'79-#134-# 7412

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY TEST SURVEY
ON THE
CY CLAIM GROUP
ATLIN MINING DIVISION
WEIR MOUNTAIN AREA, BRITISH COLUMBIA
FOR
MATTAGAMI LAKE MINES LTD.

104N/10W

7412

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MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7412
Part 1 OF 3

# PHOENIX GEOPHYSICS LIMITED

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

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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 cannot 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 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) betwen 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 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 at the top of the data profile, above the metal factor values. On a third line, below the metal factor values, are plotted the values of the percent frequency effect. 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 the 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.

The IP measurement is basically obtained by measuring the difference in potential or voltage ($\Delta V$) 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 ($\Delta V$) 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 noisy 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.

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

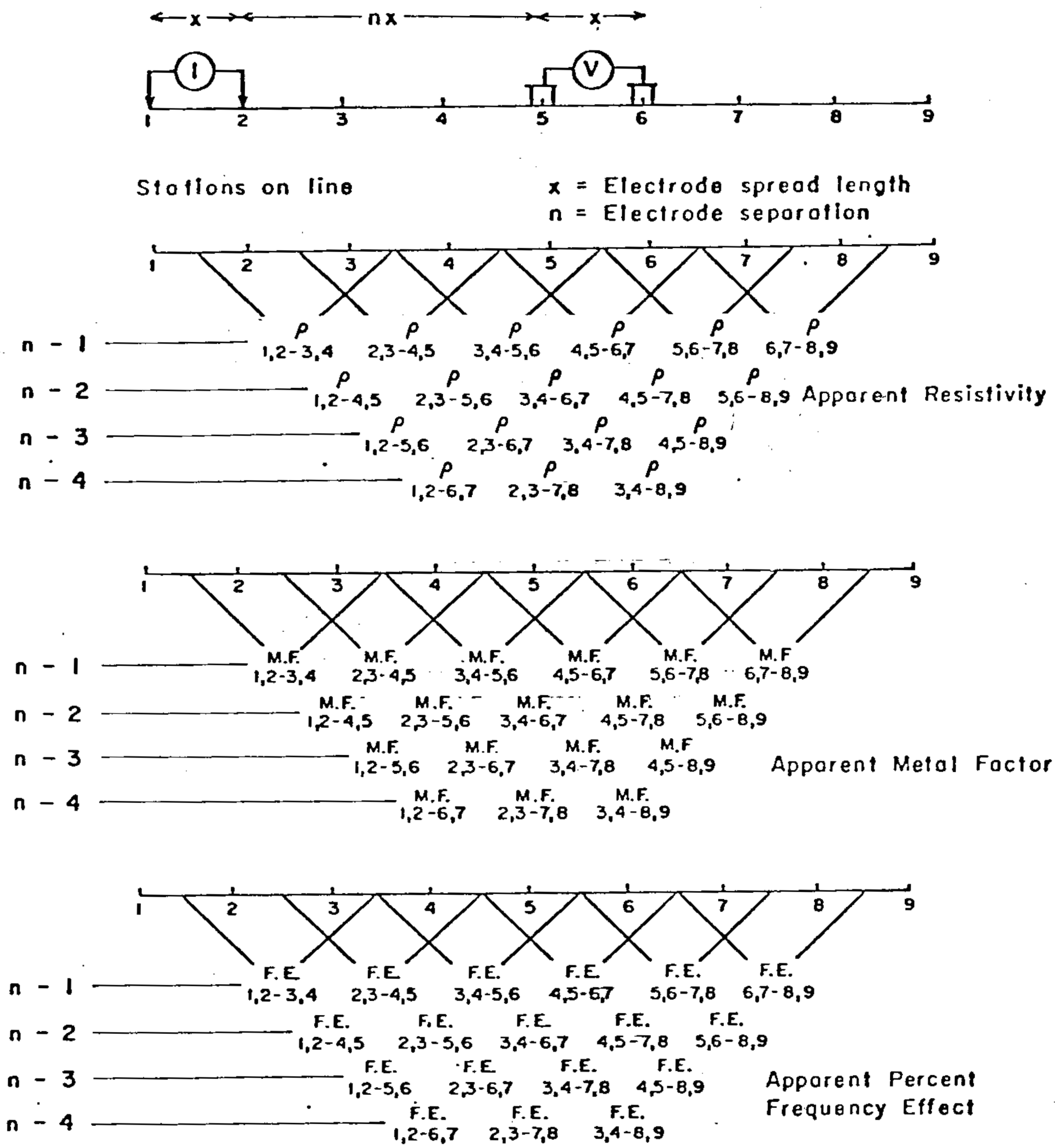


Fig. A

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REPORT ON THE

INDUCED POLARIZATION

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WEIR MOUNTAIN AREA, BRITISH COLUMBIA

FOR

MATTAGAMI LAKE MINES LTD.

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## 1. INTRODUCTION

At the request of Mattagami Lake Mines Ltd., we have complted a brief induced polarization and resistivity survey on the CY Claim Group. The work was initiated at the request of Mr. Franco Morra, Exploration Geologist with Mattagami Lake Mines Ltd.

The property is 25 miles in a direction North 60 East from the town of Atlin, B.C. The center of the property is located at $59^{o}40'N$ and $133^{o}20'W$. Access to the property is by helicopter from the town of Atlin.

The purpose of the survey was to attempt to determine the possible presence of metallic mineralization associated with geochemical anomalies, radiometric anomalies and showings of Zn, Pb and U.

## 2. DESCRIPTION OF THE PROPERTY

The following claims are included in the area covered by the survey:

CY 4
CY 5
CY 6
CY 7

## 3. GEOLOGIC DESCRIPTION OF ROCKS AND MINERALIZATION

The area surveyed lies within the Cretaceous Surprise Lake batholith. The entire batholith is composed of relatively fresh alaskite.

The following description of the rocks and mineralization was taken by reports made available by Mattagami Lake Mines Ltd.

"The claims owned by Mattagami in this area cover part of the Cretaceous Surprise Lake batholith. The entire batholith presents anomalous radioactivity, with a $U_3O_8$ average content of 8 ppm, which is approximately 3 times higher than the average $U_3O_8$ content detected in similar rock types elsewhere.

Metalliferous mineralization within the area includes zeunerite and other non-identified uranium minerals, molybdenite, galena, sphalerite, hematite, magnetite, pyrite, fluorite, wolframite and beryl.

All the above-listed minerals were found in outcrop as well as on talus slopes and along creek beds; with the exception of magnetite and sphalerite which occur in mafic dykes, all the other minerals mainly occur within the alaskite, in fractures evident by hydrothermal alteration.

Strong hydrothermal alteration is lacking within the alaskite, although kaolinization of the feldspars, chloritization and epidote alteration occur locally.

Supergene alteration is evidenced by a surface zone of oxidation on the north side of Weir Mountain, and by the presence of a zone of Kasolite and wulfenite staining present on the SW flank of Weir Mountain.

The only type of mineralization of some interest observed on outcrop seems to be always associated to local fractures or assumed faults.

Structural lineaments in the map area have a constant N50$^{o}$E trend and 60$^{o}$NW dip. Due to the paucity of outcrops none of the fractures or assumed faults were investigated nor followed for more than a few meters at the most".

Recent magnetic surveys and geological mapping have located magnetic diabase dikes that contain magnetite as distinct zoning at the edges of the dikes. In several localities, sphalerite can be seen to be associated with the magnetite, and it is felt that the source of the radiometric anomalies may be associated with these base metal occurrences.

The outcrop in the area is poor, and the surface is covered by 30 to 150 CM of very immature soil and glacial deposits.

## 4. PRESENTATION OF RESULTS

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

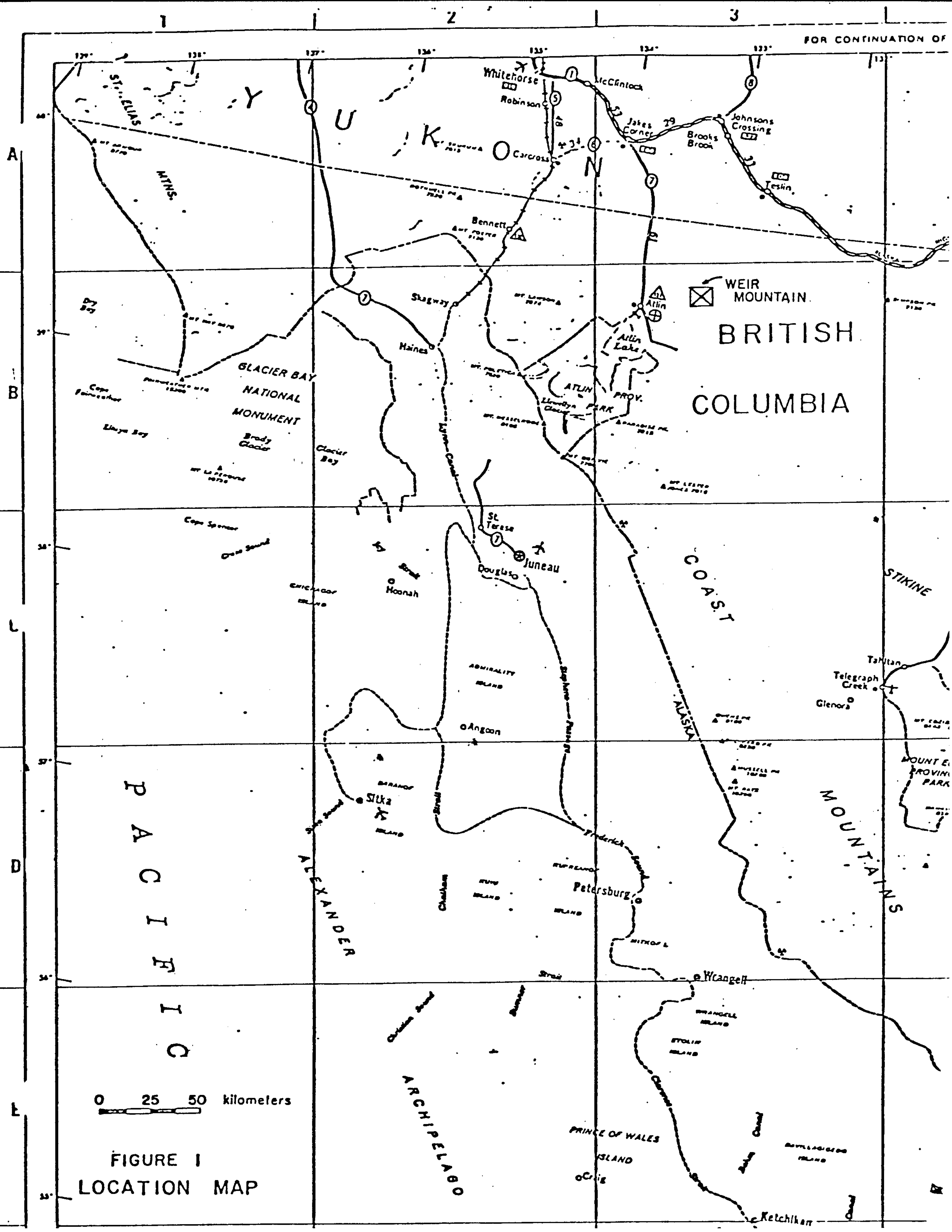



FIGURE I
LOCATION MAP

| | | |
|---|---|---|
| Line A | X = 50 Meters | Dwg. No. IP 5120-1 |
| Line A | X = 25 Meters | Dwg. No. IP 5120-2 |
| Line B | X = 25 Meters | Dwg. No. IP 5120-3 |
| Line C | X = 25 Meters | Dwg. No. IP 5120-4 |
| Line D | X = 25 Meters | Dwg. No. IP 5120-5 |
| Line E | X = 25 Meters | Dwg. No. IP 5120-6 |

Also enclosed with this report is Dwg. I.P.P. 3058, a plan map of the CY Claims Grid at a scale of 1:4000. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on 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 electrode interval length; i.e. when using 25 meter electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 25 meters apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals 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.

The geographic and geologic information shown on Dwg. No. I.P.P. 3058 has been taken from maps provided by Mattagami Lake Mines Ltd.

## 5. DISCUSSION OF RESULTS

A total of five test lines were surveyed on the CY Claim Group. The lines were placed at irregular intervals (see Dwg. No. I.P.P. 3058), to cover positions of particular geologic interest.

### Line A

This N-S line passed over a magnetic dike with which sphalerite could be seen to be associated. Measurements with X = 50 meters outlined two broad, weak anomalies at the south end of the line and a very weak, narrow anomaly centered at 250N.

When the measurements over this northern anomaly were repeated using X = 25M, a relatively definite, weak, narrow source is indicated at 250N. This correlates exactly with the position of the known mineralization at the edge of the dike.

As explained in the Appendix to this report, it is not possible to evaluate the source of a narrow, shallow anomaly, if the electrode interval used is appreciably greater than the width of the source. In order to better locate, and evaluate the source of such an anomaly, it is necessary to repeat the measurements using shorter electrode intervals.

Therefore, the anomaly centered at 250N on Line A could be better located, and evaluated, by making measurements with X = 15 meters. Further, it would be necessary to survey closely spaced parallel lines in order to determine the strike length and direction of the source.

### Line B

This NW-SE line lies 500 to 1000 meters to the east of Line A. At about 250S, it passes over the eastern end of a distinct, linear magnetic anomaly. There are weak IP effects in this area that suggest a source at depth, or to the side of the line.

At the north end of the line, a very weak, shallow anomaly at 300N may correlate with the similar anomaly on the north end of Line A. On Line B, the anomaly measured with X = 25 meters is very similar to that measured on Line A using X = 50 meters. As explained in the Appendix, it would be necessary to repeat the measurement with shorter electrode intervals in order to better locate the source.

Line C

This N-S line lies at the northeastern edge of the area of interest. At the north end of the line the results show variable but high, apparent resistivities and very little IP effect.

However, a very definite anomaly has been located in the interval from 300S to 150S. The anomalous pattern suggests either a broad zone at some depth, or a tabular zone approximately parallel to the line and some distance to the side. Further measurements on additional lines would be necessary to locate and evaluate the source of this quite definite anomaly.

Line D

This N-S line crosses the most obvious magnetic feature located by the magnetic survey. The strong magnetic anomaly lies along the southeast side of a quite distinct diabase dike. The weak, narrow, shallow IP anomaly centered at 75N on Line D occurs at the northwest contact of the dike.

The more definite IP anomaly centered at 25S occurs at the south contact. The center of the IP anomaly seems to be somewhat south of the magnetic high. This may be of importance, since magnetite is a metallic mineral that would contribute to the IP anomaly. Detailed IP measurements and magnetic readings using closely spaced stations would help to sort out the exact correlation of the two effects.

Line E

The IP anomaly on this E-W line is very similar to that measured on Line D. In both cases, the anomalous patterns indicate a fairly wide source. However, this is a result of the fact that the survey line passes over the source at an angle of $45^{o}$. The true width of the source can best be checked by surveying lines perpendicular to the strike of the source, using shorter electrode intervals.

## 6. CONCLUSIONS

The brief induced polarization and resistivity test survey completed on the CY Claim Group has shown that some zones of metallic mineralization are present. The measurements with X = 25 meters would suggest that most of these anomalies are due to narrow, shallow sources. As outlined in the Appendix to this report, the anomaly from a narrow source cannot be fully evaluated if the electrode interval used is much greater than the width of the source. In order to better locate, and evaluate the sources of such narrow anomalies, it is necessary to repeat the measurements using shorter electrode intervals.

The definite anomaly located at the south end of Line C has a different character. The anomalous pattern measured with X = 25 meters suggests a broad source, at some depth. However, the source could also be a tabular source lying approximately parallel to, but some distance from, the survey line. The source of this large magnitude, definite anomaly cannot be better located with the data presently available.

The measurements made on the five lines at the CY Claim Group during this brief survey, show that metallic mineralization is present. However, further measurements with different electrode intervals, and also measurements on additional lines, will be necessary before the possible importance of the mineralization in the sources can be further studied.

PHOENIX GEOPHYSICS LIMITED

Philip G. Hallof, Ph.D. P.Eng.
Geophysicist

P. G. HALLOF

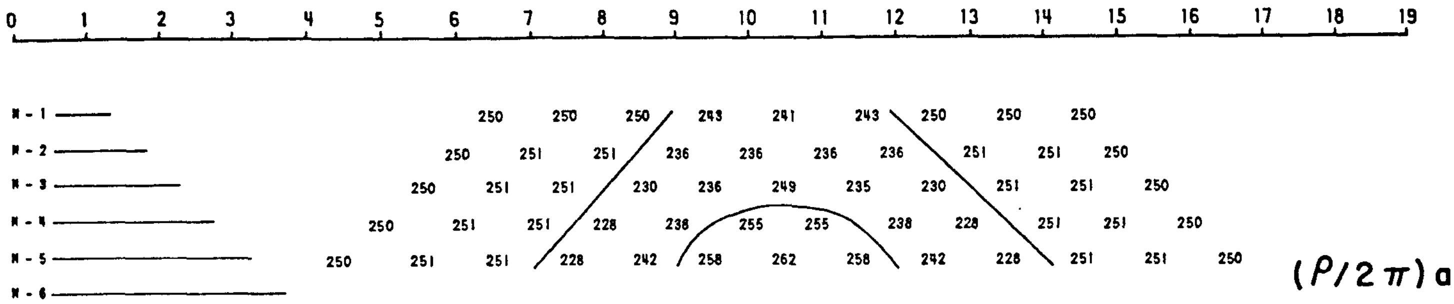
Expiry Date: February 25, 1979

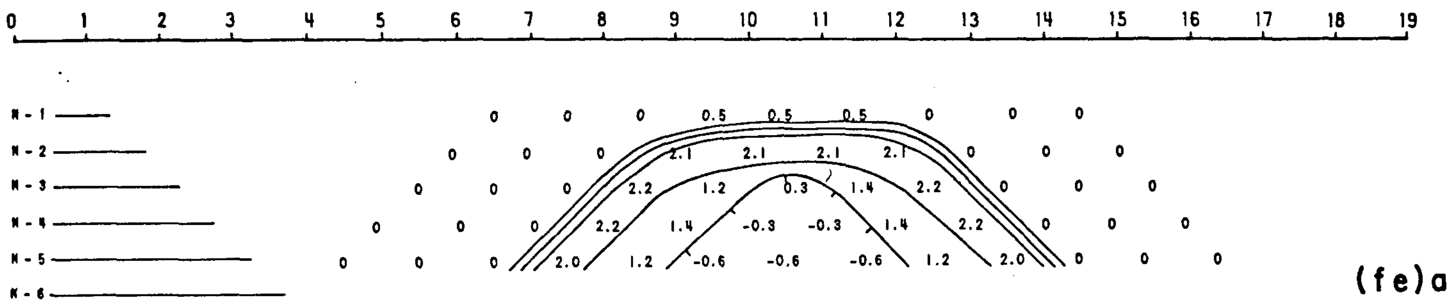
Dated: October 16, 1978

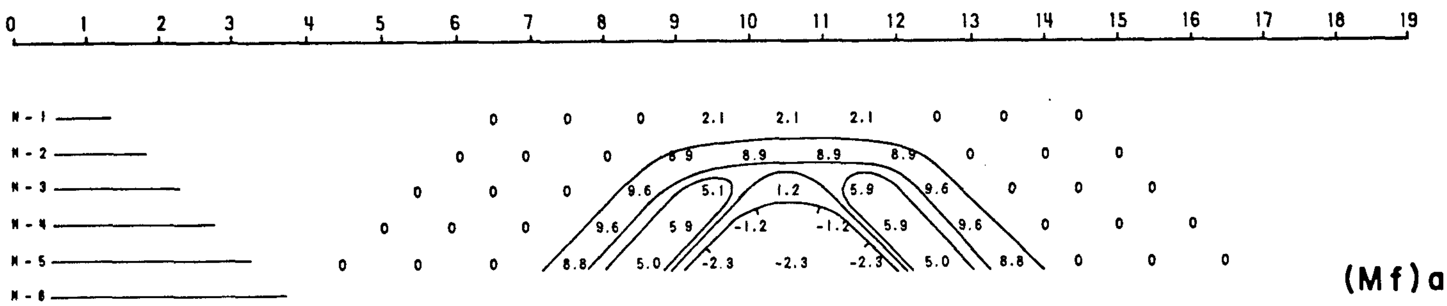
PHOENIX GEOPHYSICS LIMITED

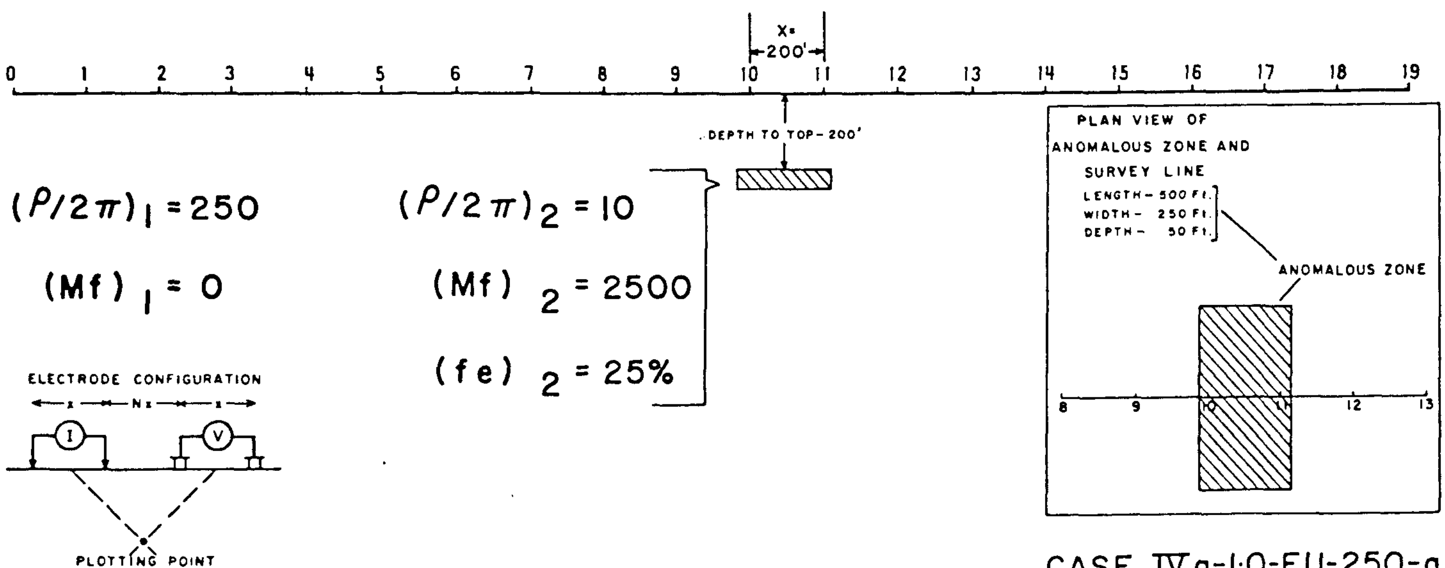
# Theoretical Induced Polarization and Resistivity Studies

## Scale Model Cases



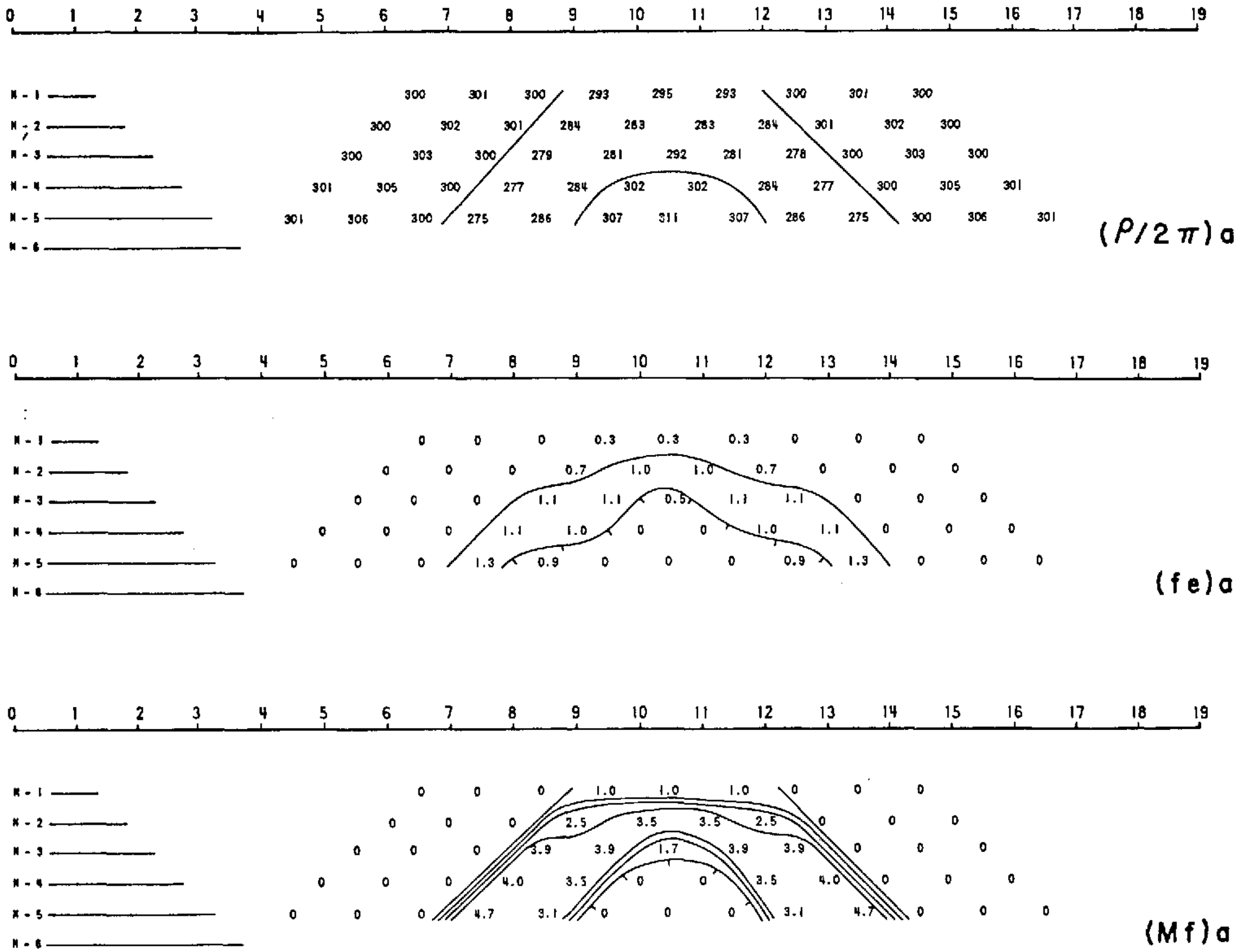



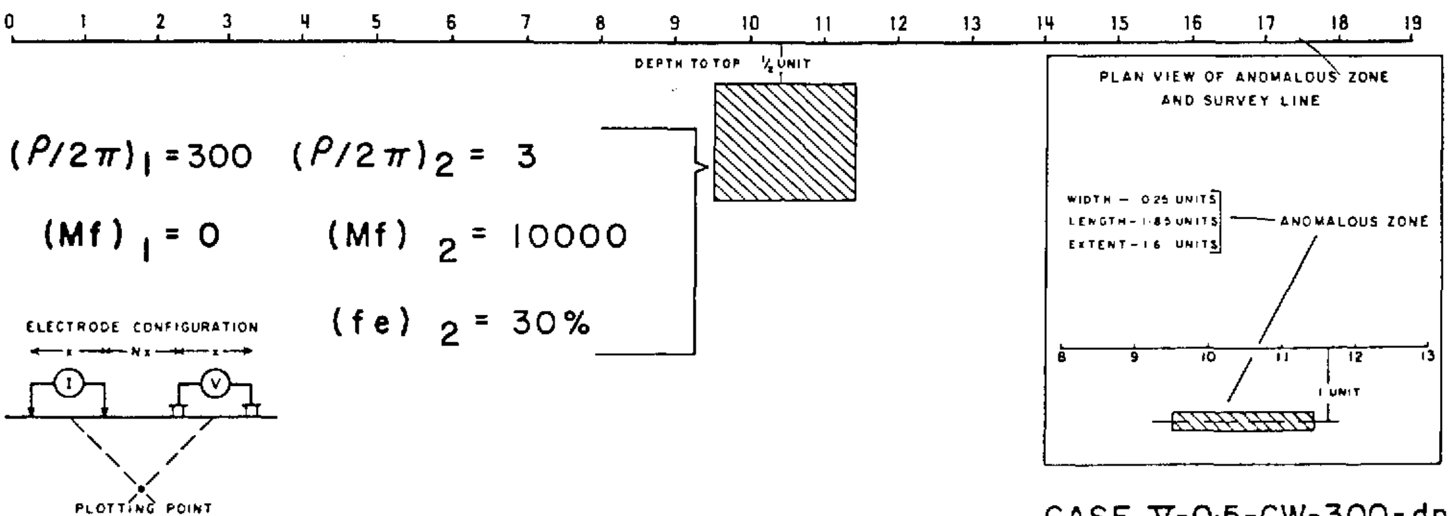

CASE IVa-1·0-EU-250-a

PHOENIX GEOPHYSICS LIMITED

# Theoretical Induced Polarization and Resistivity Studies

## Scale Model Cases




$(\rho/2\pi)_1 = 300$ $(\rho/2\pi)_2 = 3$

$(Mf)_1 = 0$ $(Mf)_2 = 10000$

$(fe)_2 = 30\%$

CASE V-0.5-CW-300-dp

## ASSESSMENT DETAILS

| | | | |
|---|---|---|---|
| PROPERTY: | Cy Claims | MINING DIVISION: | Atlin |
| SPONSOR: | Mattagami Lake Mines Ltd. | PROVINCE: | British Columbia |
| LOCATION: | Weir Mountain Area | | |
| TYPE OF SURVEY: | Induced Polarization and Resistivity | | |
| OPERATING MAN DAYS: | 5.3 | DATE STARTED: | August 22, 1978 |
| EQUIVALENT 8 HR. MAN DAYS: | 7.9 | DATE FINISHED: | August 30, 1978 |
| CONSULTING MAN DAYS: | 2.0 | NUMBER OF STATIONS: | 135 |
| DRAFTING MAN DAYS: | 12.4 | NUMBER OF READINGS: | 900 |
| TOTAL MAN DAYS: | 27.6 | KM. OF LINE SURVEYED: | 3.8 |

CONSULTANTS:

Philip G. Hallof, 15 Barnwood Court, Don Mills, Ontario.

FIELD TECHNICIANS:

R. Fernholm, 140 Margaret Avenue, Kitchener, Ontario.
J. Kistabish, R.R.#4, (Pikogan) Amos, Quebec.

DRAUGHTSMEN:

R.C. Norris, 708 - 51 Parkwoods Village Drive, Don Mills, Ontario.
R.J. Pryde, R.R.#1, Sharon, Ontario.

PHOENIX GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof, Ph.D. P.Eng.,
Geophysicist

PROFESSIONAL ENGINEER — PROVINCE OF — P. G. HALLOF

Dated: October 16, 1978

Expiry Date: February 25, 1979

# STATEMENT OF COST

Mattagami Lake Mines Ltd. - IP Survey
Atlin Area - British Columbia

PERIOD: August 22 - August 30, 1978

CREW: R. Fernholm - J. Kistabish

| | | | | |
|---|---|---|---|---|
| 5¼ | Operating days | | @ $490.00/day | $2,572.50 |
| 2 | Travel ) | | | |
| 2 | Standby ) | 4½ days | @ $190.00/day | 855.00 |
| ½ | Bad Weather ) | | | |

EXPENSES:

| | | |
|---|---|---|
| Fares | $ 662.25 | |
| Meals & Accommodation | 134.80 | |
| Freight | 194.00 | |
| Supplies | 41.90 | |
| Miscellaneous | 8.00 | |
| | $1,040.95 | |
| + 10% | 104.10 | |
| | | 1,145.05 |
| | | $4,572.55 |

PHOENIX GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof, Ph.D., P.Eng.
Geophysicist

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA P. G. HALLOF

Dated: October 16, 1978

Expiry Date: February 25, 1979

CERTIFICATE

I, Philip George Hallof, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 15 Barnwood Court, Don Mills, Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.Sc. Degree (1952) in Geology and Geophysics, and a Ph.D. Degree (1957) in Geophysics.

3. I am a member of the Society of Exploration Geophysicists and the European Association of the Exploration Geophysicists.

4. I am a Professional Geophysicist, registered in the Province of Ontario, the Province of British Columbia and the State of Arizona.

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 Mattagami Lake Mines Ltd., 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 16th day of October, 1978

Philip G. Hallof

Philip G. Hallof, Ph.D. P.Eng.

PROFESSIONAL ENGINEER PROVINCE OF ONTARIO P. G. HALLOF

Expiry Date: February 25, 1979

# APPENDIX

## THE INTERPRETATION OF INDUCED POLARIZATION ANOMALIES FROM RELATIVELY SMALL SOURCES

The induced polarization method was originally developed to detect disseminated sulphides and has proven to be very successful in the search for "porphyry copper" deposits. In recent years we have found that the IP method can also be very useful in exploring for more concentrated deposits of limited size. This type of source gives sharp IP anomalies that are often difficult to interpret.

The anomalous patterns that develop on the contoured data plots will depend on the size, depth and position of the source and the relative size of the electrode interval. The data plots are not sections showing the electrical parameters of the ground. When the electrode interval (X) is appreciably greater than the width of the source, a large volume of unmineralized rock is averaged into each measurement. This is particularly true for the large values of the electrode separation (n).

The theoretical scale model results shown in Figure 1 and Figure 2 indicate the effect of depth. If the depth to the top of the source is small compared to the electrode interval (i. e. d X) the measurement for n = 1 will be anomalous. In Figure 1 the depth is 0. 5 units (X = 1. 0 units) and the n = 1 value is definitely anomalous; the pattern on the contoured data plot is typical for a relatively shallow, narrow, near-vertical tabular source. The results in Figure 2 are for the same source with the depth increased to 1. 5 units. Here the n = 1 value is not anomalous; the larger values of (n) are anomalous but the magnitudes are much lower than for the source at less depth.

When the electrode interval is greater than the width of the source, it is not possible to determine its width or exact position between the electrodes. The true IP effect within the source is also indeterminate; the anomaly from a very narrow source with a very large true IP effect will be much the same as that from a zone with twice the width and 1/2 the true IP effect. The theoretical scale model data shown in Figure 3 and Figure 4 demonstrate this problem. The depth and position of the source are unchanged but the width and true IP effect are varied. The anomalous patterns and magnitudes are essentially the same, hence the data are insufficient to evaluate the source completely.

The normal practise is to indicate the IP anomalies by solid, broken, or dashed bars, depending upon their degree of distinctiveness. 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. As illustrated in Figure 1, Figure 2, Figure 3 and Figure 4, no anomaly can be located with more accuracy than the spread length. While the centre of the solid bar indicating the anomaly corresponds fairly well with the source, the length of the bar should not be taken to represent the exact edges of the anomalous material.

If the source is shallow, the anomaly can be better evaluated using a shorter electrode interval. When the electrode interval used approaches the width of the source, the apparent effects measured will be nearly equal to the true effects within the source. When there is some depth to the top of the source, it is not possible to use electrode intervals that are much less than the depth to the source. In this situation, one must realize that a definite ambiguity exists regarding the width of the source and the IP effect within the source.

Our experience has confirmed the desirability of doing detail. When a reconnaissance IP survey using a relatively large electrode interval indicates the presence of a narrow, shallow source, detail with shorter electrode intervals is necessary in order to better locate, and evaluate, the source. The data of most usefulness is obtained when the maximum apparent IP effect is measured for n = 2 or n = 3. For instance, an anomaly originally located using X = 300' may be checked with X = 200' and then X = 100'. The data with X = 100' will be quite different from the original reconnaissance results with X = 300'.

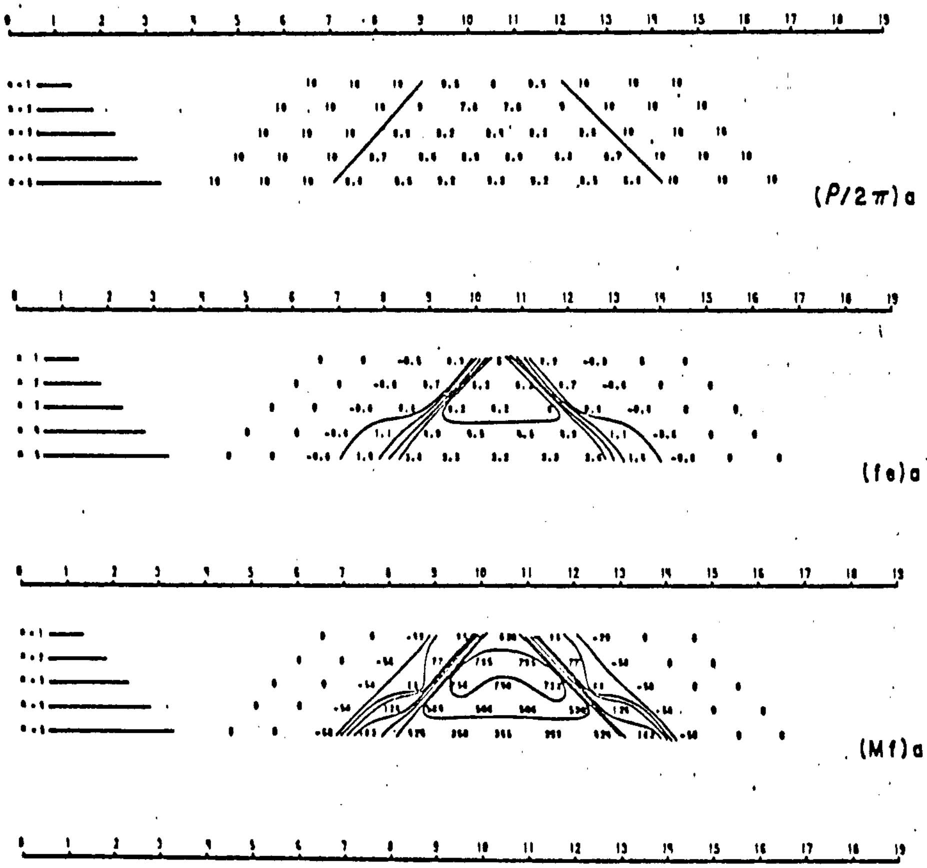
The data shown in Figure 5 and Figure 6 are field results from a greenstone area in Quebec. The expected sources were narrow (less than 30' in width) zones of massive, high-grade, zinc-silver ore. An electrode interval of 200' was used for the reconnaissance survey in order to keep the rate of progress at an acceptable level. The anomalies located were low in magnitude.

The very weak, shallow anomaly shown in Figure 5 is typical of those located by the X = 200' reconnaissance survey. Several anomalies of this type were detailed using shorter electrode intervals. In most cases the detail measurements suggested broad zones of very weak mineralization. However, in the case of the source at 20N to 22N, the measurements with shorter electrode intervals confirmed the presence of a strong, narrow source. The X = 50' results are shown in Figure 6. Subsequent drilling has shown the source to be 12.5' of massive sulphide mineralization containing significant zinc and silver values.

The change in the anomaly that results when the electrode interval is reduced is not unusual. The X = 50' data more accurately locates the narrow source, and permits the geophysicist to make a better evaluation of its importance. The completion of this type of detail is very important, in order to get the maximum usefulness from a reconnaissance IP survey.

## Theoretical Induced Polarization and Resistivity Studies

### Scale Model Cases



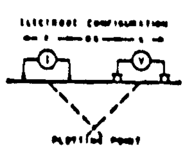

$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2.51$

$(Mf)_2 = 10000$

$(fe)_2 = 25\%$



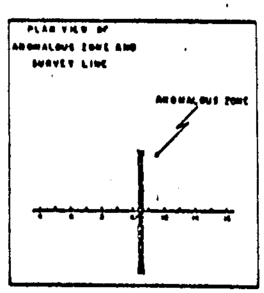
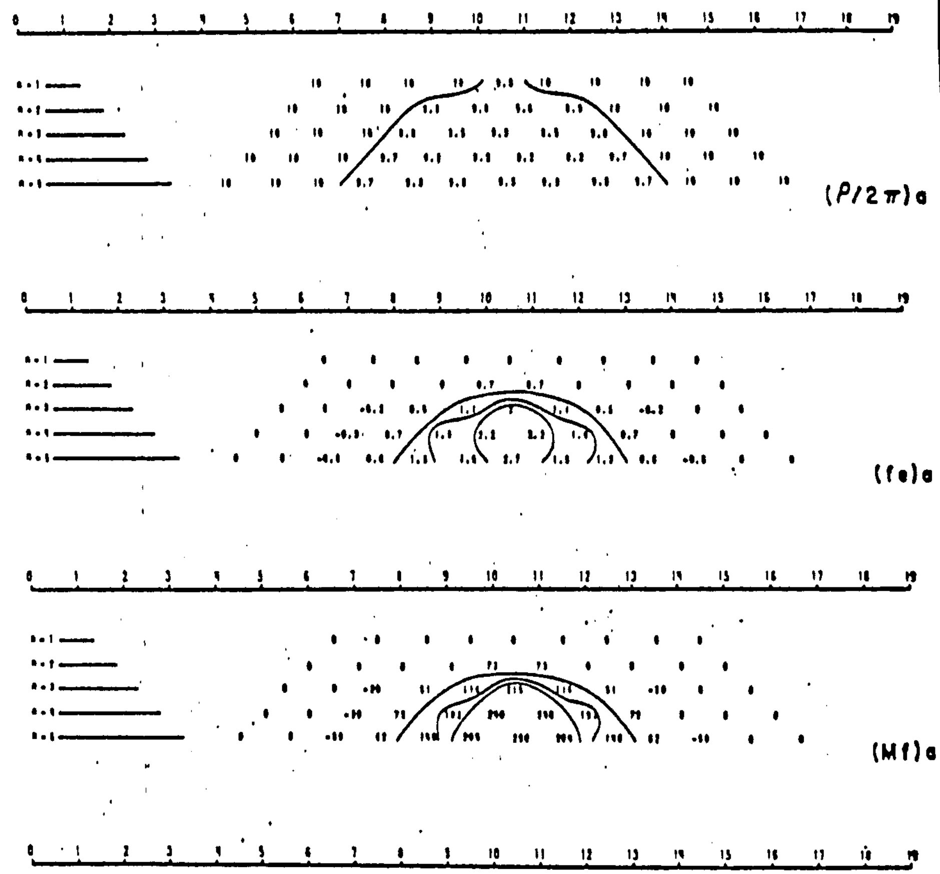




FIG 1

CASE II-0.5-BU-10-a

## Theoretical Induced Polarization and Resistivity Studies

### Scale Model Cases



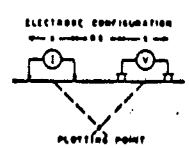

$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2.6$

$(Mf)_2 = 9250$

$(fe)_2 = 24\%$



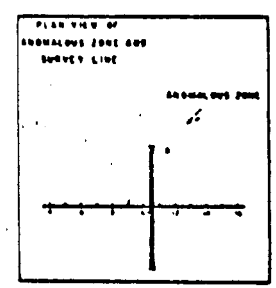



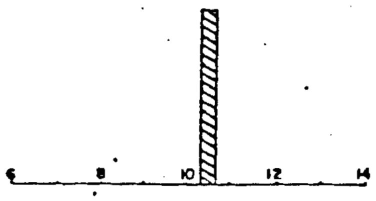

FIG 2

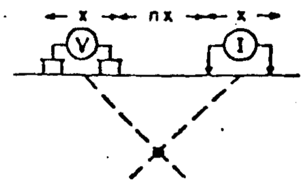
CASE II-1.5-BU-10-a

## THEORETICAL INDUCED POLARIZATION AND RESISTIVITY STUDIES

SCALE MODEL CASE

PLAN VIEW




X EQUALS 1 UNIT

Stations: 5 6 7 8 9 10 11 12 13 14 15 16

(ρ/2π)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | 10 | 10 | 10 | 9.7 | 8.8 | 9.7 | 10 | 10 | 10 | | | |
| n-2 | 10 | 10 | 10 | 9.5 | 8.7 | 8.7 | 9.5 | 10 | 10 | 10 | | |
| n-3 | 10 | 10 | 10 | 9.3 | 8.8 | 8.9 | 8.8 | 9.3 | 10 | 10 | 10 | |
| n-4 | 10 | 10 | 10 | 9.0 | 8.8 | 9.0 | 9.0 | 8.8 | 9.2 | 10 | 10 | 10 |

(Fe)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | -0.2 | 0 | -0.5 | 0.7 | 3.6 | 0.7 | -0.3 | -0.2 | -0.2 | | | |
| n-2 | 0 | 0 | -0.6 | 0.7 | 4.0 | 4.0 | 0.7 | -0.6 | 0 | 0 | | |
| n-3 | 0 | 0 | -0.5 | 0.7 | 4.7 | 4.3 | 4.6 | 0.7 | -0.6 | 0 | 0.2 | |
| n-4 | 0 | -0.3 | -0.6 | 1.1 | 3.5 | 4.2 | 4.2 | 3.5 | 1.1 | -0.6 | -0.3 | 0 |

(Mf)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | 17 | 0 | -49 | 72 | 410 | 72 | -30 | -17 | 17 | | | |
| n-2 | 0 | 0 | -59 | 74 | 460 | 460 | 74 | -59 | 0 | 0 | | |
| n-3 | 0 | 0 | -59 | 75 | 534 | 489 | 523 | 75 | 58 | 0 | 0 | |
| n-4 | 0 | -30 | -59 | 141 | 382 | 467 | 467 | 363 | 120 | -59 | -30 | 0 |

$(\rho 2\pi)_1 = 10$
$(Mf)_1 = 0$

$(\rho 2\pi)_2 = 2.57$
$(Mf)_2 = 11700$
$(Fe)_2 = 30\%$

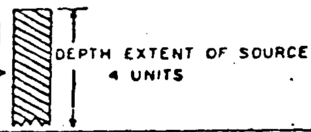
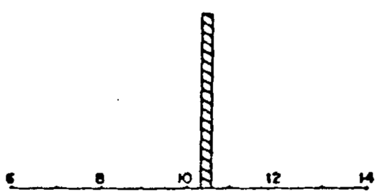


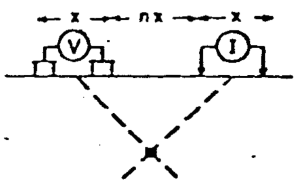

FIG. 3

## THEORETICAL INDUCED POLARIZATION AND RESISTIVITY STUDIES

SCALE MODEL CASE

PLAN VIEW




X EQUALS 1 UNIT

Stations: 5 6 7 8 9 10 11 12 13 14 15 16

(ρ/2π)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | 10 | 10 | 10 | 9.9 | 9.3 | 9.9 | 10 | 10 | 10 | | | |
| n-2 | 10 | 10 | 10 | 9.7 | 9.1 | 9.1 | 9.7 | 10 | 10 | 10 | | |
| n-3 | 10 | 10 | 10 | 9.7 | 9.2 | 9.2 | 9.2 | 9.7 | 10 | 10 | 10 | |
| n-4 | 10 | 10 | 10 | 9.6 | 9.3 | 9.3 | 9.3 | 9.3 | 9.6 | 10 | 10 | 10 |

(Fe)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | 0 | 0 | -0.3 | 0 | 3.5 | 0 | -0.3 | 0 | 0 | | | |
| n-2 | 0 | 0 | -0.8 | 0 | 3.8 | 3.8 | 0 | -0.8 | 0 | 0 | | |
| n-3 | 0 | 0 | -0.8 | 0.5 | 4.5 | 4.5 | 4.6 | 0.5 | -0.8 | 0 | 0 | |
| n-4 | 0 | 0 | -0.7 | 0.8 | 4.2 | 5.1 | 5.1 | 4.2 | 0.7 | -0.7 | 0 | 0 |

(Mf)a

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n-1 | 0 | 0 | -30 | 0 | 376 | 0 | -30 | 0 | 0 | | | |
| n-2 | 0 | 0 | -79 | 0 | 417 | 417 | 0 | -79 | 0 | 0 | | |
| n-3 | 0 | 0 | -79 | 52 | 490 | 490 | 501 | 52 | -79 | 0 | 0 | |
| n-4 | 0 | 0 | -70 | 83 | 452 | 548 | 555 | 452 | 74 | -71 | 0 | 0 |

$(\rho 2\pi)_1 = 10$
$(Mf)_1 = 0$

$(\rho 2\pi)_2 = 2.41$
$(Mf)_2 = 22800$
$(Fe)_2 = 55\%$

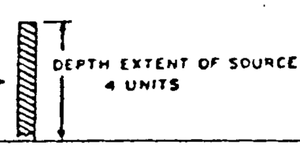



FIG 4

INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.

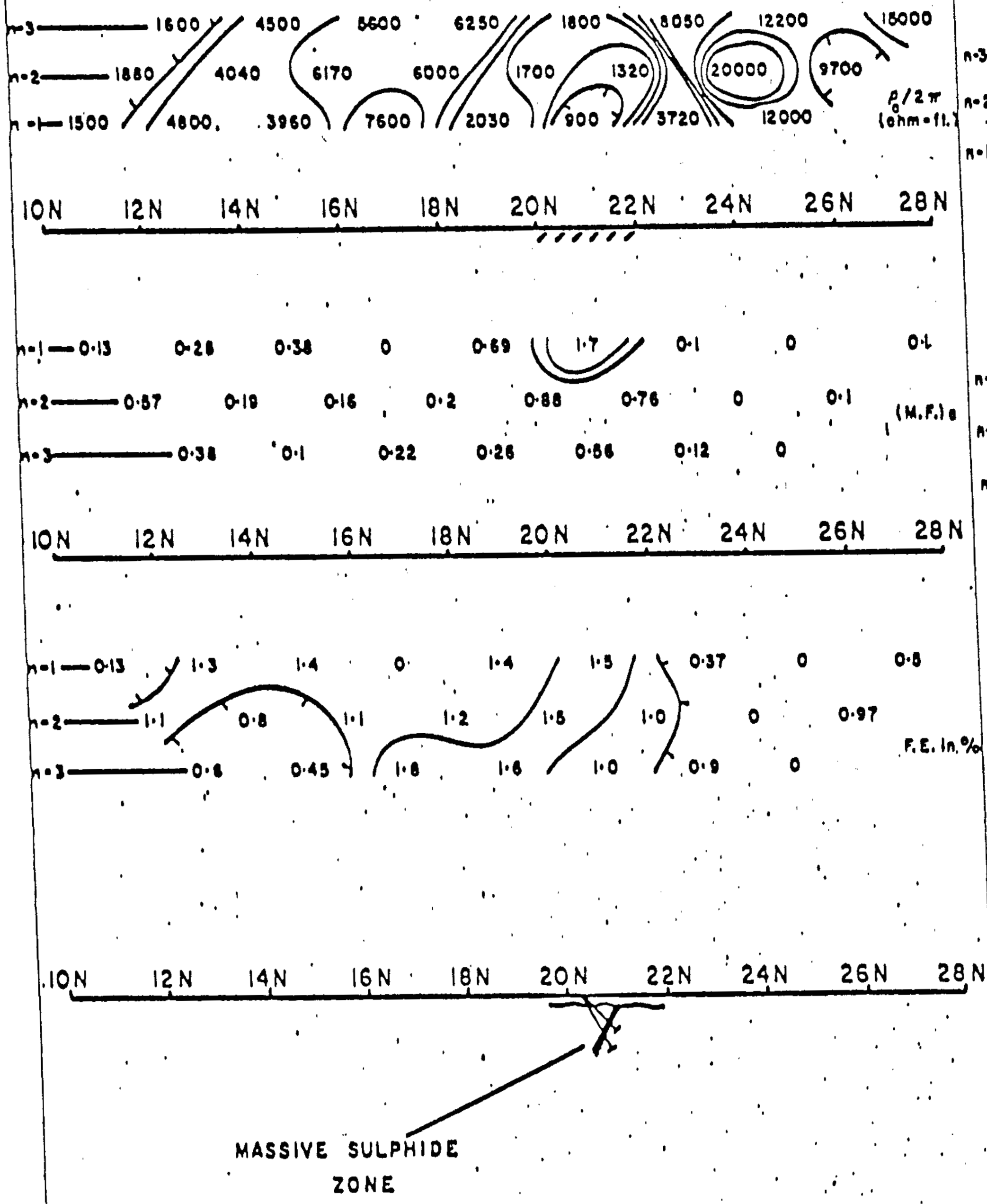



FIG. 5

INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.

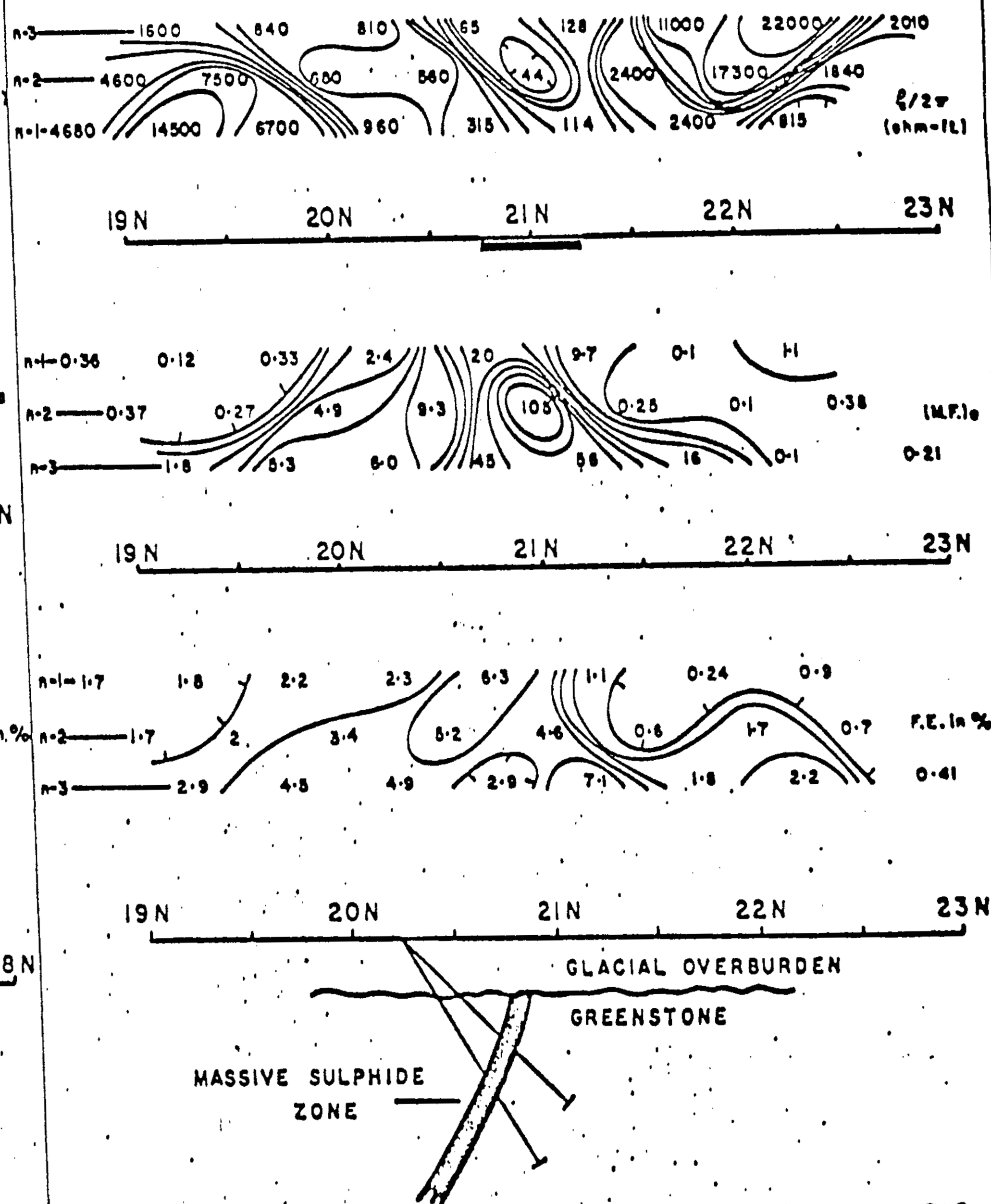



FIG. 6


DWG. NO.- I.P.- 5120-1

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.- A

ELECTRODE CONFIGURATION
X — NX — X

PLOTTING POINT
X = 50 m.

SURFACE PROJECTION OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH ASSESSMENT REPORT
NO. 7412
part 1 of 3

FREQUENCIES 0·3-5·0 HZ.

DATE SURVEYED AUG. 1978

APPROVED

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, -1·5, -2, -3, -5, -7·5, -10

DATE

Expiry Date: February 25, 1979

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY


DWG. NO.– I.P.– 5120-2

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.– A

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT

x = 25 m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
7412
NO.
Part 1 of 3

FREQUENCIES 0·3–5·0 HZ.

DATE SURVEYED: 5 AUG 1978

APPROVED

NOTE – CONTOURS AT LOGARITHMIC INTERVALS 1, –1·5, –2, –3, –5, –7·5, –10

DATE

Expiry Date: February 25, 1979

## PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

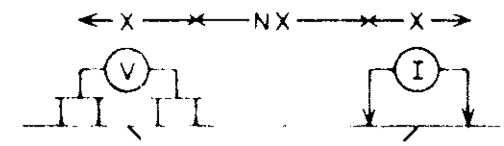

DWG. NO.– I.P.– 5120-3

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.– B

ELECTRODE CONFIGURATION




PLOTTING POINT → X  x = 25 m.

SURFACE PROJECTION OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7412
part 1 of 3

FREQUENCIES 0·3–5·0 HZ.

NOTE – CONTOURS AT LOGARITHMIC INTERVALS
1, -1·5, -2, -3, -5, -7·5, -10

DATE SURVEYED AUG. 1978

APPROVED

DATE 10/16/78

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA
Expiry Date: February 25, 1979

## PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY


DWG. NO.- I.P.- 5120-4

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.- C

ELECTRODE CONFIGURATION

PLOTTING POINT x = 25 m.

SURFACE PROJECTION OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH ASSESSMENT REPORT
7412
Part 1 of 3

FREQUENCIES 0·3-5·0 HZ.

DATE SURVEYED AUG. 1978

APPROVED

DATE 10/16/78

Expiry Date: February 25, 1979

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, -1·5, -2, -3, -5, -7·5, -10

## PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY


DWG. NO.- I.P.- 5120-5

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.- D

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT ——— X x = 25 m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
7412
Part 1 of 3

FREQUENCIES 0·3-5·0 HZ.

DATE SURVEYED AUG. 1978

APPROVED

DATE

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, -1·5, -2, -3, -5, -7·5, -10

Expiry Date: February 25, 1979

## PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY


DWG. NO.- I.P.- 5120-6

# MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,
WEIR MOUNTAIN, B.C.

LINE NO.- E

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 25 m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7412
Part 1 of 3

FREQUENCIES 0·3-5·0 HZ.

DATE SURVEYED: AUG. 1978

APPROVED

DATE

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, -1·5, -2, -3, -5, -7·5, -10

Expiry Date: February 25, 1979

## PHOENIX GEOPHYSICS LIMITED

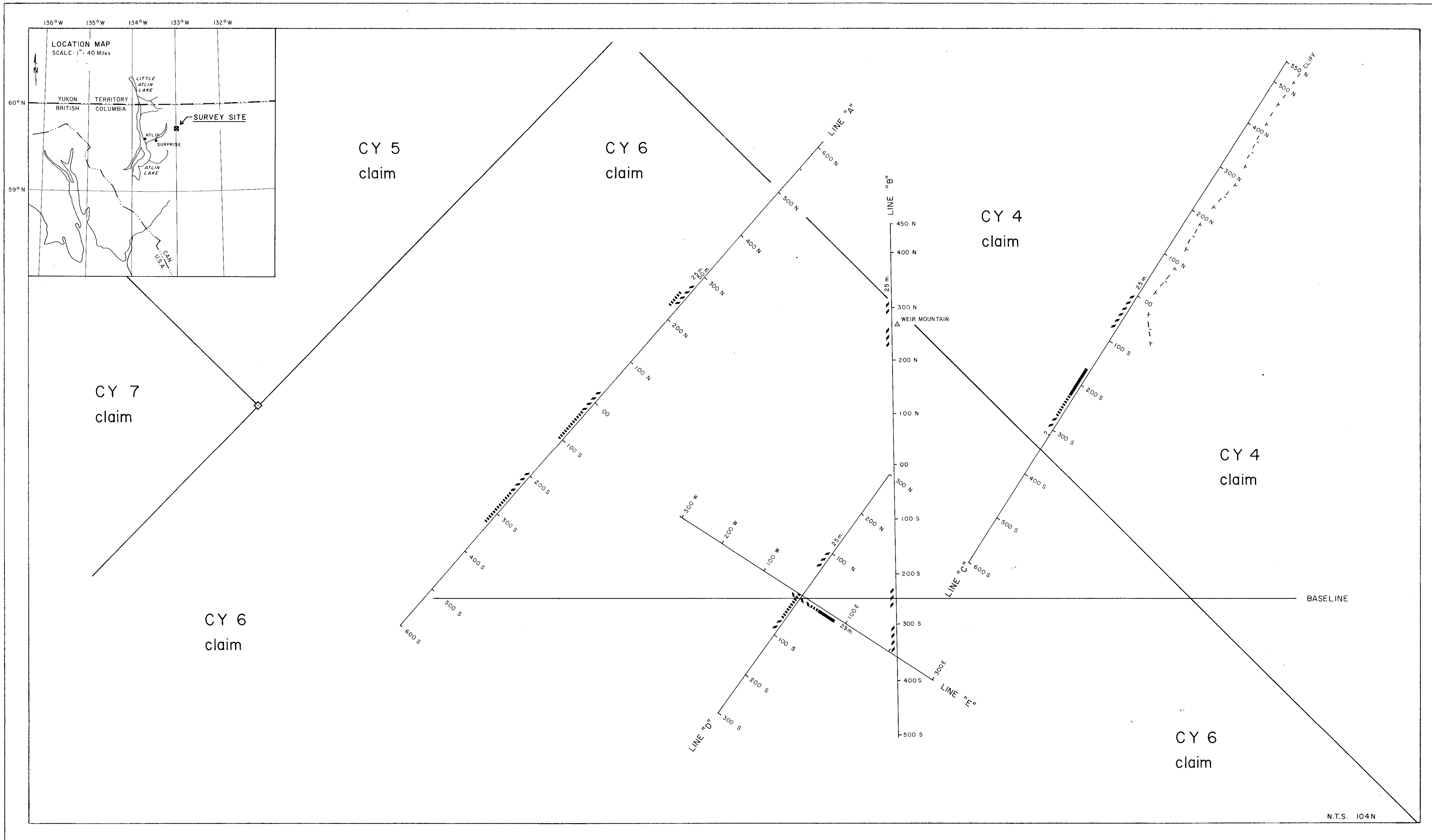
INDUCED POLARIZATION AND RESISTIVITY SURVEY

DWG. NO. - I.P.P.-3058

# PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP




SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

NUMBER AT END OF ANOMALIES INDICATE SPREAD USED.

## MATTAGAMI LAKE MINES LTD.

CY CLAIMS, ATLIN M.D.,

WEIR MOUNTAIN, B.C.

SCALE

100 0 100 200 300 400 METRES

1:4000

NOTE -

TO ACCOMPANY GEOPHYSICAL REPORT FOR MATTAGAMI LAKE MINES LTD. ON THE CY CLAIM GROUP IN THE ATLIN MINING DISTRICT, WEIR MOUNTAIN, BRITISH COLUMBIA BY PHILIP G. HALLOF P.ENG. GEOPHYSICIST, AND A.W. MULLEN P.ENG. GEOLOGIST.

DATED - OCT. 16, 1978.

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7412
PART 1 OF 3

DRAWN: R.C.N.

DATE: OCT., 1978.

APPROVED:

DATE: 10/16/78

Expiry Date: February 25, 1979