PHOENIX GEOPHYSICS LIMITED

9447

REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY RED FISHER CLAIMS NAKUSP AREA, BRITISH COLUMBIA FOR SHAMROCK CONSTRUCTION

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1. INTRODUCTION

A short Induced Polarization and Resistivity survey was conducted on the Red Fisher claims for Shamrock Construction.

The property is located approximately 10 miles north of the Arrow Park ferry, B.C., at approximately $50^{\circ}12'$ north latitude and $118^{\circ}00'$ west longitude. Access is via road from the town of Nakusp, B.C.

An interesting gossan has been located over a logging road on the property. The present IP and Resistivity survey was planned in order to outline additional mineralization.

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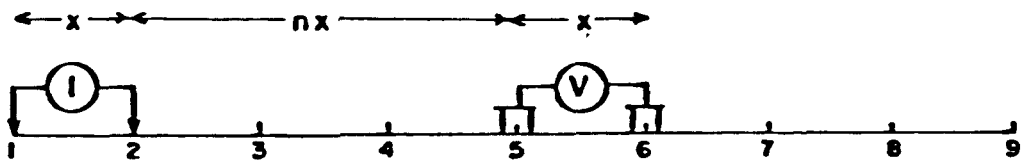
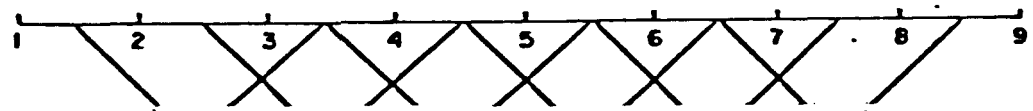
METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS



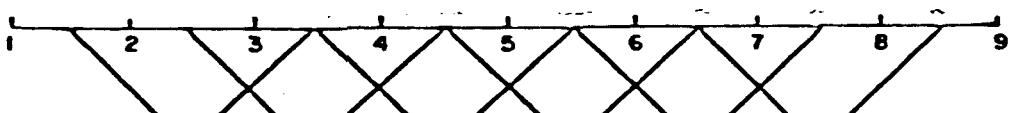
Stations on line

x = Electrode spread length
n = Electrode separation



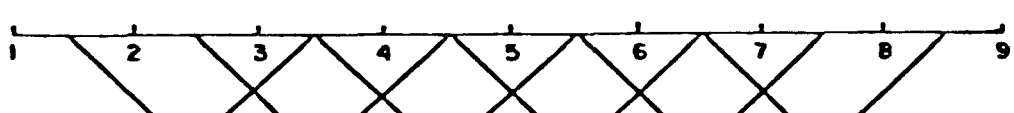
n - 1	ρ 1,2-3,4	ρ 2,3-4,5	ρ 3,4-5,6	ρ 4,5-6,7	ρ 5,6-7,8	ρ 6,7-8,9
n - 2	ρ 1,2-4,5	ρ 2,3-5,6	ρ 3,4-6,7	ρ 4,5-7,8	ρ 5,6-8,9	
n - 3	ρ 1,2-5,6	ρ 2,3-6,7	ρ 3,4-7,8	ρ 4,5-8,9		
n - 4	ρ 1,2-6,7	ρ 2,3-7,8	ρ 3,4-8,9			

Apparent Resistivity



n - 1	M.F. 1,2-3,4	M.F. 2,3-4,5	M.F. 3,4-5,6	M.F. 4,5-6,7	M.F. 5,6-7,8	M.F 6,7-8,9
n - 2	M.F. 1,2-4,5	M.F. 2,3-5,6	M.F. 3,4-6,7	M.F. 4,5-7,8	M.F. 5,6-8,9	
n - 3	M.F. 1,2-5,6	M.F. 2,3-6,7	M.F. 3,4-7,8	M.F 4,5-8,9		
n - 4	M.F. 1,2-6,7	M.F. 2,3-7,8	M.F. 3,4-8,9			

Apparent Metal Factor



n - 1	F.E. 1,2-3,4	F.E. 2,3-4,5	F.E. 3,4-5,6	F.E. 4,5-6,7	F.E. 5,6-7,8	F.E. 6,7-8,9
n - 2	F.E. 1,2-4,5	F.E. 2,3-5,6	F.E. 3,4-6,7	F.E. 4,5-7,8	F.E. 5,6-8,9	
n - 3	F.E. 1,2-5,6	F.E. 2,3-6,7	F.E. 3,4-7,8	F.E. 4,5-8,9		
n - 4	F.E. 1,2-6,7	F.E. 2,3-7,8	F.E. 3,4-8,9			

Apparent Percent Frequency Effect

Fig. A

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REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY RED FISHER CLAIMS NAKUSP AREA, BRITISH COLUMBIA FOR SHAMROCK CONSTRUCTION

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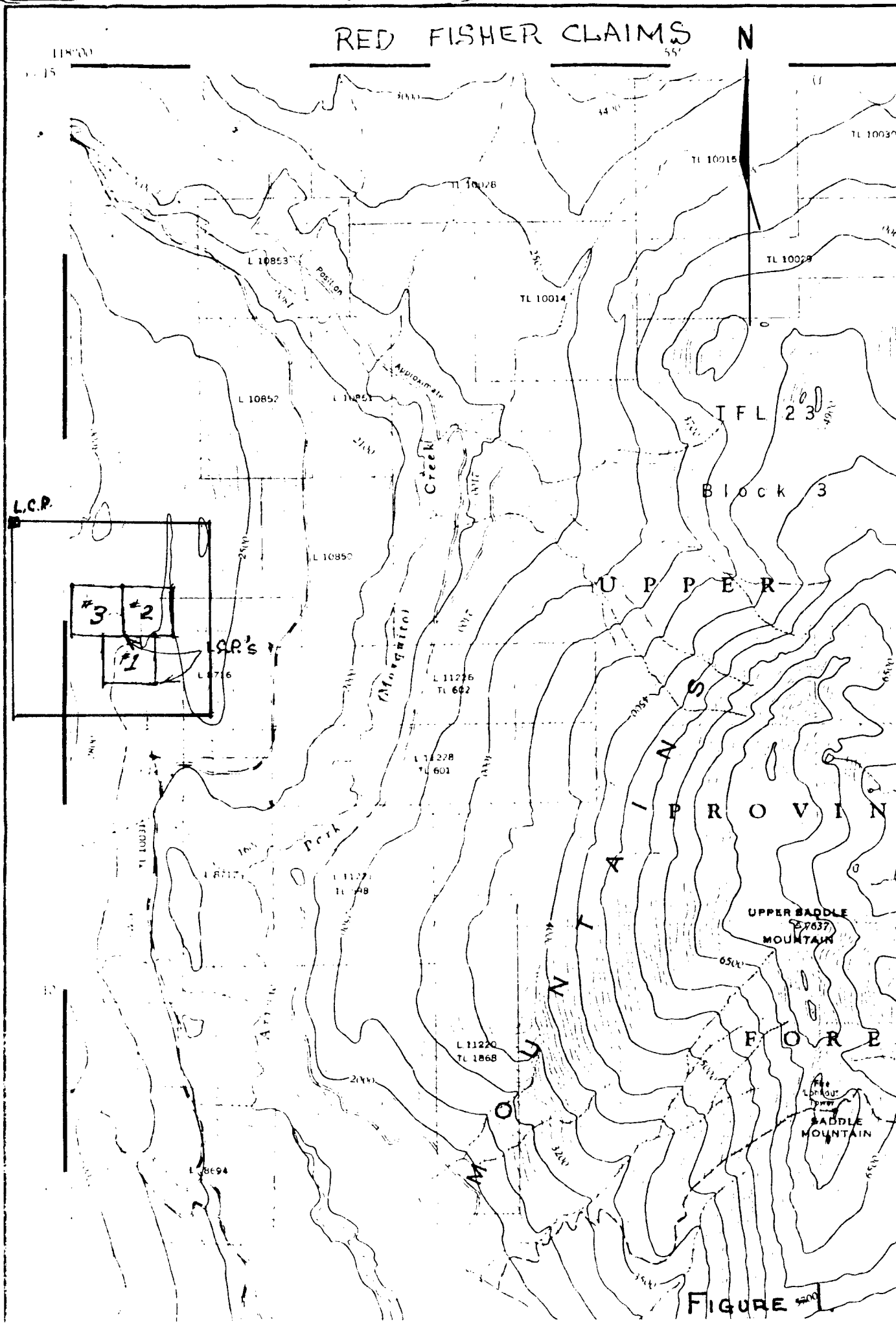
1. INTRODUCTION

A short Induced Polarization and Resistivity survey was conducted on the Red Fisher claims for Shamrock Construction.

The property is located approximately 10 miles north of the Arrow Park ferry, B.C., at approximately $50^{\circ}12'$ north latitude and $118^{\circ}00'$ west longitude. Access is via road from the town of Nakusp, B.C.

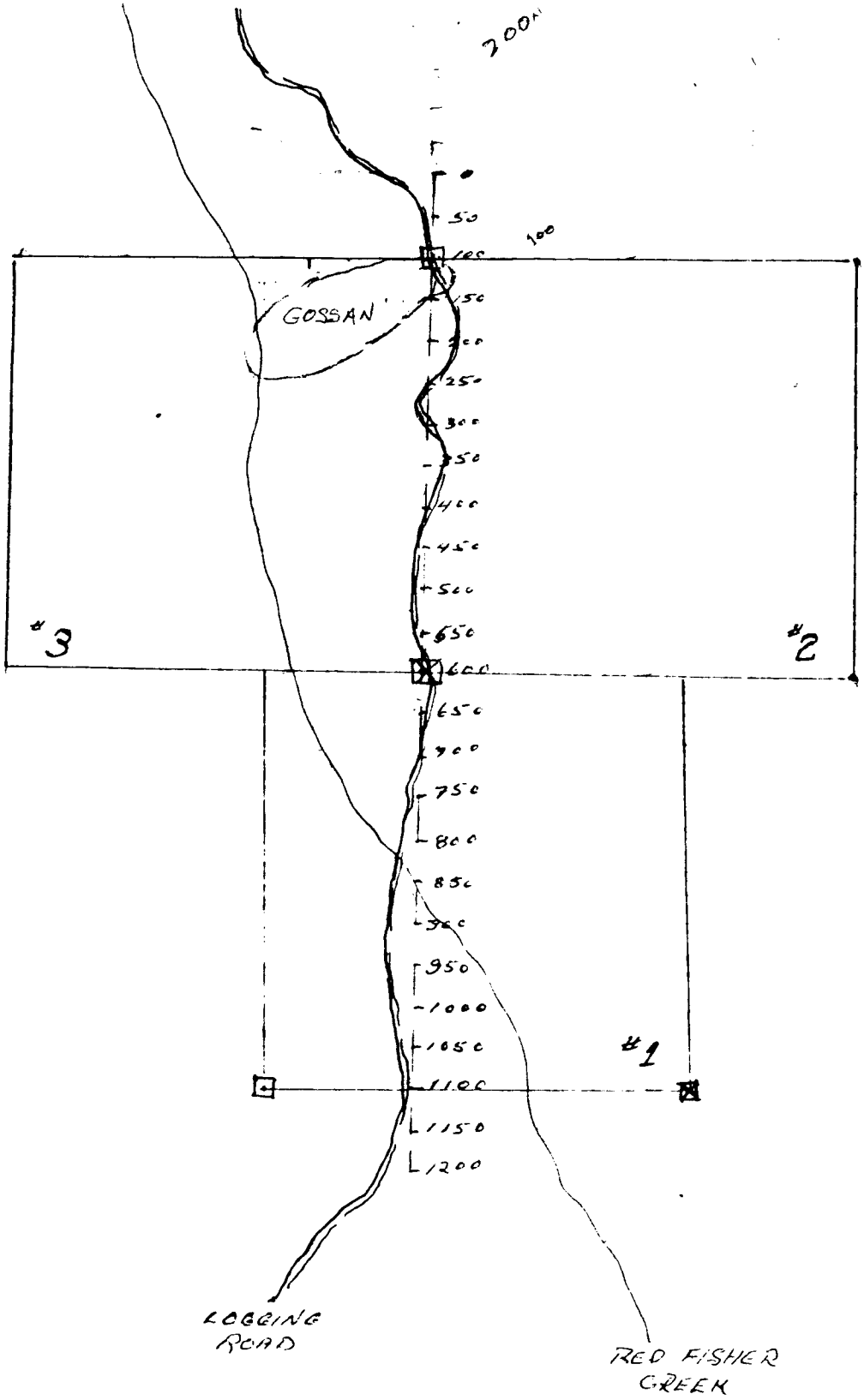
An interesting gossan has been located over a logging road on the property. The present IP and Resistivity survey was planned in order to outline additional mineralization.

A line was surveyed over the gossan in August 1980. An extension to this line as well as a parallel line was surveyed in November 1980.


RED FISHER CLAIMS
N
L.C.P.
#3
#2
#1
L.C.P.'s
IFL 230
Block 3
UPPER
MOUNTAINS
PROVIN
FORE
UPPER SADDLE MOUNTAIN
SADDLE MOUNTAIN
Creek
TL 10028
TL 10014
L 10853
L 10852
L 10850
L 11226
TL 602
L 11228
TL 601
L 11220
TL 1868
L 8694

FIGURE

RED FISHER CLAIMS



SCALE: ½" = 100 METRES

A dipole-dipole array was used with basic inter-electrode separation of 50 meters. Four dipole separations were recorded using Phoenix IPT-1 IP and Resistivity transmitter, and Phoenix IPV-1 IP and Resistivity receiver, operating at 0.3 Hz. and 5.0 Hz. The surveys were performed by P. Gardner in August 1980 and F. DiSpirito in November 1980.

2. DESCRIPTION OF CLAIMS

Figure 1 shows the Red Fisher claim group consisting of Red Fisher numbers 1, 2 and 3.

3. 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	Electrode Interval	Dwg. No.
East Line	50 meters	IP 5241-1
Base Line	50 meters	IP 5241-2

Also enclosed with this report is Dwg. I.P.P. 1055, a plan map of the surveyed lines, in relation to the Red Fisher claims, at a scale of 1:2500. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manners hown 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 50 meter electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 50 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.

4. DISCUSSION OF RESULTS

A short Induced Polarization and Resistivity survey has been completed on two lines of the Red Fisher claims.

Several definite and probable anomalies are outlined in the data. The top of the source for all the anomalies appear at a depth of less than 50 meters, i.e. one dipole spacing.

All the anomalies have lower than normal resistivities associated with higher than background frequency effect readings. The two anomalous zones on the East Line extend from 325S northward (Zone A) and from 650S southward (Zone B). These zones seen on the East Line may correspond to the anomalous zones seen on the Base Line extending from 250S northward and 625S southward respectively. On the Base Line there appears another definite anomaly centered at 475S. Metallic sulphide mineralization would be the most likely cause of the anomalies.

5. SUMMARY AND RECOMMENDATIONS

Two lines have been surveyed on the Red Fisher claims using the Induced Polarization and Resistivity technique.

Two major IP zones (Zone A and Zone B), which may represent metallic sulphide mineralization, are outlined in the data. One other strong anomaly appears on the Base Line in the vicinity of station 475S. The source for all the anomalies should be encountered at less than 50 meters depth.

Additional IP measurements utilizing shorter dipole spacings (less than 50 meters) should be taken in order to better define the anomalies. The existing lines should be extended to the north and south and more survey lines added in order to delineate the extent and ascertain the significance of the IP zones.

PHOENIX GEOPHYSICS LIMITED

Frank DiSpirito, B.A.Sc., P.Eng.
Geophysicist

Paul A. Cartwright, B.Sc.
Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
F. DISPIRITO

Dated: January 7, 1981

ASSESSMENT DETAILS

PROPERTY: Red Fisher Claims PROVINCE: British Columbia

SPONSOR: Shamrock Construction

LOCATION: Nakusp Area

TYPE OF SURVEY: Induced Polarization and Resistivity

OPERATING MAN DAYS:	3.0	DATE STARTED:	November 4, 1980
EQUIVALENT 8 HR. MAN DAYS:	4.5	DATE FINISHED:	November 4, 1980
CONSULTING MAN DAYS:	2.0	NUMBER OF STATIONS:	41
DRAFTING MAN DAYS:	1.5	NUMBER OF READINGS:	335
TOTAL MAN DAYS:	8.0	KM. OF LINE SURVEYED:	1.95

CONSULTANTS:

Mr. F. DiSpirito, 2748 Oxford Street, Vancouver, B.C.
Mr. P.A. Cartwright, 4238 West 11th Avenue, Vancouver, B.C.

FIELD TECHNICIANS:

F. DiSpirito, 2748 Oxford Street, Vancouver, B.C.
G. Ouellette, 502 Taschereau Est. Rouyn, Quebec.
K. Johnston, 2519 Lakeshore Blvd. W., Apt. 206, Mimico, Ontario. M8V 1E3

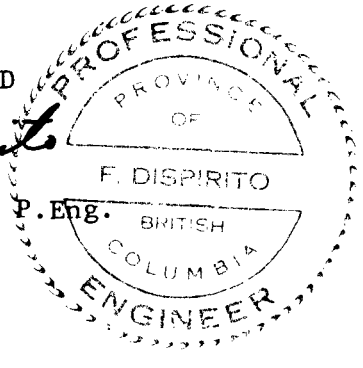
CARTOGRAPHERS:

R.C. Norris, 1204 - 45 Sunrise Avenue, Toronto, Ontario.
R.J. Pryde, R.R.#1, Sharon, Ontario.
M.W. Reh, 58 Crossbow Cres., Willowdale, Ontario.

PHOENIX GEOPHYSICS LIMITED

Frank DiSpirito

Frank DiSpirito, B.A.Sc., P.Eng.
Geophysicist



Dated: January 7, 1981

STATEMENT OF COST

Shamrock Construction - IP and Resistivity Survey -
Red Fisher Claims - Makusp, B.C.

CREW: F. DiSpirito, G. Ouellette, K. Johnston

PERIOD: November 4, 1980

1 Operating Day	@ $700.00	$700.00

PHOENIX GEOPHYSICS LIMITED

Frank DiSpirito

Frank DiSpirito, B.A.Sc., P.Eng.
Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
F. DISPIRITO

Dated: January 7, 1981

CERTIFICATE

I, Frank DiSpirito, of the City of Vancouver, Province of British Columbia, do hereby certify that:

1. I am a geophysicist residing at 2748 Oxford Street, Vancouver, B.C.

2. I am a graduate of the University of British Columbia, B.C. with a B.A.Sc. Degree in Geological Engineering.

3. I have been practising my profession about 6 years.

4. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Shamrock Construction or any affiliate.

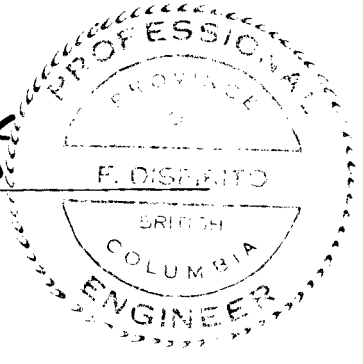
5. The statements made in this report are based on a study of published geological literature and unpublished private reports.

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

Dated at Vancouver

This 7th day of January, 1981

Frank DiSpirito, P.Eng.



CERTIFICATE

I, Paul A. Cartwright, of the City of Vancouver, Province of British Columbia, do hereby certify that:

1. I am a geophysicist residing at 4238 West 11th Avenue, Vancouver, B.C.

2. I am a graduate of the University of British Columbia, B.C. with a B.Sc. Degree.

3. I am a member of the Society of Exploration Geophysicists.

4. I have been practising my profession about 10 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 Shamrock Construction or any affiliate.

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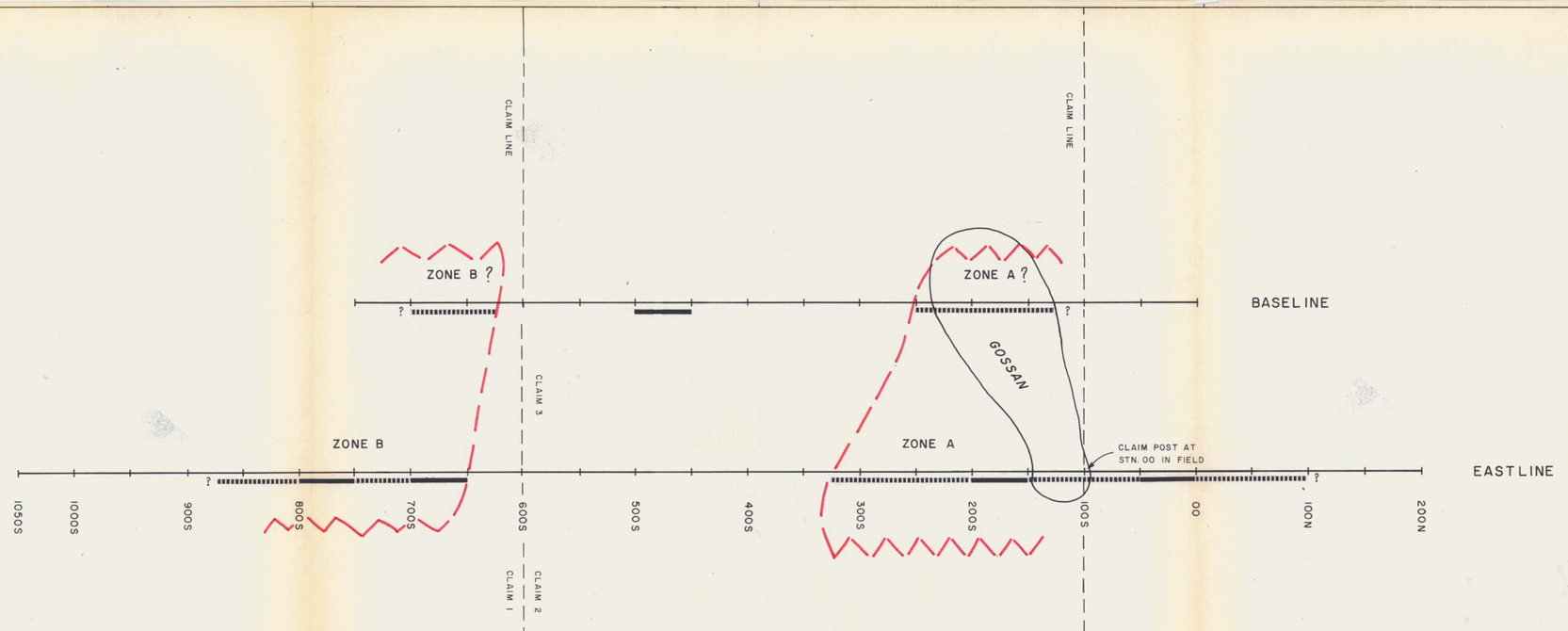
This 7th day of January, 1981

Paul A. Cartwright

Paul A. Cartwright, B.Sc.



DWG. NO.- I.P.P.- 1055

SHAMROCK CONSTRUCTION

RED FISHER CLAIMS, NAKUSP AREA

BRITISH COLUMBIA

SCALE

(Metres)

50 0 50 100 150 200

1 : 2500

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

NUMBER AT END OF ANOMALIES INDICATE SPREAD USED.

— ANOMALOUS I.P. ZONE

DRAWN : R.J.P.

DATE : JAN. 1981

APPROVED : J.D'Eguino

DATE : JAN 7/81

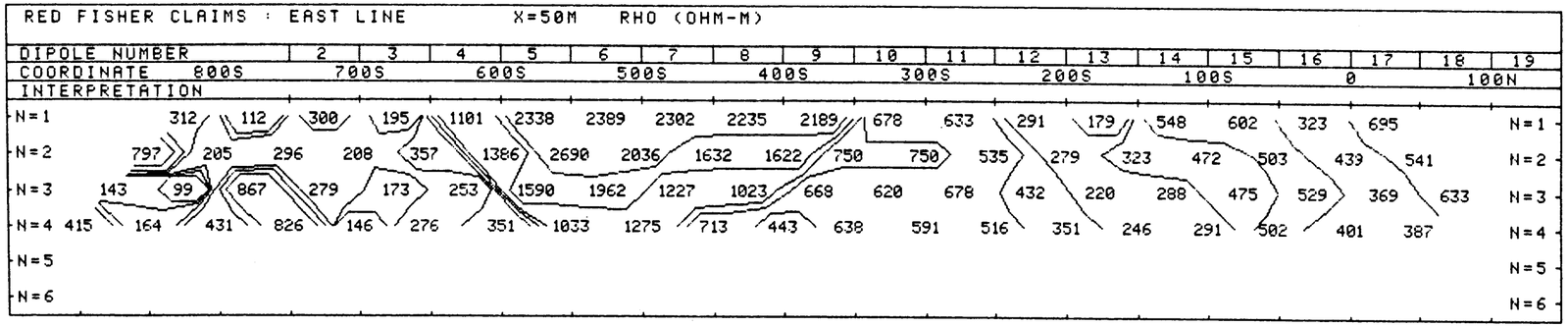
MINERAL TITLES BRANCH

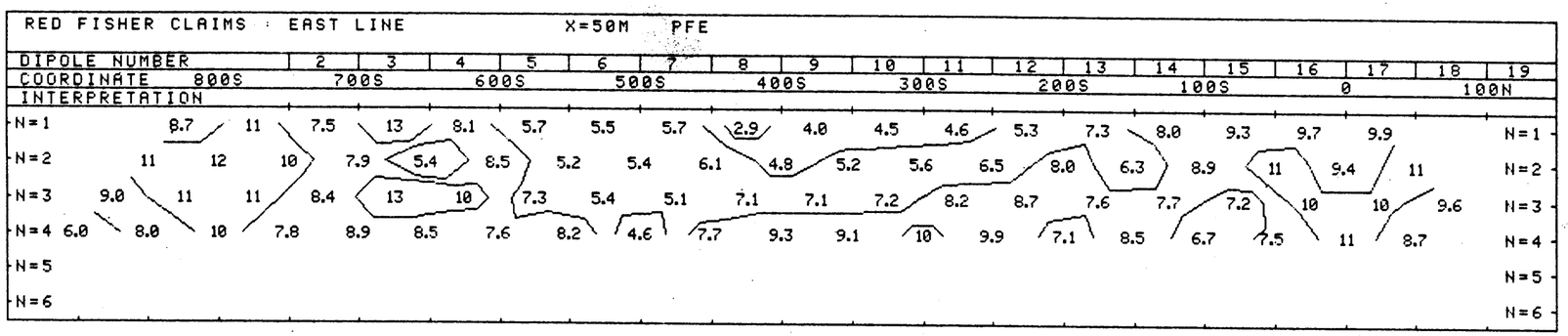
9447

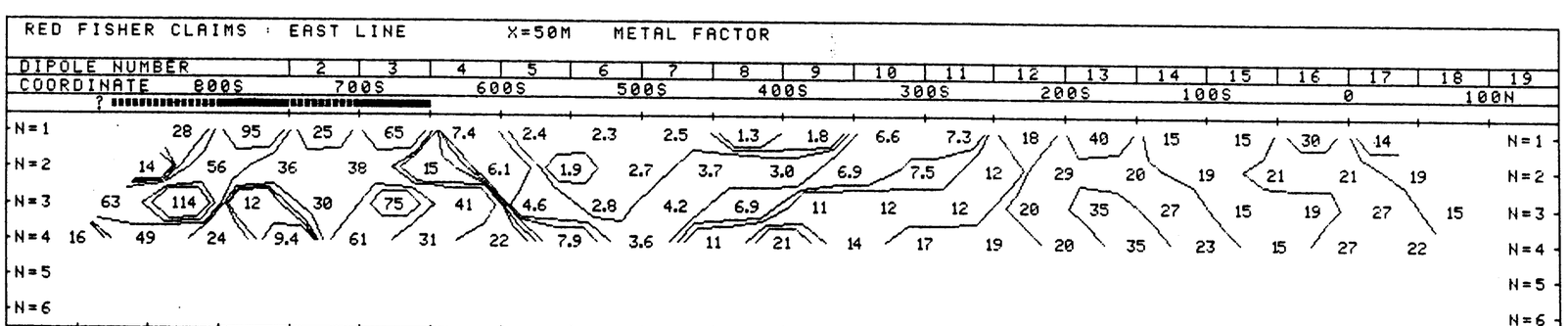
ASSOCIATION OF PROFESSIONAL ENGINEERS OF BRITISH COLUMBIA

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY







DWG. NO. - I.P. - 5241-1

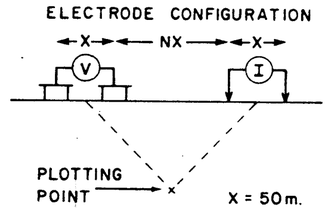
SHAMROCK CONSTRUCTION

RED FISHER CLAIMS , NAKUSP AREA

BRITISH COLUMBIA

LINE NO. - EAST LINE

ELECTRODE CONFIGURATION



9447

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0.3 - 5.0 Hz.

DATE SURVEYED AUG. 1980

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

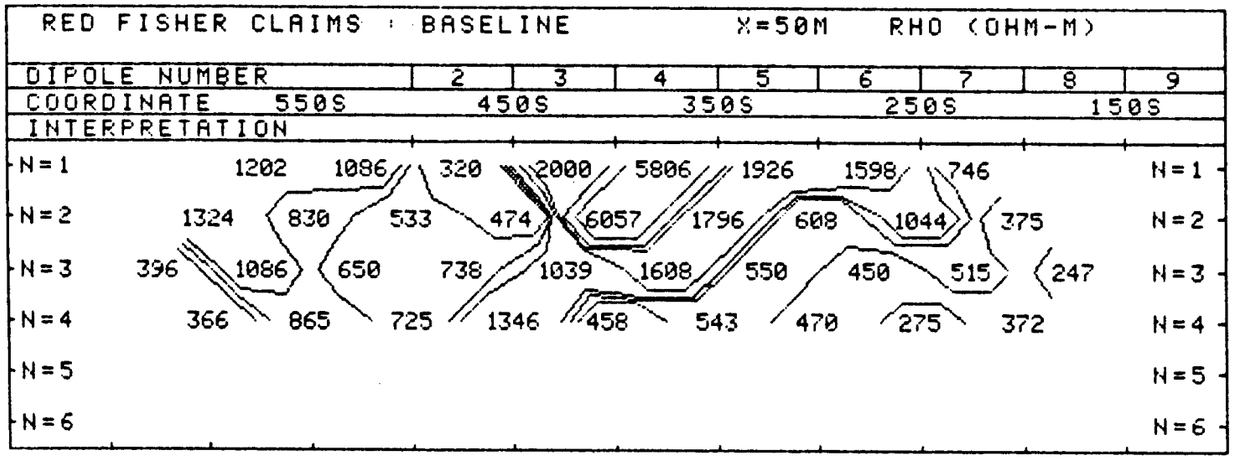
APPROVED

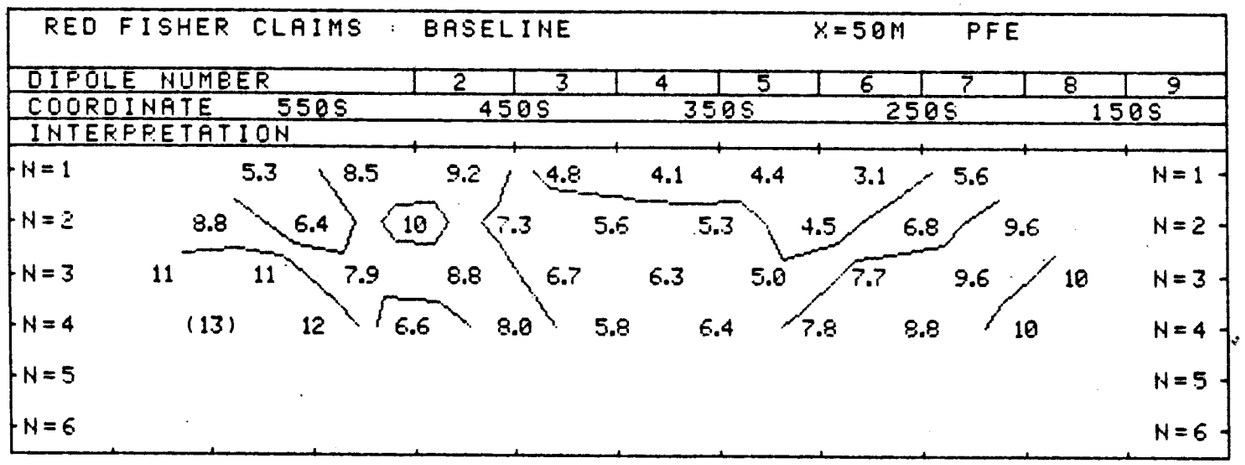
DATE JAN. 7 /81

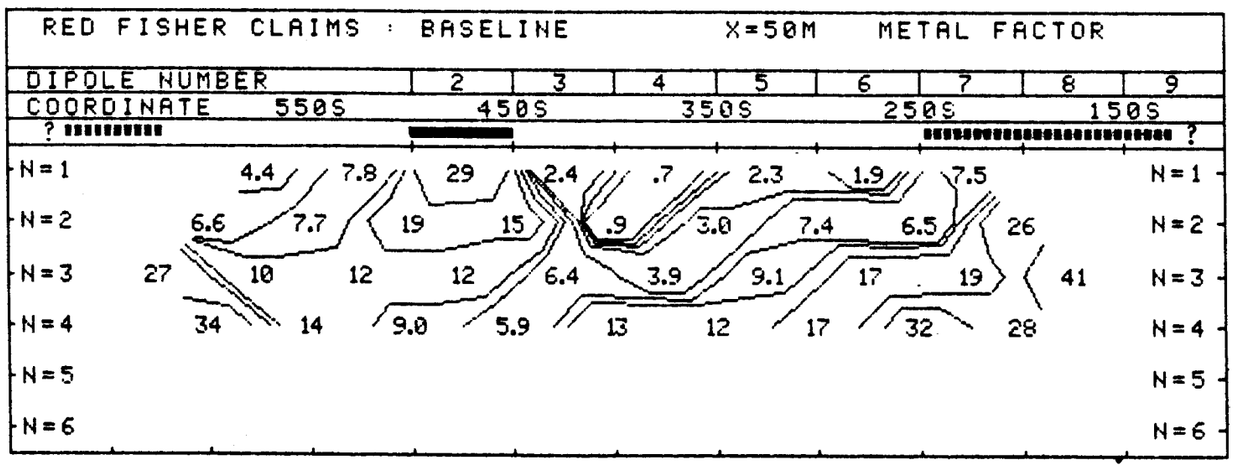
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY







DWG. NO. - I.P. - 5241-2

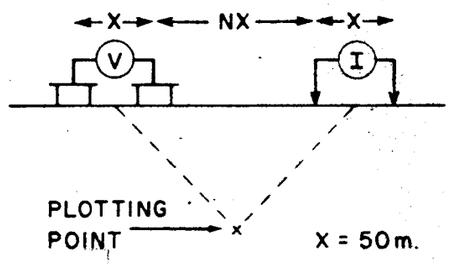
SHAMROCK CONSTRUCTION

RED FISHER CLAIMS , NAKUSP AREA

BRITISH COLUMBIA

LINE NO. - BASELINE

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

9447

FREQUENCIES 0.3 - 5.0 Hz.

DATE SURVEYED NOV. 1980

NOTE — CONTOURS AT LOGARITHMIC INTERVALS 1, -1.5, -2, -3, -5, -7.5, -10

APPROVED J. DiSpirito

DATE JAN. 7 / 81

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY