S.

Line 32S

Weakly anomalous effects were measured throughout this traverse.

Line 36S

Anomalous effects occur from 16E to at least 26W on this line. The section from 8W to 26W is slightly higher in magnitude than on Line 32S,

however due to the uniformly low resistivities and generally low frequency effect response, the comments regarding gravel overburden on Line 12N would apply here.

Line 40S

Similar results were obtained here, with the strongest section of the zone between 4E and 6W.

Line 44S

The highest Metal Factor values measured on the grid occur at the west end of this line and the data should be extended to complete the pattern. As in the case of Line 36S and Line 40S, the comments made for Line 12N would apply here as well.

4. SUMMARY AND RECOMMENDATIONS

No strong anomalies were found on the Axel Property but there are weak IP effects on most of the traverses and these have been shown as possible and probable anomalies on the data plots and accompanying plan. In view of the nature of the anticipated mineralization (i.e. up to a few per cent chalcopyrite), relatively weak anomalies may be important as illustrated in the following Appendix (see results at Brenda).

Geological information supplied by the Company, as well as reference to G.S.C. regional geology map (Quesnel Map 12-1959), indicate that the main part of the property is covered by gravel till. The extreme eastern portion of the property is indicated as being underlain by the favourable intrusive rock. However, previous drilling on the lake has indicated

intrusive rock underlying the gravel till overburden. The survey results have indicated generally low values of Apparent Resistivity on the western and central portion of the property with increasing resistivity to the east. The high resistivities on the extreme eastern portion of the property are typical of those due to fresh granitic rock in British Columbia. The low resistivity values may be due to thick gravel cover, different rock type (the volcanics in the Highland Valley area generally exhibit low resistivities), or alteration and fracturing (increased porosity).

Most of the weak anomalies on the Axel Property occur in the central section and comprise a large variable zone. Before extensive drilling is planned in this area consideration should be given to the possible thickness of gravel till to determine if the weak responses are due to sources within the gravel or from the bed-rock below. The geological information supplied suggests that the alteration associated with the mineralization is generally weak and would not account for the low resistivities. Depending upon the above factors, these broad anomalous features (Line 36S or Line 40S) could be evaluated by drilling a series of widely spaced holes. The section should consist of vertical or inclined holes, depending upon the altitude of the fracture pattern.

The weakly anomalous zones on the eastern portion of the grid may be significant, especially since they occur in a resistivity environment similar to the Brenda Deposit (see appendix). In particular, incomplete anomaly patterns are indicated at the extreme east end of Line 20S, Line 22S and Line 24S, which would require extension of the effective survey coverage

to the east to be properly evaluated. The other similar area warranting further work would be the anomaly centered at depth under 14E and from 18E to 24E on Line 24S, as well as 15E to 19E on Line 26S.

The weak, above background responses in the northern portion of the grid do not correlate into well-defined zones and are questionable due to the generaly low resistivity and frequency effect response.

On completion of the preliminary drilling the geophysical results should be reviewed in an attempt to correlate the magnitude of the weak anomalies with the total sulphide content. This would then serve as a basis for more extensive drilling, if warranted by the preliminary results.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell,
Geologist.

David K. Fountain, P.Eng.,
Geophysicist.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. R. FOUNTAIN

Dated: September 18, 1969.

Expiry Date: April 25, 1970

ASSESSMENT DETAILS

PROPERTY: Axel Group

MINING DIVISION: Caribou

SPONSOR: Iso Exploration Ltd.

PROVINCE: British Columbia

LOCATION: McLeese Lake Area

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS:	52	DATE STARTED:	June 29, 1969
EQUIVALENT 8HR. MAN DAYS:	78	DATE FINISHED:	July 22, 1969
CONSULTING MAN DAYS:	3	NUMBER OF STATIONS:	300
DRAUGHTING MAN DAYS:	7	NUMBER OF READINGS:	1971
TOTAL MAN DAYS:	140	MILES OF LINE SURVEYED:	10.8

CONSULTANTS:
D. K. Fountain, 44 Highgate Road, Toronto 18, Ontario.
R. A. Bell, 50 Hemford Crescent, Don Mills, Ontario.

FIELD TECHNICIANS:
R. Alvarez, Plinio 354, Mexico 5, D. F.
R. Pearson, 7836 Bowcliffe Crescent, Calgary, Alberta.

HELPERS:
Glen Pearson, 7836 Bowcliffe Crescent, Calgary, Alberta.
W. Pilky, c/o McPhar Geophysics Limited, 139 Bond Avenue, Don Mills, Ontario.

DRAUGHTSMEN:
P. Coulson, 77 Peter Street, Markham, Ontario
Nora Lade, 1355 Lakefield Street, Oshawa, Ontario
Barbara Marr, 19 Kenewen Court, Toronto 16, Ontario

McPHAR GEOPHYSICS LIMITED

Robert A. Bell.

Robert A. Bell,
Geologist.

Dated: September 18, 1969

Declared before me at the City

of Vancouver, in the Province of British Columbia, this 28

day of November 1969

A Commissioner for Taking Affidavits within British Columbia
A Notary Public in and for the Province of British Columbia

- 10 -

PROPERTY: Axel Group

SPONSOR: Leo Exploration

LOCATION: McLeese Lake Area

TYPE OF SURVEY: Induced Polarization

CREDITED MAN DAYS:	52	DATE STARTED: June 29, 1969
EQUIVALENT 8HR. MAN DAYS:	78	DATE FINISHED: July 22, 1969
CONSULTING MAN DAYS:	9	NUMBER OF STATIONS: 300
DRAUGHTING MAN DAYS:	7	NUMBER OF READINGS: 1971
TOTAL MAN DAYS:	140	MILES OF LINE SURVEYED: 10.8

CONSULTANTS:

D. K. Fountain, 44 Highgate Road, Toronto 18, Ontario.
R. A. Dell, 30 Kenlord Crescent, Don Mills, Ontario.

FIELD TECHNICIANS:

R. Alvarez, Plinio 234, Mexico 5, D. F.
E. Pearson, 7836 Bowcliffe Crescent, Calgary, Alberta.

ASSISTED BY:

Glen Pearson, 7836 Bowcliffe Crescent, Calgary, Alberta.
T. Pilly, c/o McPhar Geophysics Limited, 139 Nord Avenue, Don Mills, Ontario.

DRAUGHTSMEN:

P. Coulson, 77 Peter Street, Markham, Ontario
Nora Lade, 1855 Lakefield Street, Ottawa, Ontario
Barbara Marr, 19 Keewaydin Court, Toronto 18, Ontario

McPHAR GEOPHYSICS LIMITED

Robert A. Bell,
Geologist.

Dated: September 18, 1969

Details re field crew wage rates, gross earnings and living expenses.

- Mr. R. Pearson

Salary rate - $250.00 per month plus $20.00 per working day or $10.00 per travel or standby day plus expenses.

Period worked - June 29 - July 22, 1969.

Gross earnings - $740.00

Value of meals and accommodation - $369.32

- Mr. R. Alvarez

Salary rate - $500.00 per month plus expenses.

Period worked - As above.

Gross earnings - $388.00

Value of meals and accommodation - $369.32

- Mr. G. Pearson

Salary rate - $200.00 per month plus $12.00 per working day or $6.00 per travel or standby day plus expenses.

Period worked - As above.

Gross earnings - $402.32

Value of meals and accommodation - $369.32

- Mr. W. Pilky

Same as G. Pearson.

Declared before me at the City

of Vancouver, in the

Province of British Columbia, this 28

day of November 1969 A.D.

Joan Turner

A Commissioner for taking Affidavits within British Columbia
A Notary Public in and for the Province of British Columbia

SUB-MINING RECORDER

STATEMENT OF COST

Axel Group - Iso Explorations Limited

Crew (2 men)

13 days Operating		@ $240.00/day	$3,120.00
2 days Travel	)		
1 1/2 days Bad Weather	) 6 days	@ $ 85.00/day	510.00
2 1/2 days Standby	)		
Extra Labour at cost		$804.64	
+ 20%		160.93	
			965.57

Expenses

Transportation - Air	$	299.16	
Vehicle Expense		635.95	
Rented Vehicles		168.00	
Taxis		8.00	
Freight and Brokerage		317.55	
Meals and Accommodation		1,477.29	
Telephone and Telegraph		22.34	
Supplies		71.92	
			3,000.21
	+ 10%		300.02
			$7,895.80

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

Robert A. Bell,
Geologist.

Dated: September 18, 1969

STATEMENT OF COST

Axel Group - Iso Explorations Limited

Crew (2 men)

13 days Operating	@ $240.00/day	$3,120.00
2 days Travel) 1 1/2 days Bad Weather) 6 days 2 1/2 days Standby)	@ $ 85.00/day	510.00
Extra Labour at cost	$804.64	
+ 20%	160.93	
		965.57

Expenses

Transportation - Air	$ 259.16	
Vehicle Expense	635.95	
Rented Vehicles	168.00	
Taxis	8.00	
Freight and Brokerage	317.55	
Meals and Accommodation	1,477.29	
Telephone and Telegraph	22.34	
Supplies	71.92	
		3,000.21
	+ 10%	300.02
		$7,595.80

McPHAR GEOPHYSICS LIMITED

Robert A. Bell,
Geologist.

Dated: September 18, 1969

Declared before me at the City of Vancouver, in the Province of British Columbia, this 28 day of November 1969 A.D.

A Commissioner for taking Affidavits within British Columbia
A Notary Public in and for the Province of British Columbia

SUB-MINING RECORDER

CERTIFICATE

I, Robert Alan Bell, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 50 Hemford Crescent, Don Mills, (Toronto) Ontario.

2. I am a graduate of the University of Toronto in Physics and Geology with the degree of Bachelor of Arts (1949); and a graduate of the University of Wisconsin in Economic Geology with the degree of Ph. D. (1953).

3. I am a member of the Society of Economic Geologists and a fellow of the Geological Association of Canada.

4. I have been practising my profession for over fifteen years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Iso Explorations Limited or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto
This 18th day of September 1969

Robert A. Bell.
Robert A. Bell, Ph. D.

CERTIFICATE

I, David Kirkman Fountain, of the City of Toronto, Province of Ontario, do certify that:

1. I am a geophysicist residing at 44 Highgate Road, Toronto 18, Ontario.

2. I am a graduate of the University of Toronto with a Bachelor of Applied Science Degree in Engineering Physics (Geophysics).

3. I am a member of the Society of Exploration Geophysicists, the European Association of Exploration Geophysicists and the Canadian Instituted of Mining and Metallurgy.

4. I am a registered Professional Engineer in the Province of British Columbia and Ontario, and have been practising my profession for eight years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Iso Explorations Limited or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto
This 18th day of September 1969

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

David Kirkman Fountain, A.B.N.A. Sc. P. Eng.

Expiry Date: April 25, 1970

McPHAR GEOPHYSICS

APPENDIX

EXPECTED IP ANOMALIES FROM "PORPHYRY COPPER" TYPE ZONES OF DISSEMINATED SULPHIDE MINERALIZATION

Our experience in other areas has shown that the induced polarization method can be successfully used to locate, and outline, zones of disseminated sulphide mineralization of the "porphyry copper" type. In most cases the interpretation of the IP results is simple and straightforward. The results shown in Figure 1 and Figure 2 are typical.

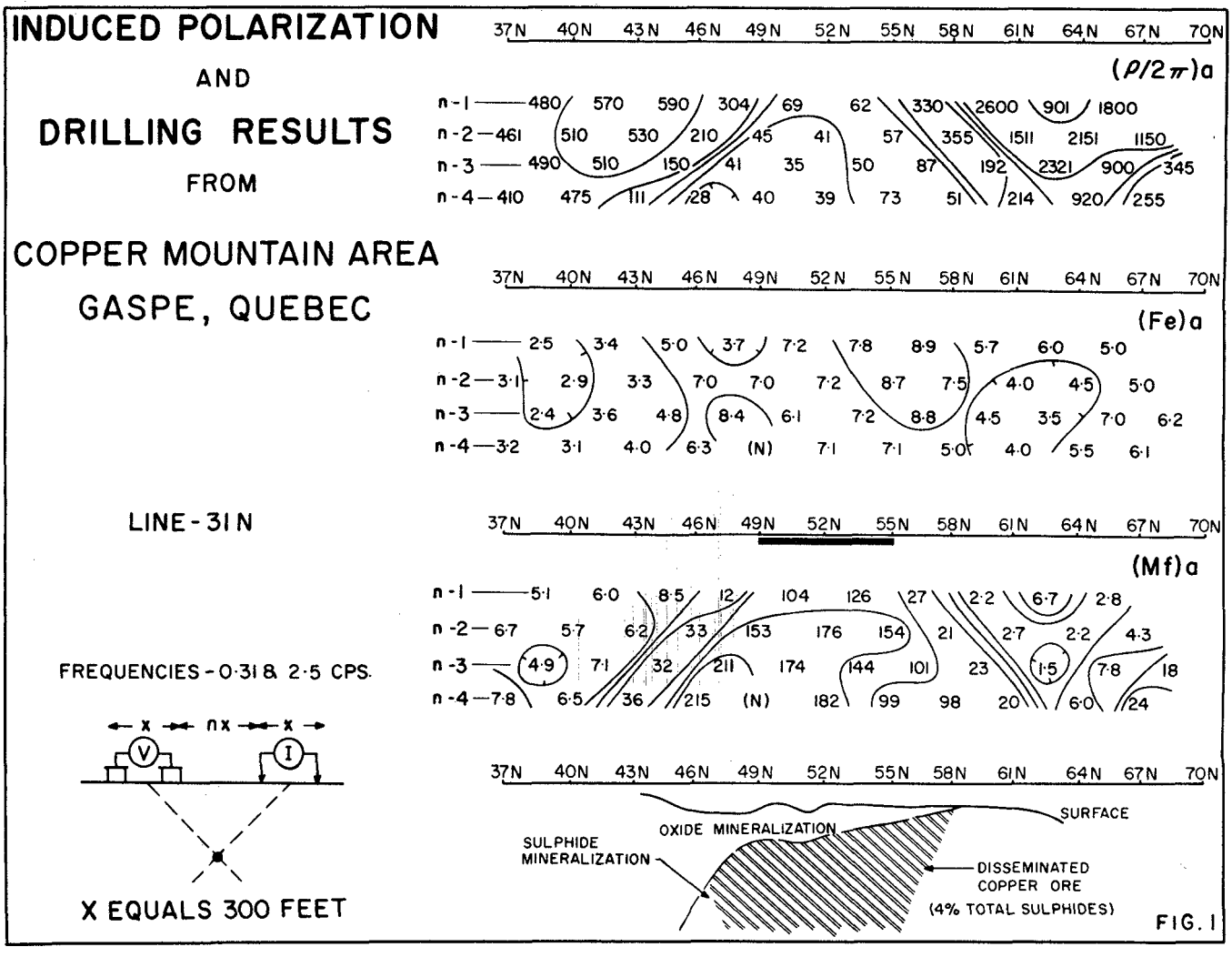


FIG. 1

The source of the moderate magnitude IP anomaly shown in Figure 1 contains approximately 4% metallic mineralization. The zone is of limited lateral extent and enough copper is present to make the mineralization "ore grade". The presence of the surface oxidation can be seen in the fact that the apparent IP effects increase for n = 2.

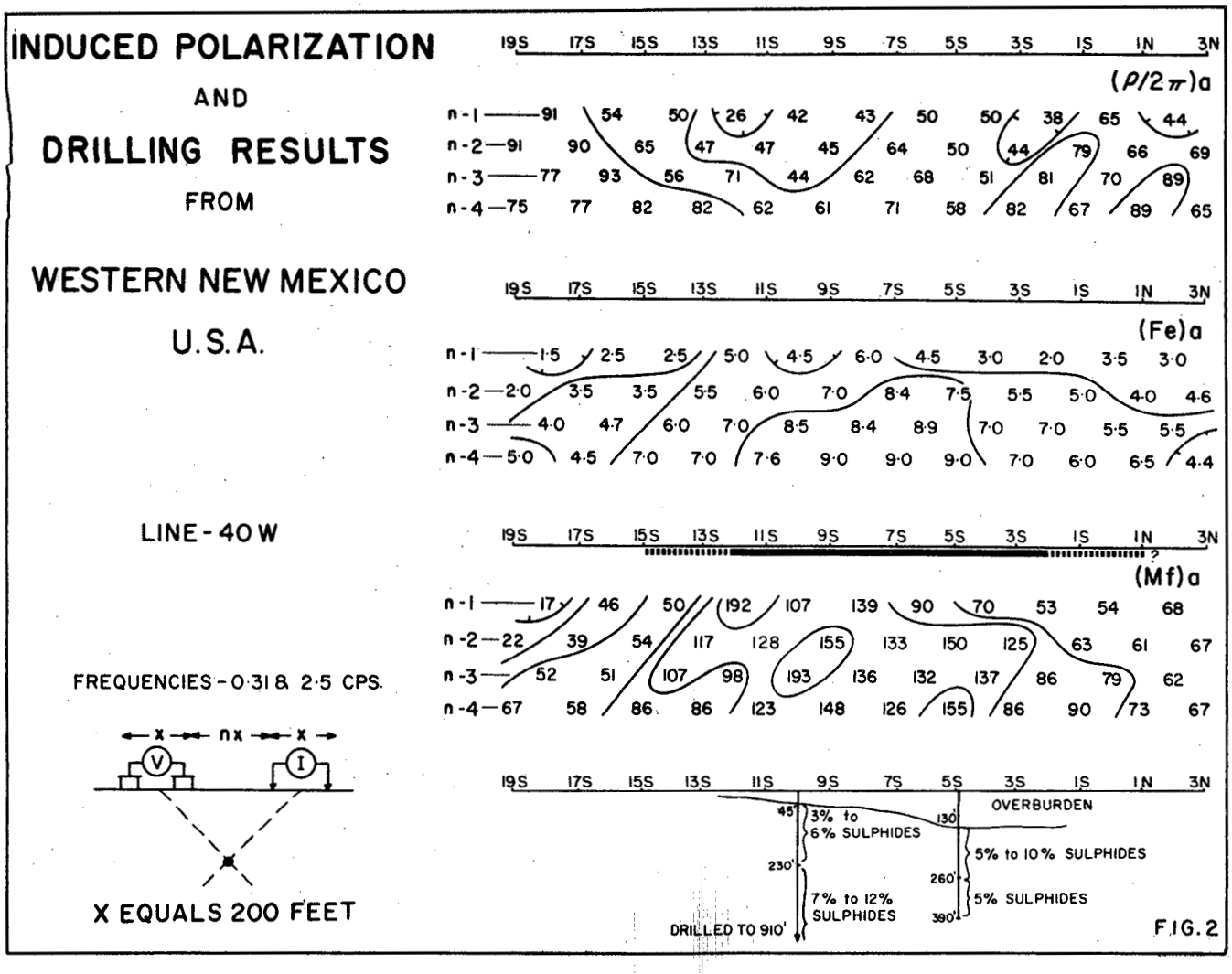


FIG. 2

The IP anomaly shown in Figure 2 has about the same magnitude as that described above. It should be noted that appreciably greater concentrations of metallic mineralization are present; further, there is little or no copper present. These results illustrate the fact that IP results can not be used to determine the exact amount of metallic mineralization present or to determine the economic importance of a mineralized zone. In some geologic situations zoning is present; the zones of mineralization of greatest economic value may contain less total metallic mineralization than other zones in the same general area.

In the proper geologic environment, the method will detect even very low concentrations of metallic mineralization. The IP results shown in Figure 3 located the ore zone at the Brenda Property near Peachland, B.C. The zone contains 1.0 to 1.5 per cent metallic mineralization; however, the mineralization is "ore grade" because only molybdenite and chalcopyrite are present.

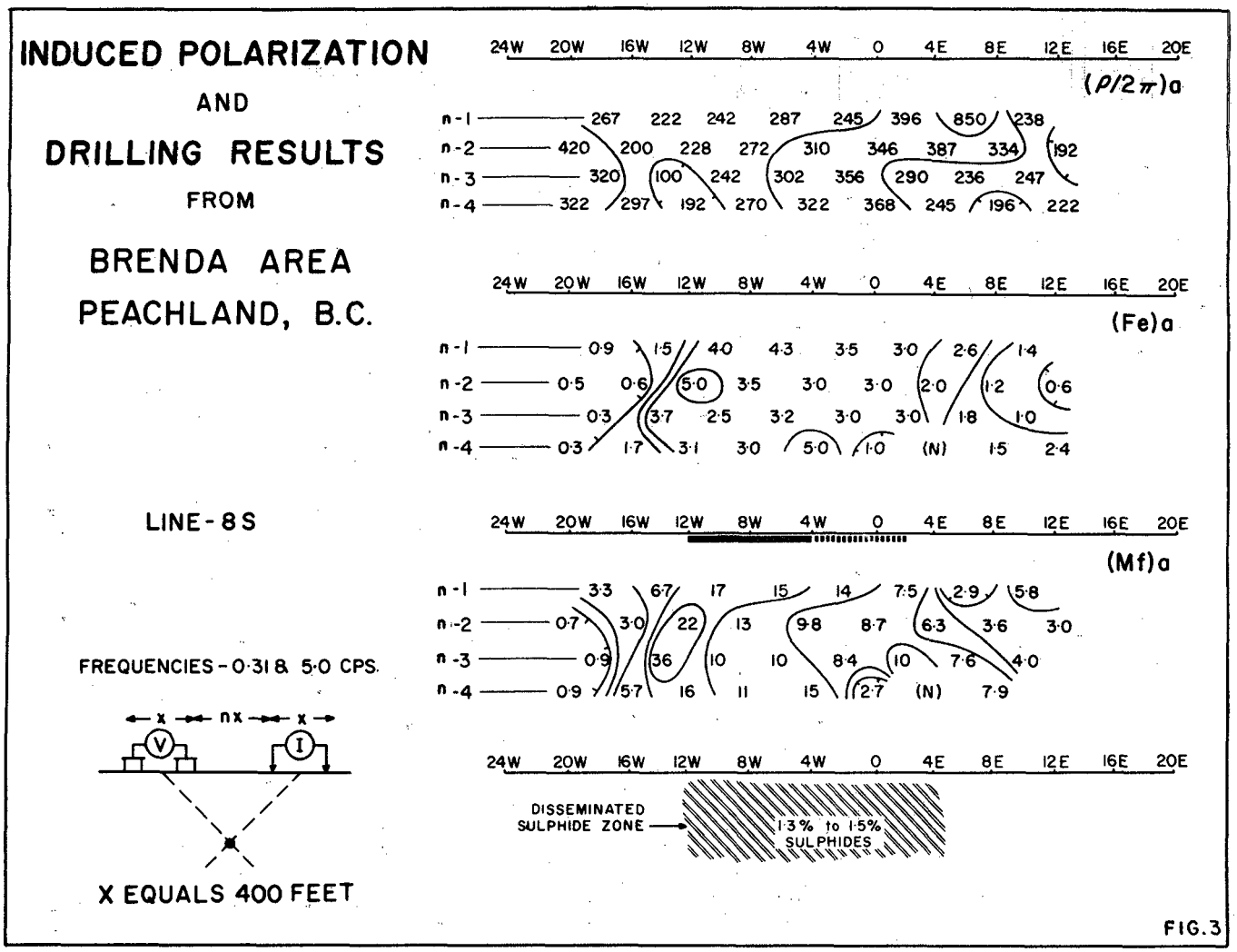
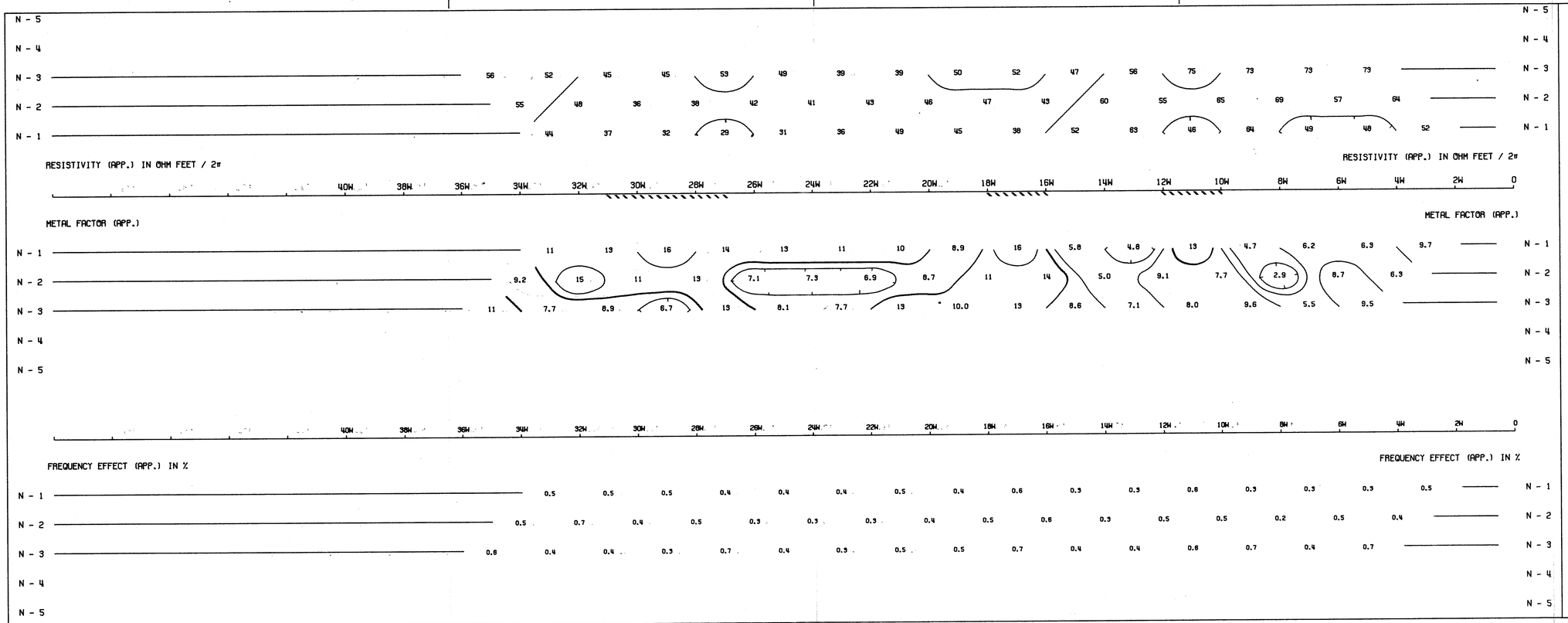


FIG. 3



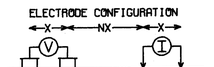
DWG. NO.- I.P.- 5317-I

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 12N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

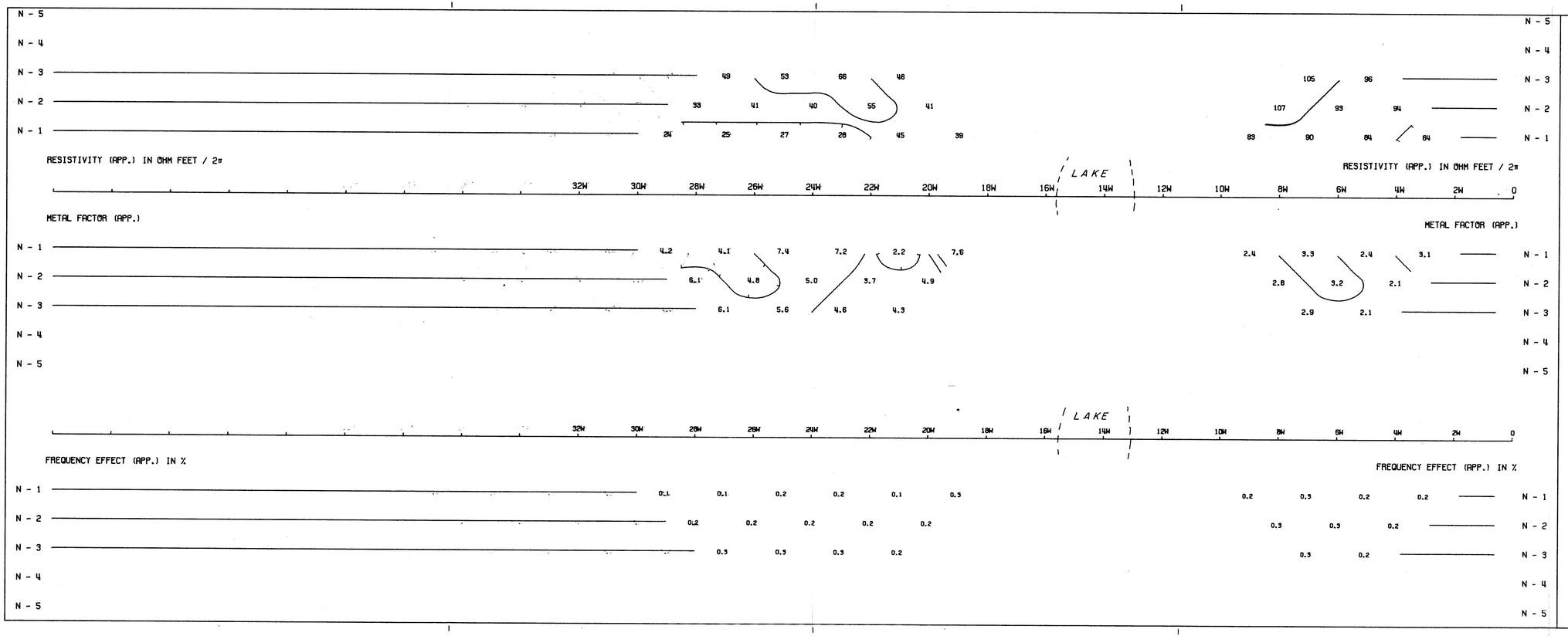
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN
Expiry Date, April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



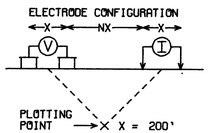
DWG. NO.- I.P.-5317-2

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 8N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

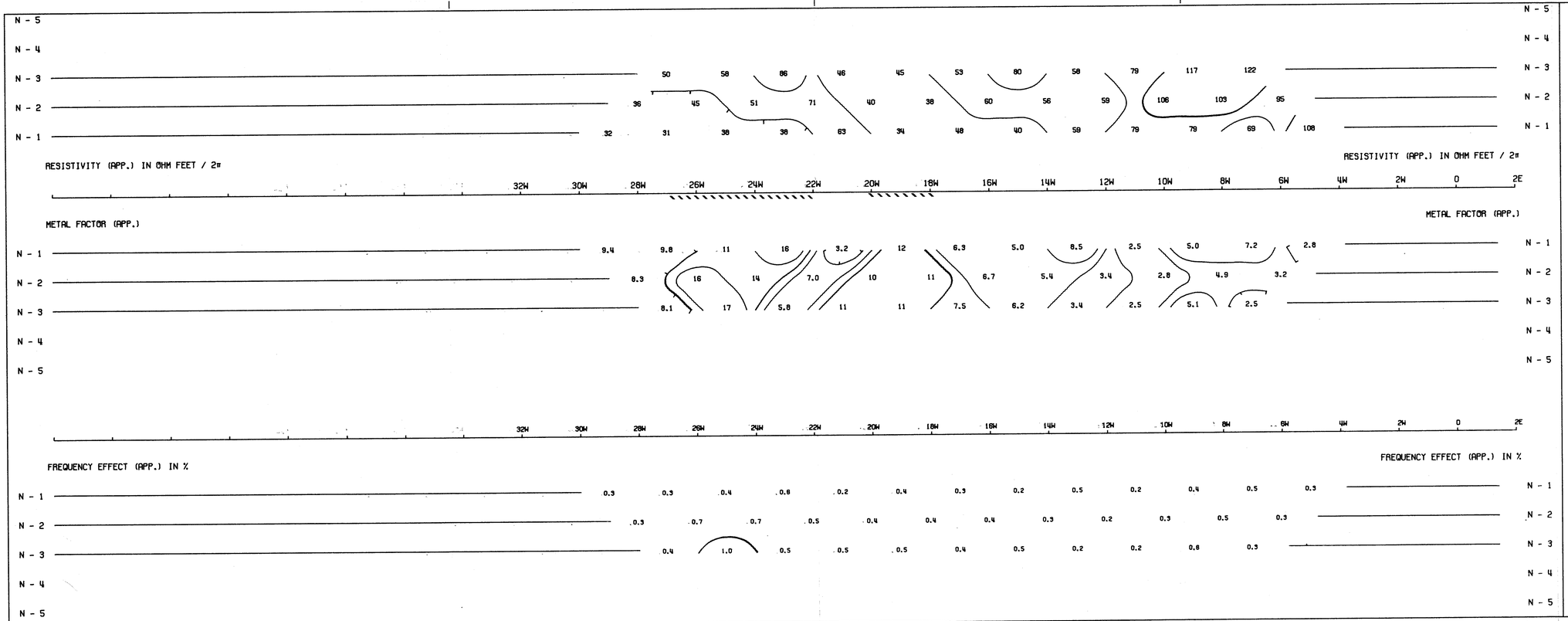
Expiry Date: April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



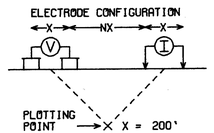
DWG. NO.- I.P.-5317-3

ISØ EXPLØRATIØNS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 4N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

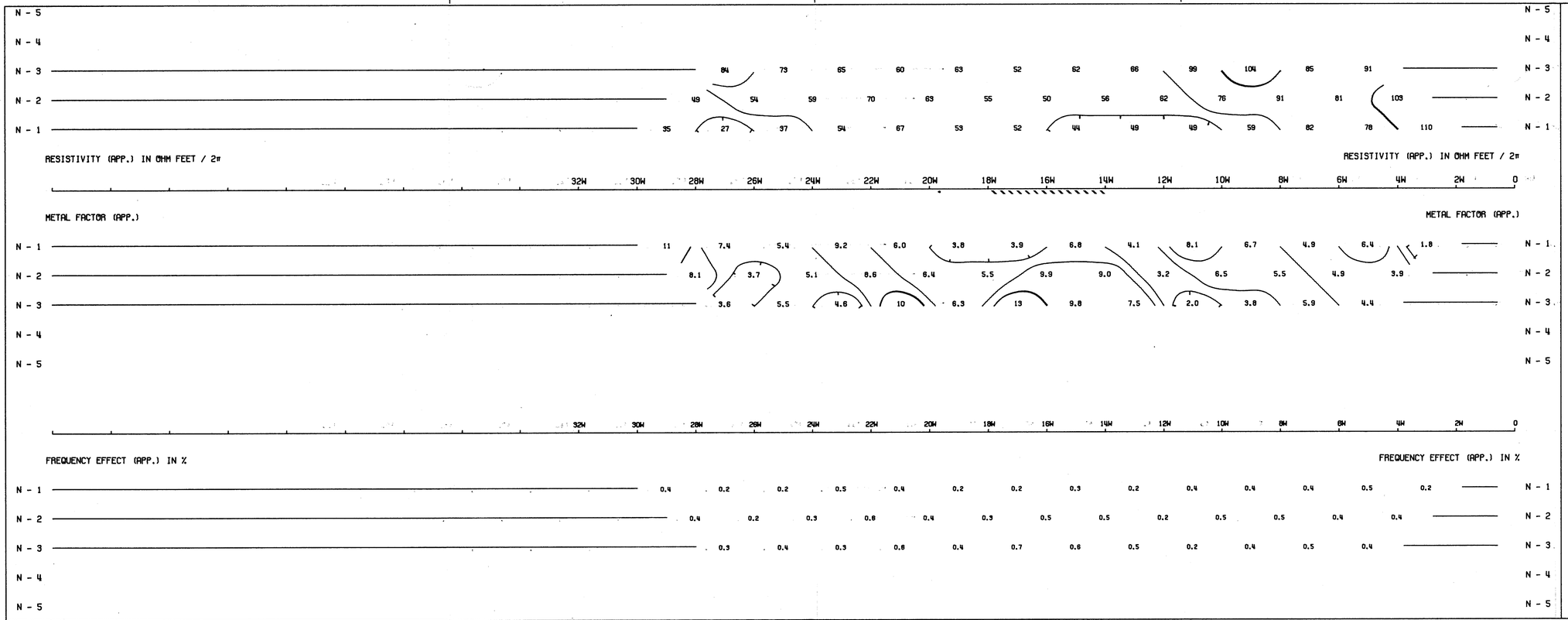
Expiry Date: April 24, 1970

2149

McPHAR GEØPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



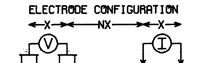
DWG. NO.- I.P.-5317-4

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 00

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

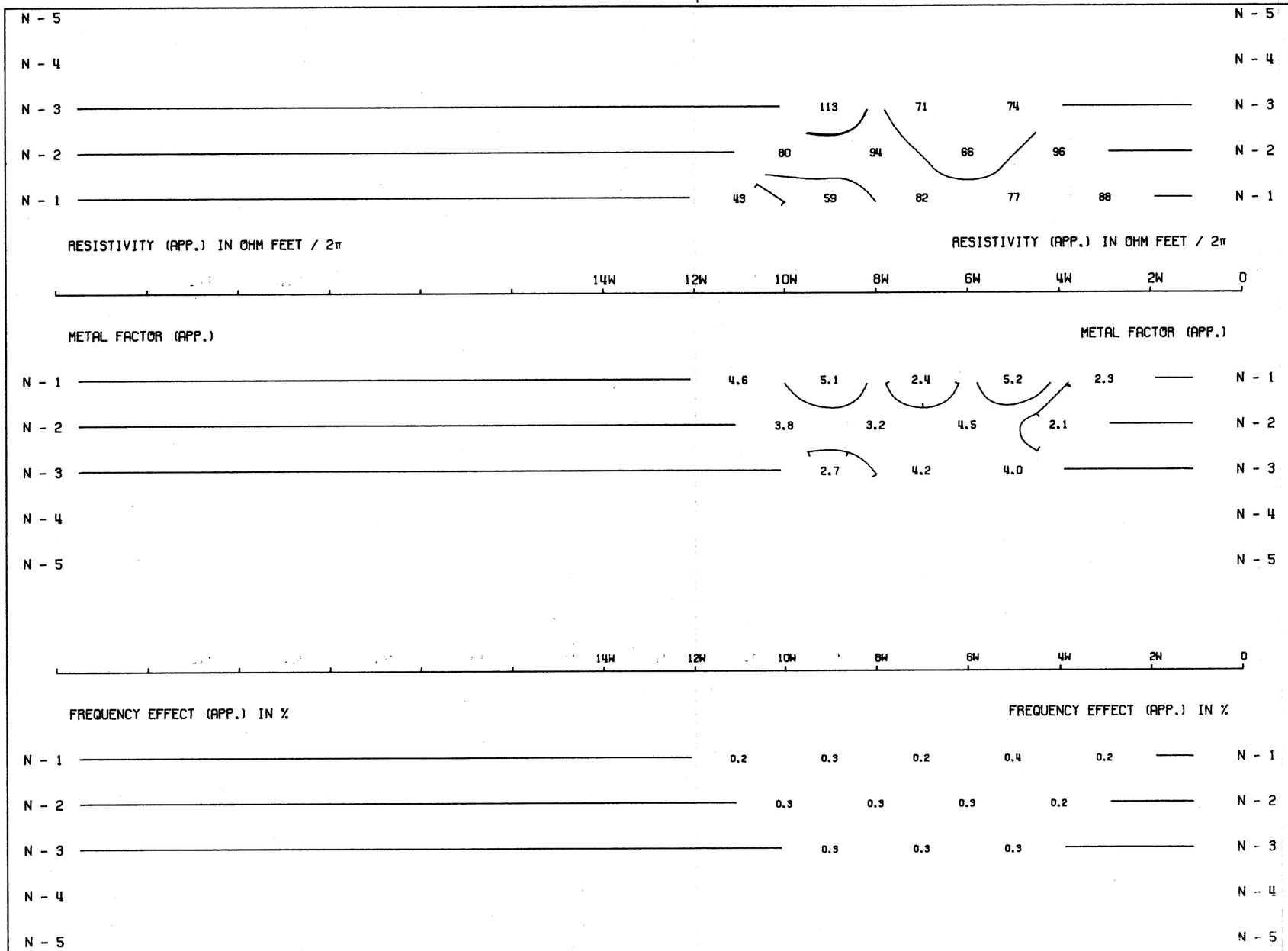
2149

Expiry Date: April 25, 1970

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



DWG. NO.- I.P.-5317-5

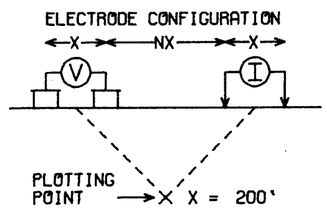
ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA

CARIBOU M.D., B.C.

LINE NO.- 4S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬

PROBABLE ▪▪▪▪▪▪▪▪▪▪▪▪

POSSIBLE ////////

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED: Karl K. Fountain

DATE: Sept 10/69

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

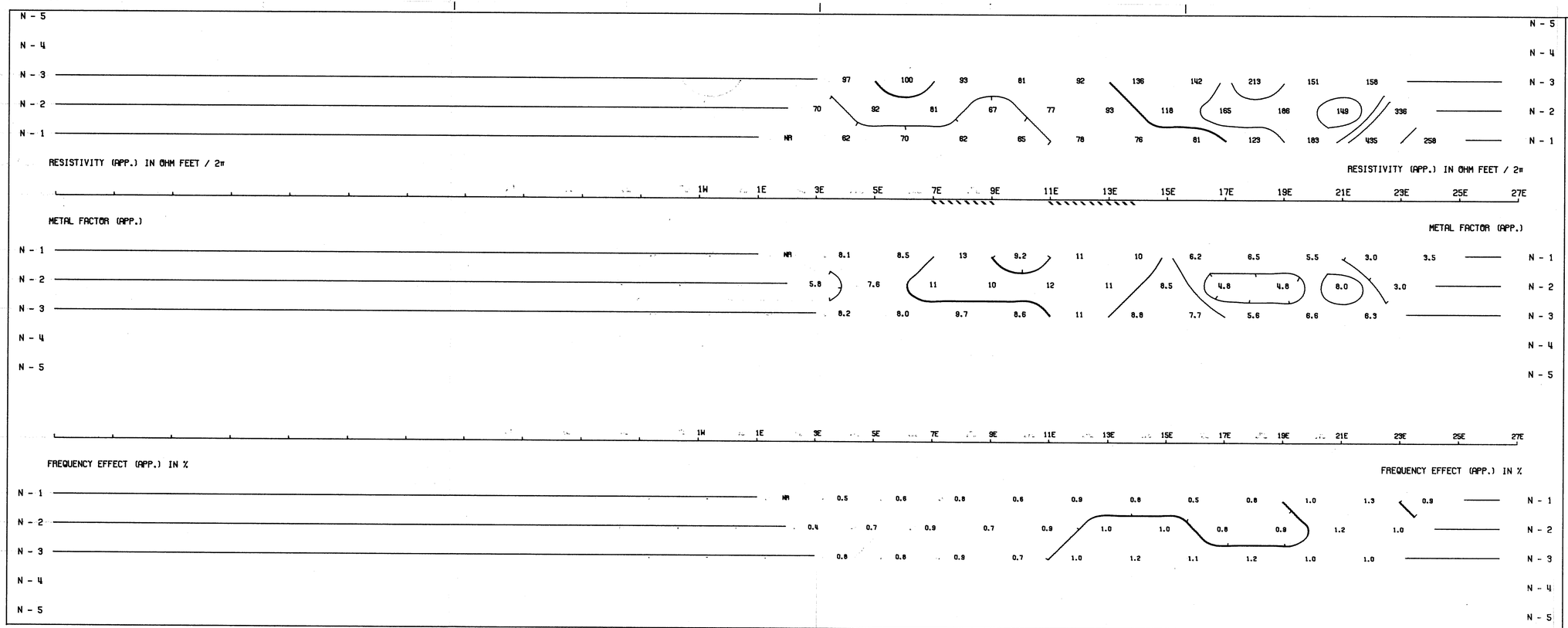
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D.K. FOUNTAIN
Expiry Date: April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



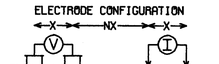
DWG. NO.- I.P.-5317-6

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 16S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED

DATE

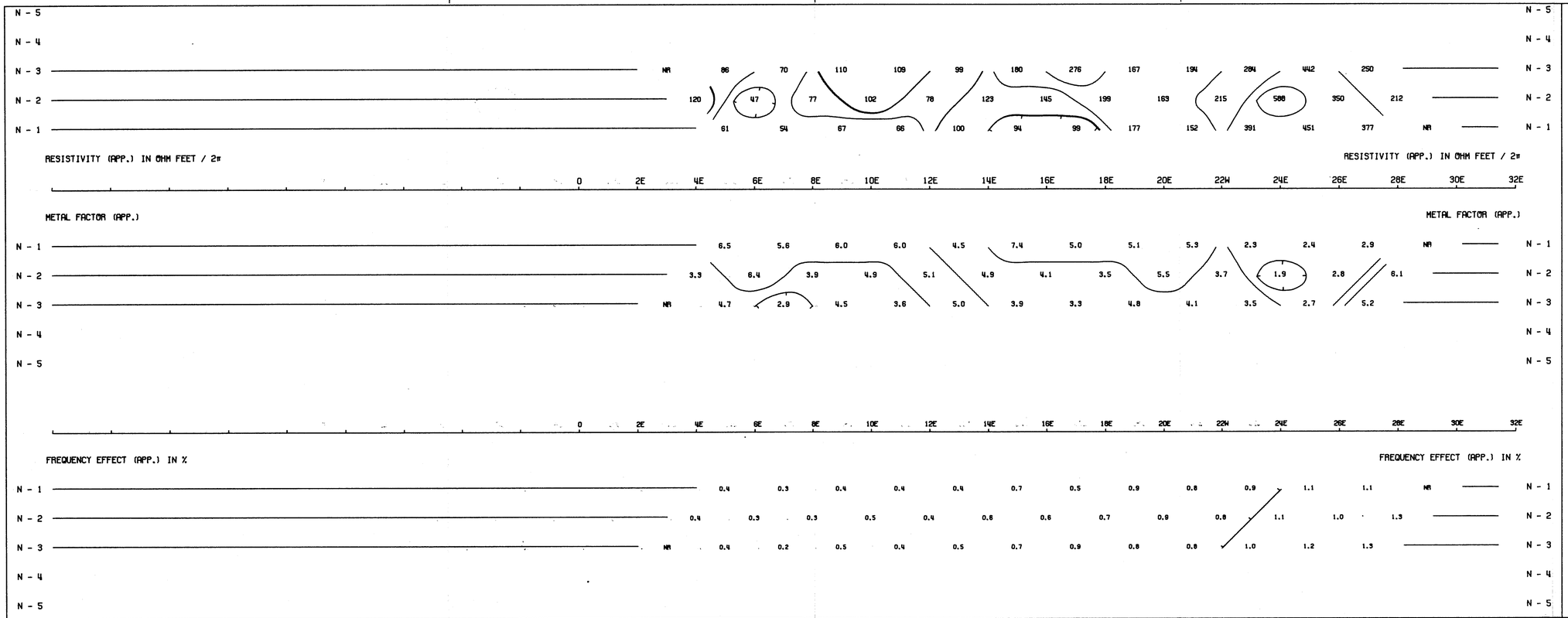
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN
Registered
Expiry Date. April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



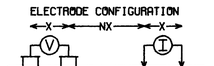
DWG. NO.- I.P.-5317-7

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 18S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

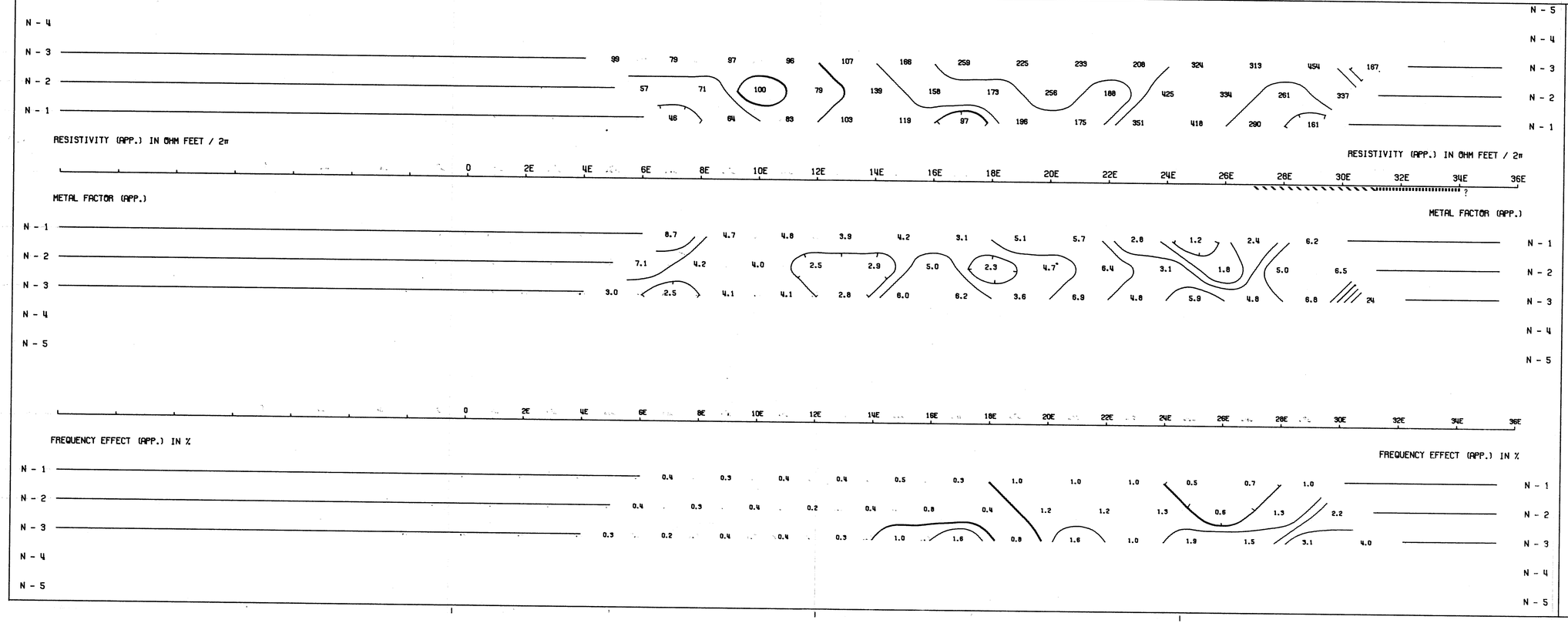
2149

Expiry Date: April 25, 1970

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



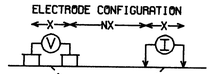
DWG. NO.- I.P.- 5317-8

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 20S

ELECTRODE CONFIGURATION



PLOTTING POINT → X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

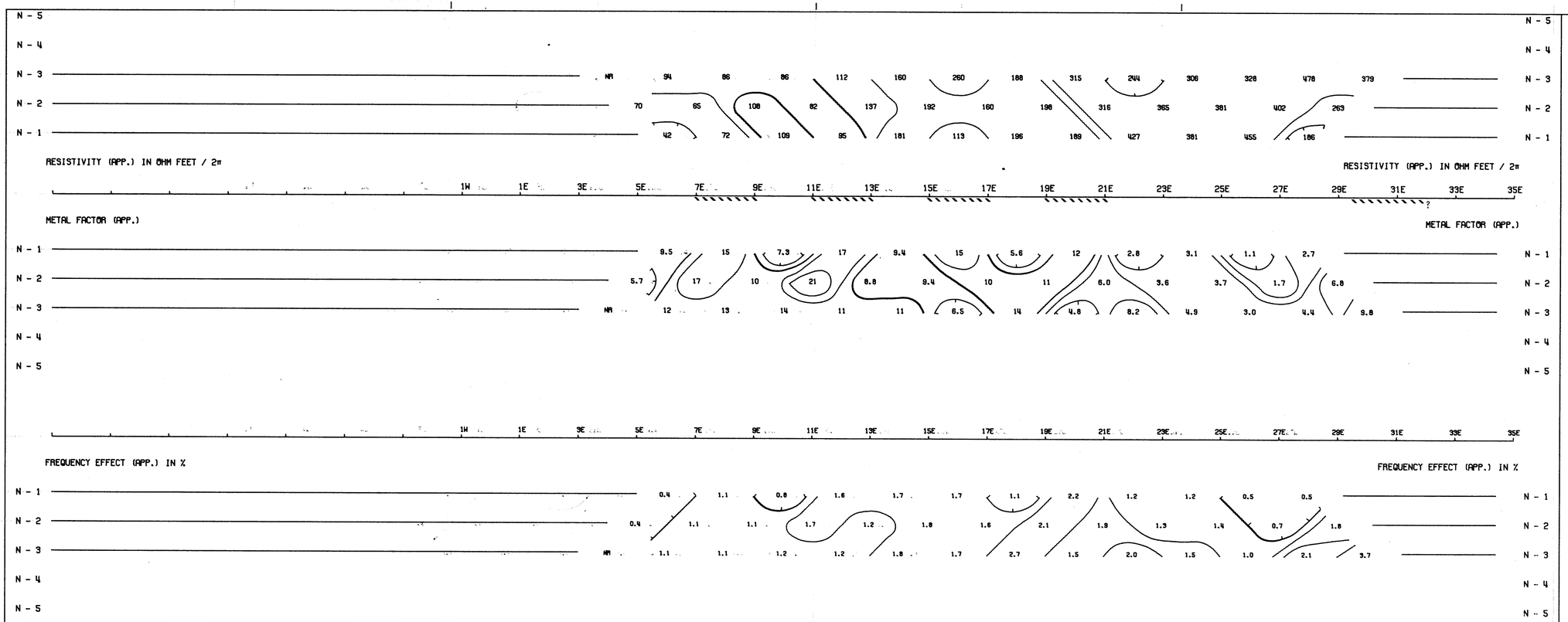
2149

Expiry Date: April 25, 1970

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



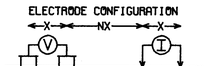
DWG. NO.- I.P.-5317-9

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 22S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED

DATE

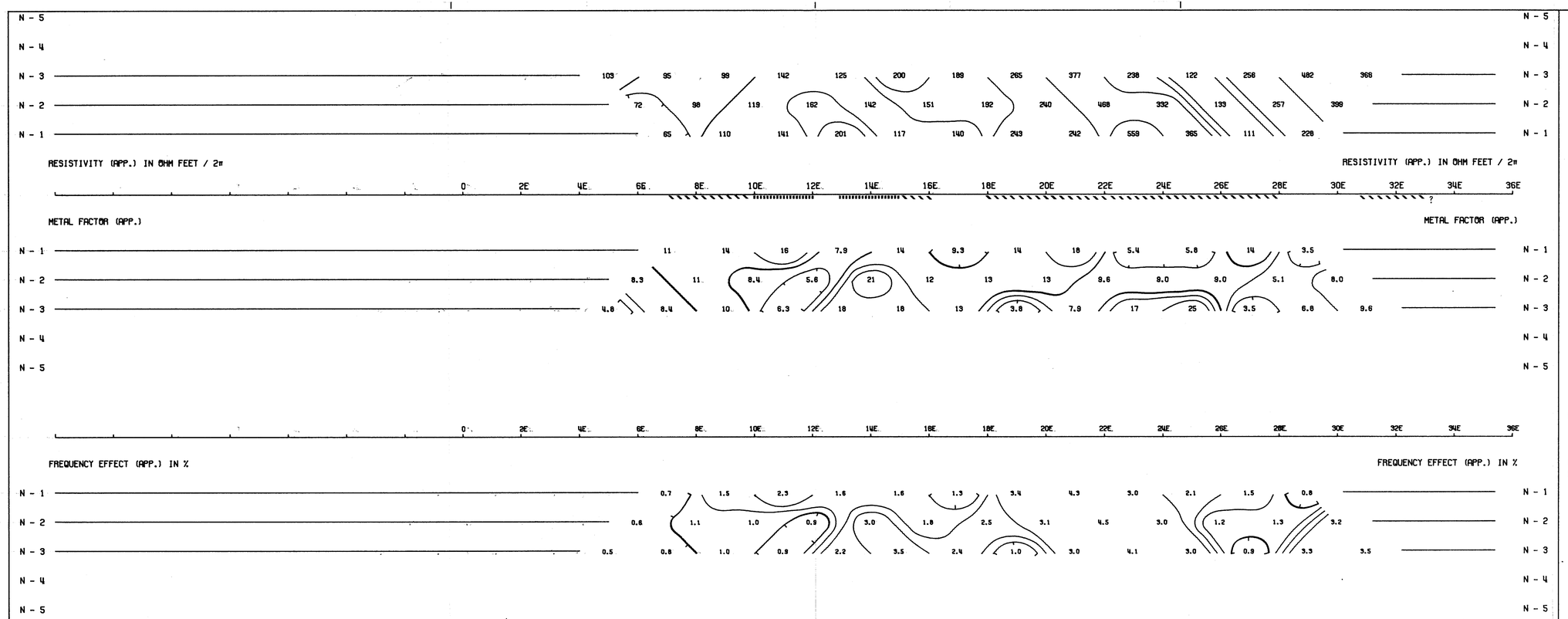
Expiry Date: April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



DWG. NO.- I.P.-5317-10

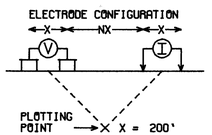
ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA

CARIBOU M.D., B.C.

LINE NO.- 24S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE

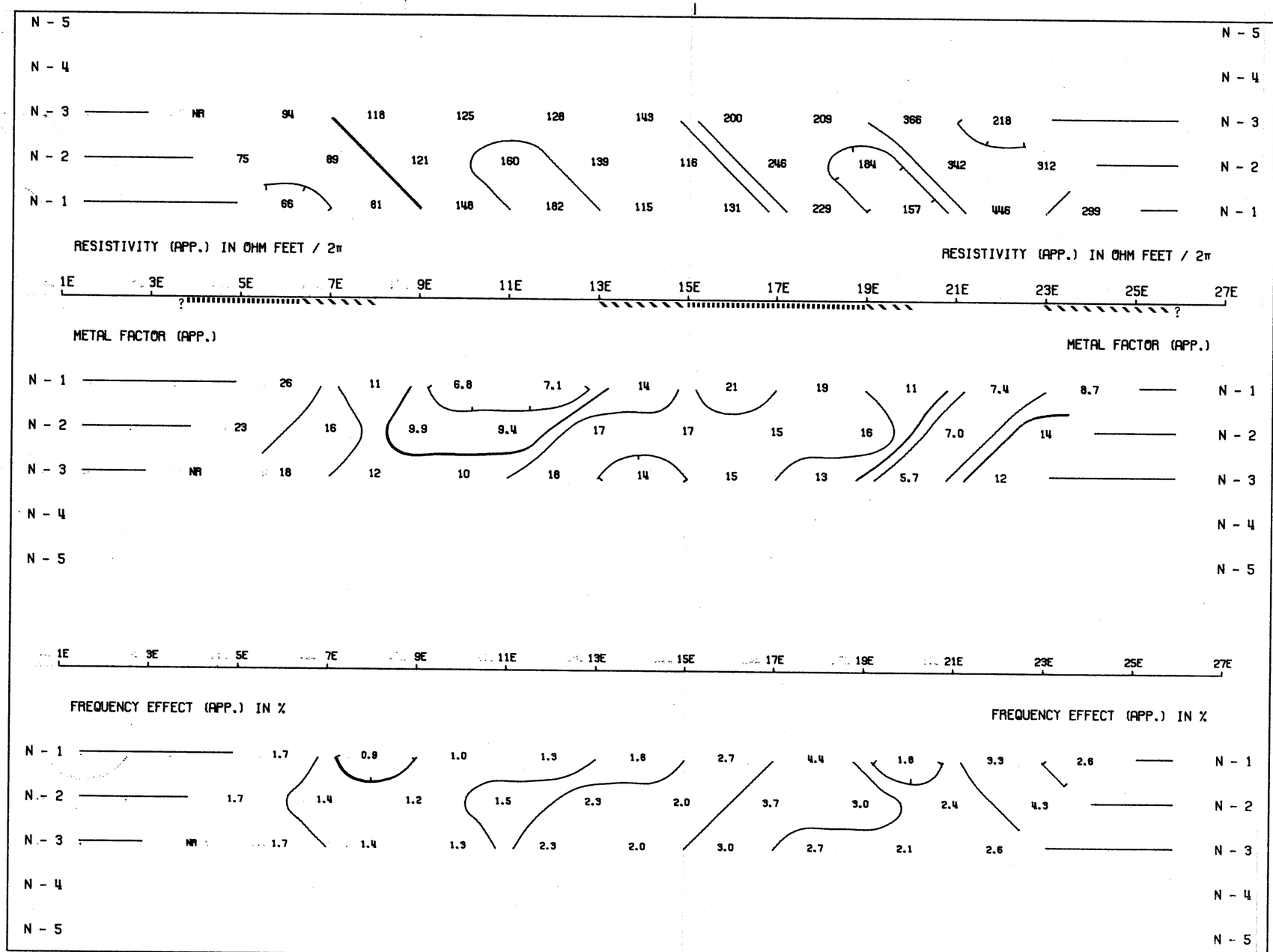
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN
Expiry Date: April 30, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



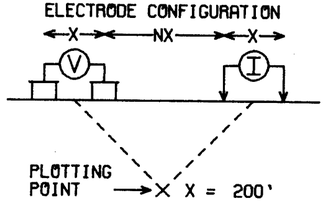
DWG. NO.- I.P.- 5317-11

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 26S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

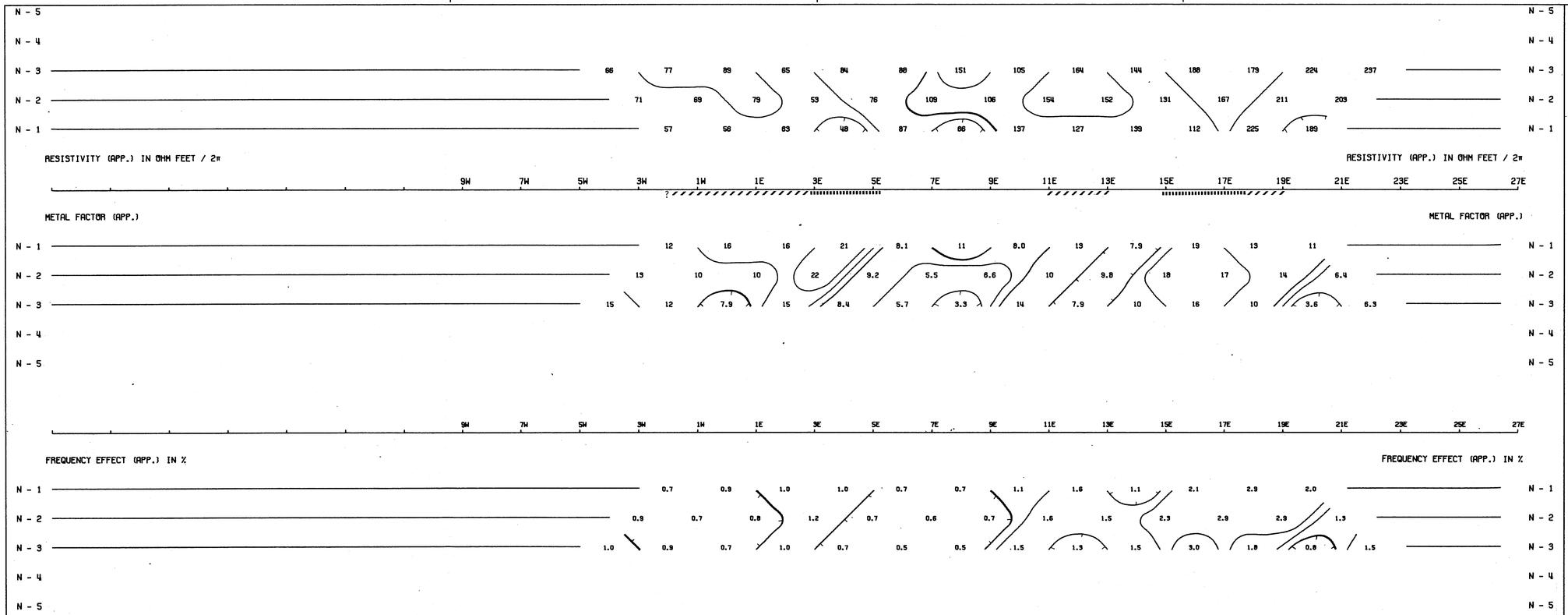
Expiry Date: April 30, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



DWG. NO.- I.P.-5317-12

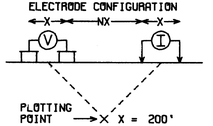
ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA

CARIBOU M.D., B.C.

LINE NO.- 28S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

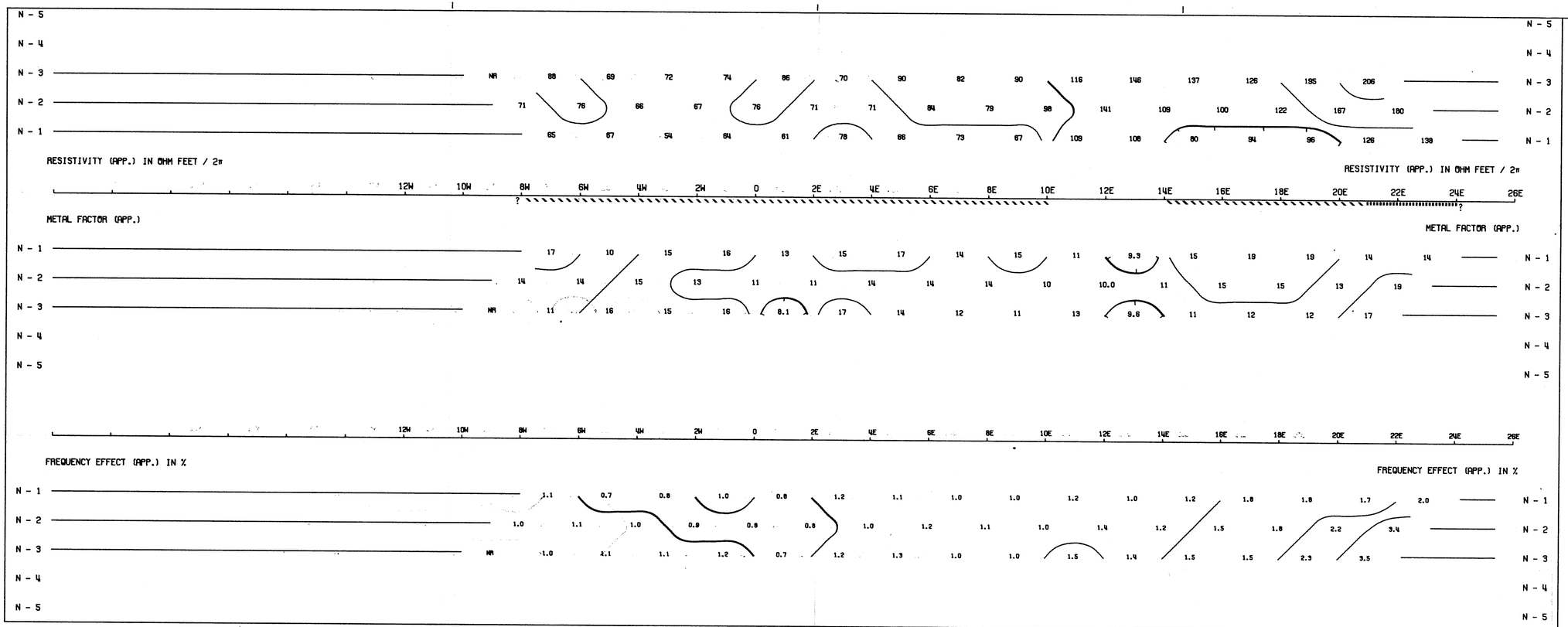
Expiry Date: April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



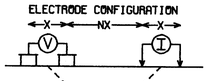
DWG. NO.- I.P.-5317-13

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 32S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

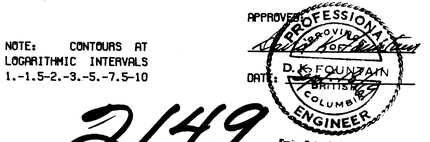
FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

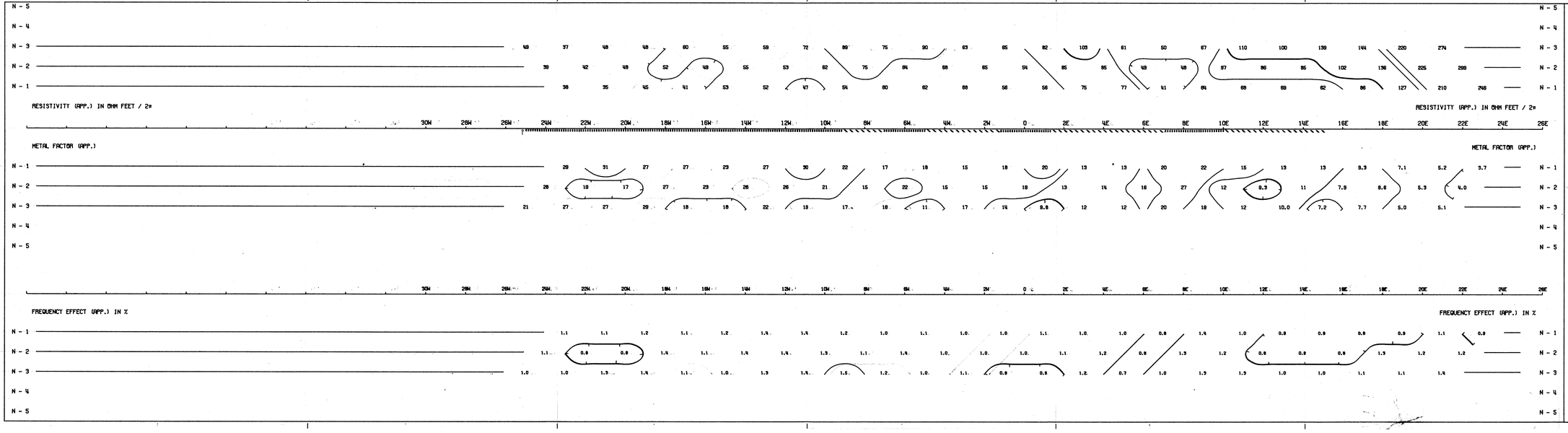


2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



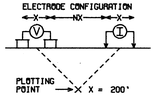
DWG. NO.- I.P.- 5317-14

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 36S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED: D.K. Fountain

DATE: APR 10/70

PROFESSIONAL ENGINEER PROVINCE OF ONTARIO D. K. FOUNTAIN

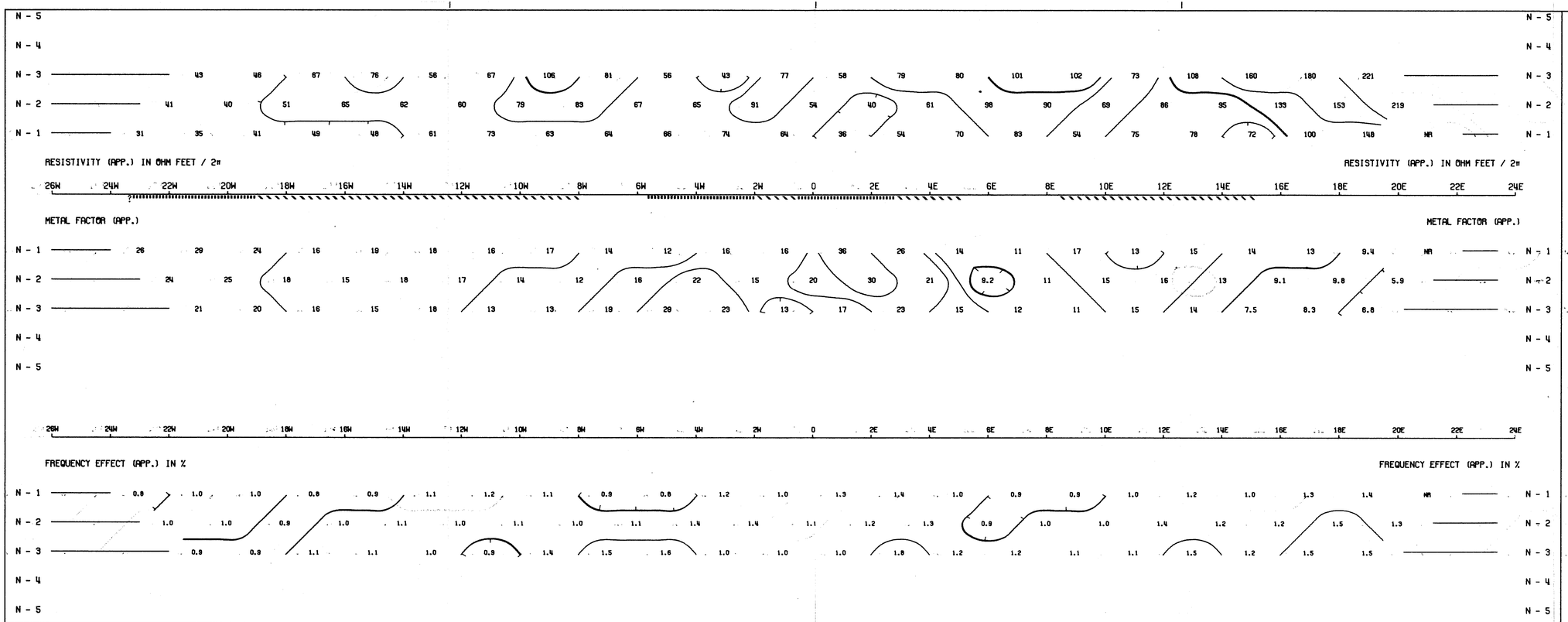
Expiry Date: April 25, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



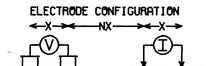
DWG. NO.- I.P.-5317-15

ISO EXPLORATIONS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 40S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED: D K FOUNTAIN

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

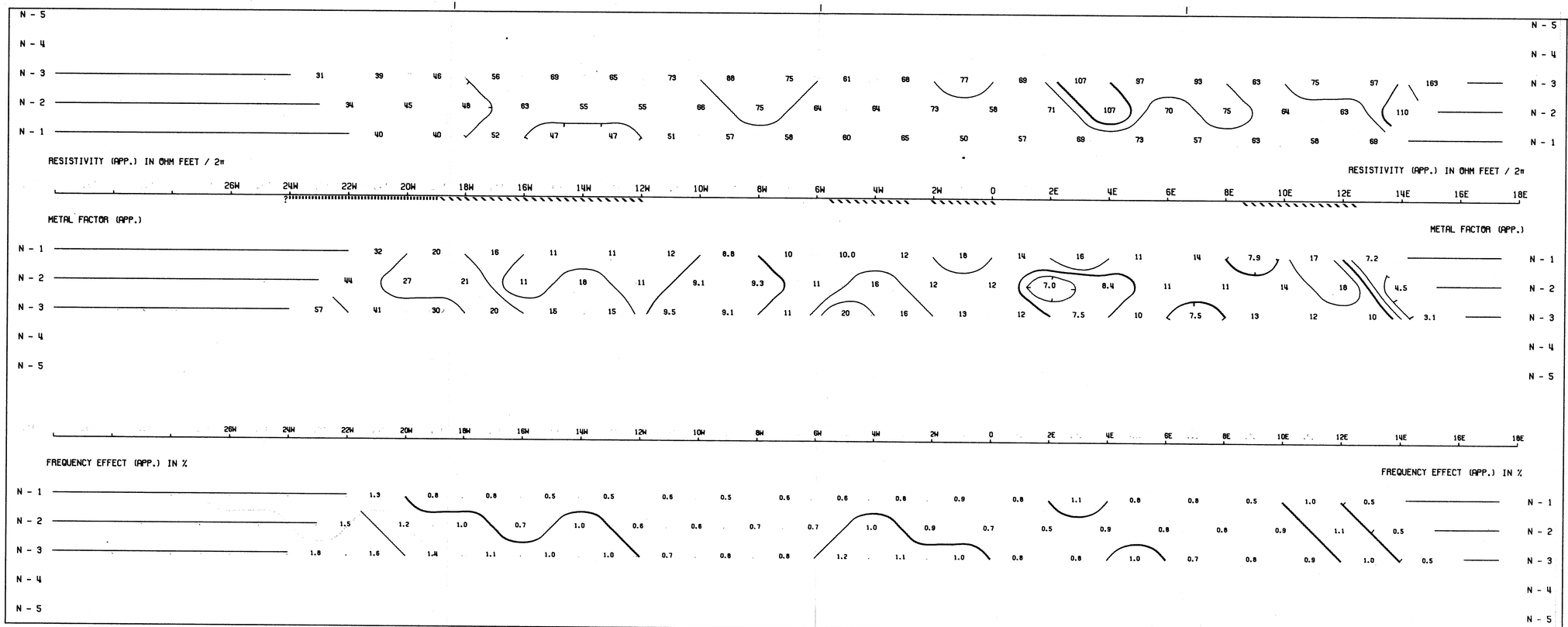
Expiry Date April 30, 1970

2149

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



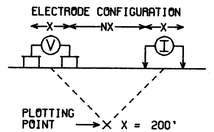
DWG. NO.- I.P.- 5317-16

ISØ EXPLØRATIØNS LTD.

AXEL GROUP, McLEESE LAKE AREA
CARIBOU M.D., B.C.

LINE NO.- 44S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: JUL 1969

APPROVED

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NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

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2149

McPHAR GEØPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

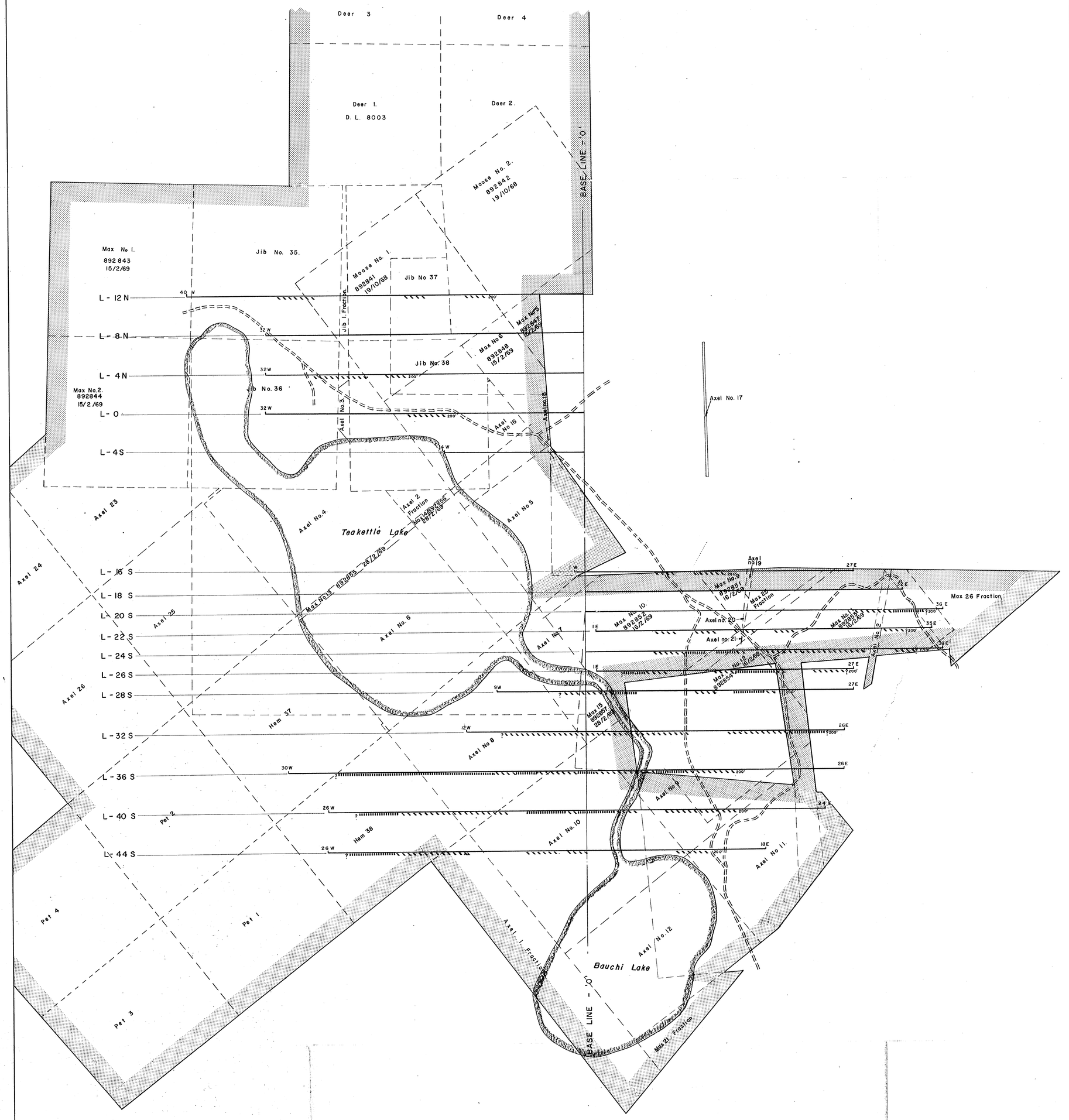
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

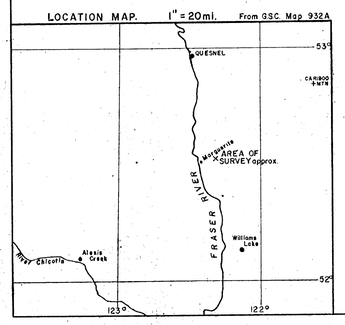
DWG. - I.P.P - 4525

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP





Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2149 MAP #1

NOTE -
TO ACCOMPANY GEOPHYSICAL REPORT
BY R. A. BELL AND D. K. FOUNTAIN, ON
THE AXEL GROUP, McLEESE LAKE AREA,
CARIBOU M.D. BRITISH COLUMBIA,
DATED SEPTEMBER 18th 1969

AXEL GROUP CLAIMS

Axel 1, 2 fraction
Axel 3-12, 16-26
Moose 1, 2
Max 1, 2, 5, 6, 8 - 16
Max 20, 21, 25-27 fraction
Jib 1. fraction
Jib 35 - 38
Hem 37, 38
Pet 1 - 4
Deer 1 - 4

N

SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE
Numbee at the end of anomaly
indicates spread used

I.S.O. EXPLORATIONS LIMITED

AXEL GROUP, McLEESE LAKE AREA, CARIBOU M.D., B.C.

SCALE

ONE INCH EQUALS FOUR HUNDRED FEET

AXEL GROUP BOUNDARY

2149

DRAWN
DATE
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PROFESSIONAL ENGINEER
PROVINCE OF
BRITISH
COLUMBIA
SEAL

Expiry Date April 25, 1970

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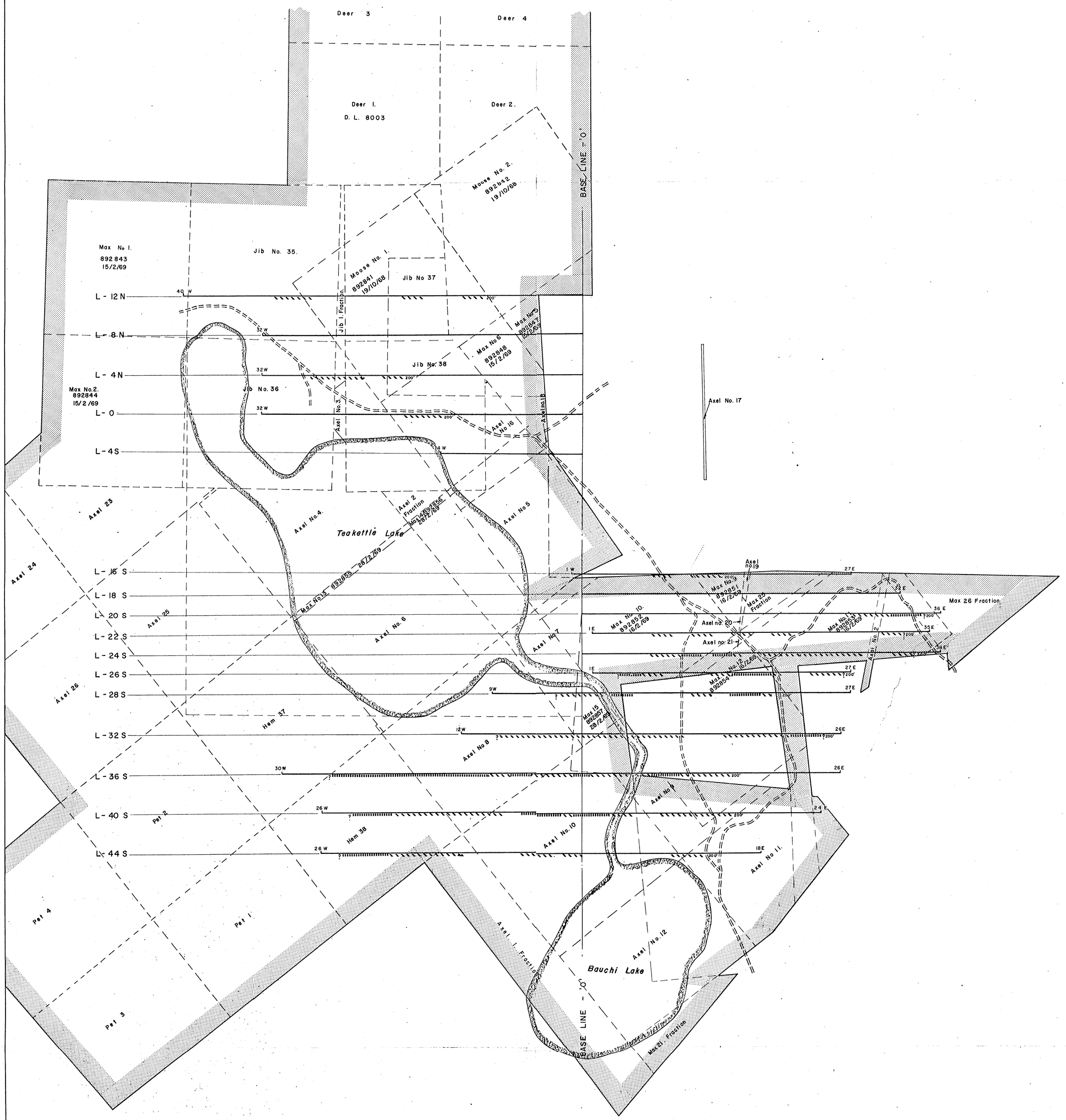
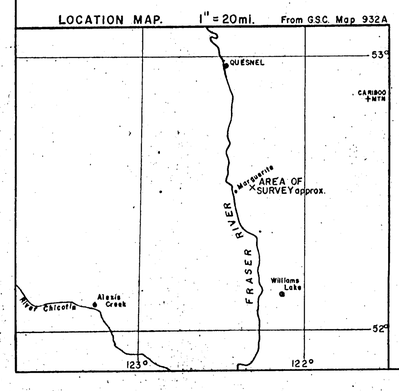
McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



LOCATION MAP. 1" = 20mi. From GSC. Map 932A



Department of
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I.S.O. EXPLORATIONS LIMITED

AXEL GROUP, McLEESE LAKE AREA, CARIBOU M.D., B.C.

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2149
map 1 duplicate copy

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PROFESSIONAL ENGINEER
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