REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE KISPIOX PROPERTY, HAZELTON AREA, OMINECA MINING DIVISION, BRITISH COLUMBIA

BURN 3, 4 and 16 (40 units)
93M
55°22.5'N, 127°45.5'W

Owner/Operator:

Amoco Canada Petroleum Company Ltd.
Mining Division
656-409 Granville Street
Vancouver, B.C. V6C 1T2

Consultant:

Phoenix Geophysics Limited
310-885 Dunsmuir Street
Vancouver, B.C.

Report written by:

A. W. Mullen
Phoenix Geophysics Limited
310-885 Dunsmuir Street
Vancouver, B.C.

Submitted January 15, 1980.

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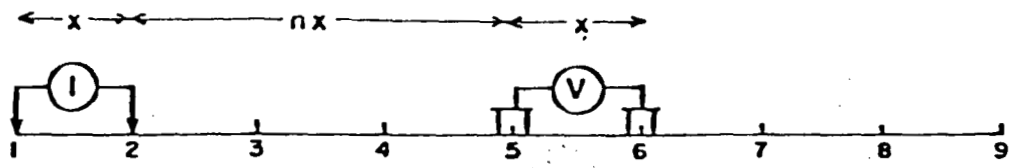
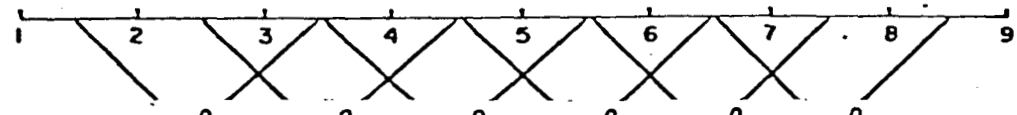
METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS



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

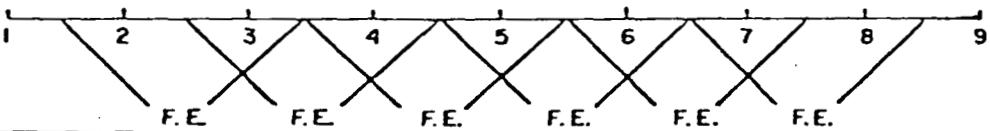
n - 1 — M.F. 1,2-3,4 M.F. 2,3-4,5 M.F. 3,4-5,6 M.F. 4,5-6,7 M.F. 5,6-7,8 M.F 6,7-8,9

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 ON THE KISPIOX PROPERTY, HAZELTON AREA OMINECA MINING DIVISION, B.C. FOR AMOCO CANADA PETROLEUM COMPANY LTD.

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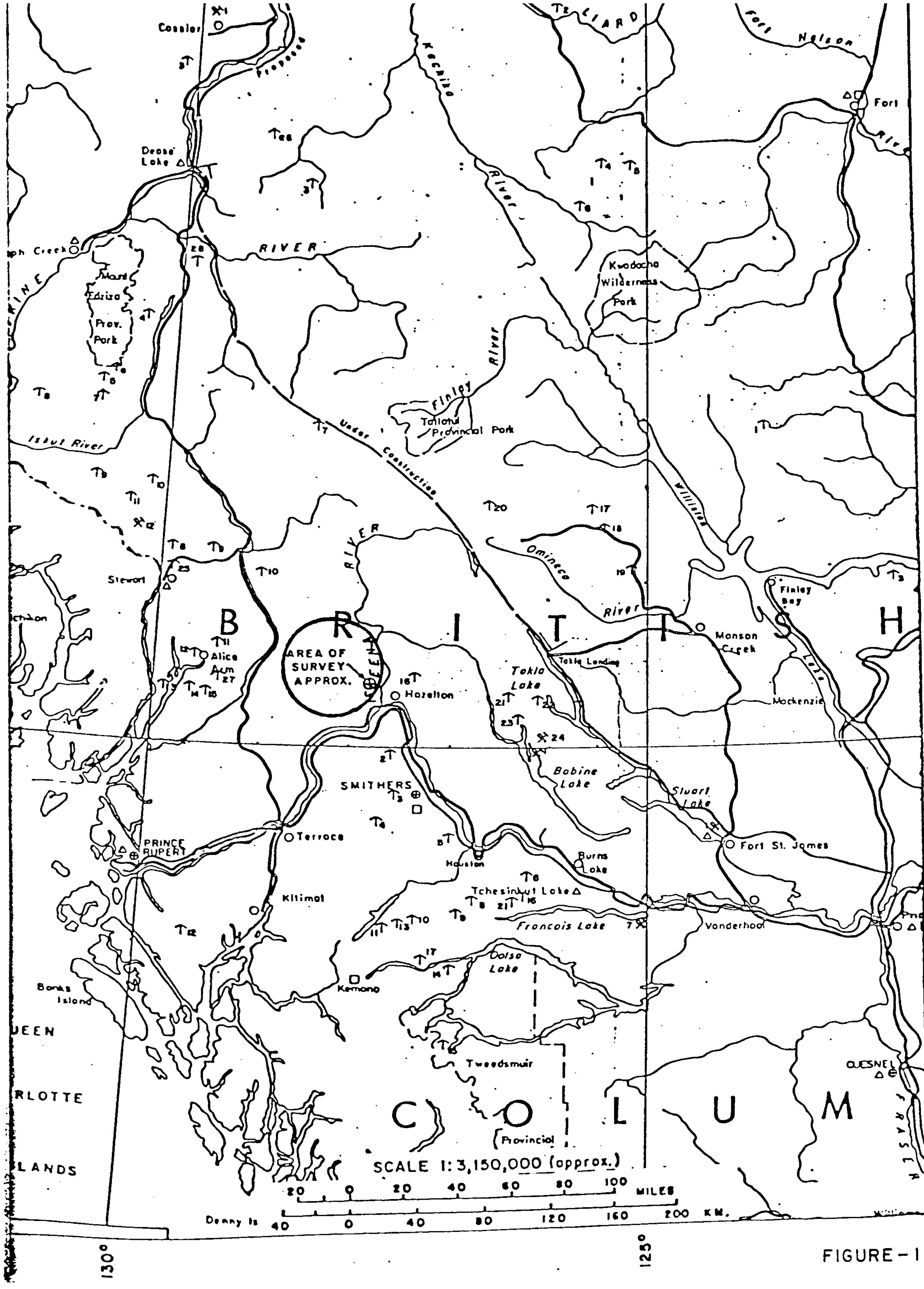
1. INTRODUCTION

An Induced Polarization and Resistivity survey has been carried out for Amoco Canada Petroleum Company Ltd., on their Kispiox Property in the Omineca Mining Division. The property is located about 14.5 km NNW of Hazelton, B.C. The centre of the claim group is positioned at about 127^{o} 45.5' west longitude and 55^{o} 22.5' north latitude. (Fig.#1).

Access to the property is via a secondary gravel road north from Hazelton to Kispiox and then NW by a bush road to the property.

The object of the survey was to explore for economic concentrations of metallic sulfides which might be associated with molybdenum mineralization.

The survey was carried out in July, 1979 under the supervision of



Cassiar
Dease Lake
LIARD
Fort Nelson
Fort
Kechika River
RIVER
Mount Edziza Prov. Park
Kwadacha Wilderness Park
Finlay River
Tatlatui Provincial Park
Under Construction
Iskut River
Stewart
Omineca River
Finlay Bay
B R I T I S H
AREA OF SURVEY APPROX.
SKEENA
RIVER
Alice Arm
Hazelton
Takla Lake
Takla Landing
Manson Creek
Mackenzie
Bobine Lake
Stuart Lake
SMITHERS
Terrace
PRINCE RUPERT
Houston
Burns Lake
Fort St. James
Tchesinkut Lake
Kitimat
Francois Lake
Vanderhoof
Ootsa Lake
Kemano
Banks Island
Tweedsmuir Provincial
QUEEN CHARLOTTE ISLANDS
C O L U M
QUESNEL
FRASER
SCALE 1: 3,150,000 (approx.)
20 0 20 40 60 80 100 MILES
40 0 40 80 120 160 200 KM.
Denny Is
130°
125°

FIGURE - I

Party Chief, John Marsh. His certificate of qualification is appended to this report.

This survey is an extension of an earlier survey carried out on the Kispiox property by Phoenix Geophysics Limited in October, 1975.

A Phoenix IPT-1, IPV-1 frequency domain IP system operating at 0.3 and 5.0 Hz was used for the survey.

2. DESCRIPTION OF CLAIMS

The Kispiox property is held by Amoco under an option agreement with Messrs. John and Earl Sargent.

Figure #2 shows the Burn Claim Group consisting of Burn 3, 4 and 16 claims. The figure also illustrates the relative position of the survey grid to the claims.

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.
94N	100 meters	IP 5164-1
98N	100 meters	IP 5164-2
	60 meters	IP 5164-3
	200 meters	IP 5164-4
100N	100 meters	IP 5164-5
102N	100 meters	IP 5164-6
104N	100 meters	IP 5164-7
106N	100 meters	IP 5164-8

Also enclosed with this report is Dwg. I.P.P. 3071 , a plan map of the Kispiox Property Grid at a scale of 1:5000. 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 100m electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 100m 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 claim and Grid information shown on Dwg. I.P.P. 3071 has been taken from maps made available by the staff of Amoco Canada Petroleum Company Ltd. Also shown on Dwg. I.P.P.3071 are IP anomaly locations obtained from a previous survey. This information was provided by Amoco.

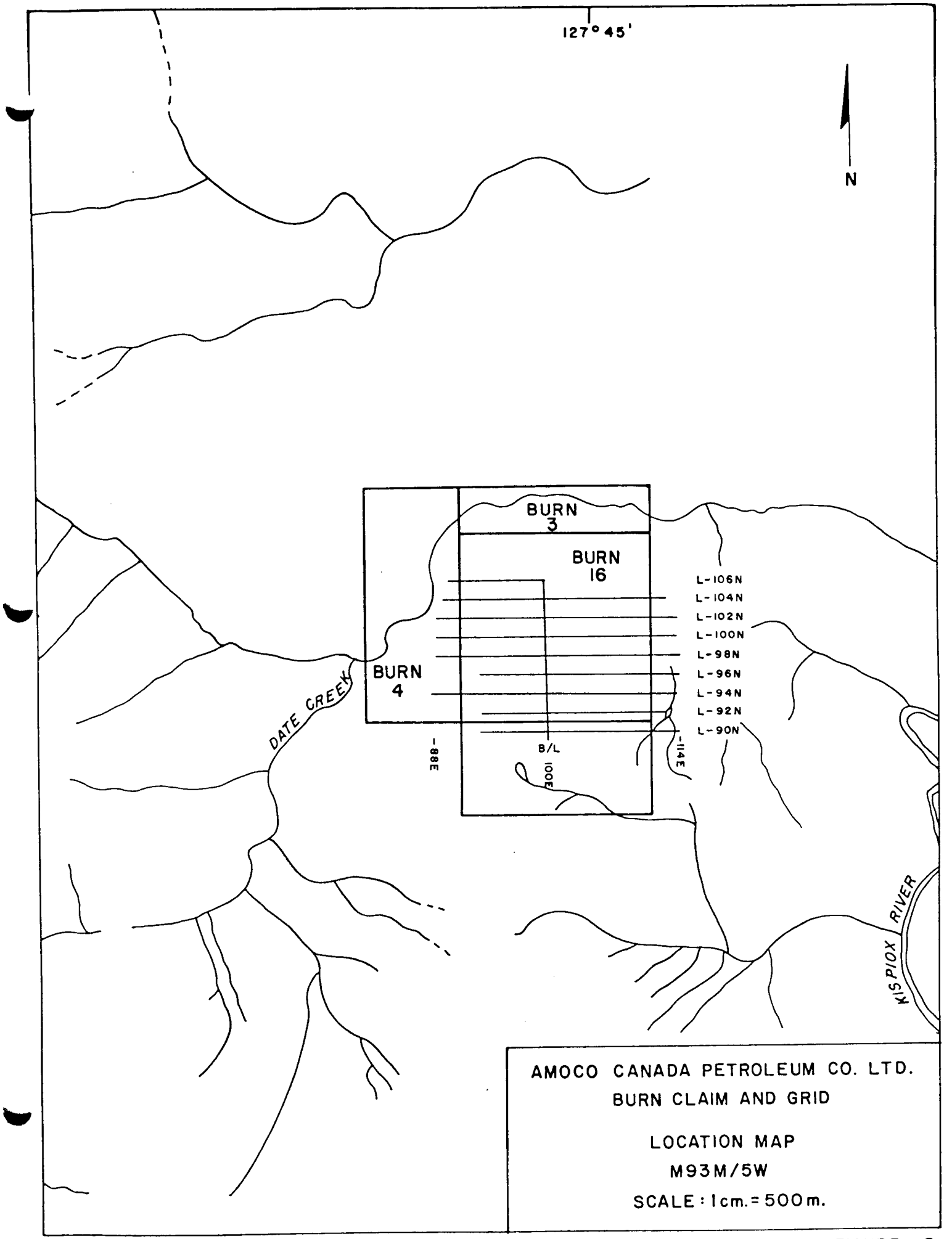

127° 45'
N
BURN 3
BURN 16
BURN 4
L-106N
L-104N
L-102N
L-100N
L-98N
L-96N
L-94N
L-92N
L-90N
-88E
B/L
100E
-114E
DATE CREEK
KISPIOX RIVER
AMOCO CANADA PETROLEUM CO. LTD.
BURN CLAIM AND GRID
LOCATION MAP
M93M/5W
SCALE : 1cm. = 500m.

FIGURE – 2

4. DESCRIPTION OF GEOLOGY

North trending moderately west dipping arkose, argillite and shale of the Jurassic Hazelton Group underlie much of the Kispiox property. Intrusive into these sedimentary rocks are several small stocks and dyke-like bodies of granodiorite and biotite feldspar-porphyry of Cretaceous to Tertiary age. Weak molybdenite and chalcopyrite mineralization occur in both intrusive varieties and in the altered hornfelsed sediments surrounding the intrusive bodies.

5. DISCUSSION OF RESULTS

The recently completed extension of the IP survey on the Kispiox property has delinated the high resistivity core. A modified interpretation of sub-surface resistivities is shown in Dwg.I.P.P. 3071. This interpretation has outlined a high resistivity core surrounded by intermediate and low magnitude resistivities.

Apparent resistivities are influenced by one or more of the following factors or conditions; rock type; depth and nature of overburden; rock alteration which can result in either increased or decreased resistivities; physical deformation such as faulting, brecciation etc; and/or mineralization.

The high resistivity core likely reflects the less porous acid intrusives while the lower resistivities could reflect sedimentary horizons or a pyritic halo related to the intrusive. A zone of intermediate magnitude resistivities could reflect either hornfelsed sediments or altered intrusives.

The high resistivity core displays a low but consistent frequency effect. This would suggest weakly disseminated metallic material in the acid intrusives. The source of these frequency effects could be magnetite or metallic sulfides. A few magnetometer profiles would investigate the possible

contribution from magnetite.

A line by line description of the current IP survey results follows:

Line 94N - Dwg. IP 5164-1

The extended survey shows a dramatic drop in resistivities and increase in recorded IP effects. As a result the high resistivity core is delineated to the west and the low to intermediate magnitude resistivities were encountered along the west grid boundary. Weak to moderate magnitude IP effects correlate with the lower resistivities.

Line 98N - Dwg. IP 5164-2,-3,-4

Line 98N was extended to the west with 100m electrode intervals, detailed with shorter 60m intervals and investigated at greater depth with 200m intervals.

The 100m survey extends the high resistivity core to the west, but suggests a limited depth extent of the higher resistivity material and confirms a narrow embayment of intermediate resistivities at 96+50E. A weak IP anomaly showing some depth to the source is centered at 96+50E. Moderate magnitude IP effects occur at the west end of the line correlating with the intermediate resistivity levels.

The 60m detail survey confirms the 100m results. The lower resistivity embayment is confirmed and better defined at 96+70E. The weak but consistent frequency effects within the higher resistivities are also confirmed. The detail does suggest some variation in IP effect with stronger anomalies centred at 96+70E, 98+50E and 99+70E.

The 200m survey basically confirms the results at the 60m and

100m intervals. There is a suggestion that lower resistivity material dips under the higher resistivity core both to the east and west. Missed readings beneath 101E unfortunately prevent investigation of resistivity levels in this vicinity.

Line 100N, Dwg. IP 5164-5

The 100m line extension again delineates the high resistivity core to the west. There is a definite indication of the lower resistivity material dipping easterly under the higher resistivities.

Moderate magnitude IP effects correlate with the low resistivities at the west end of the line.

Line 102N, Dwg. IP 5164-6

This line is located north of the core of higher resistivities and is located entirely within the low and intermediate resistivity environment.

A strong IP anomaly occurs at the east end of the line correlating with very low resistivities. A moderate magnitude IP anomaly has been located at the west end of the grid line. Weak IP anomalies centred at 94E and 97E both show some distance to the source estimated at about 25-50m. In both cases it could be a side effect from the strong IP anomalies encountered on Line 104N.

Line 104N, Dwg. IP 5164-7

This line lies almost entirely within the low to very low resistivity environment. Locally, intermediate magnitude resistivities were located at 95+50E and 104+50E.

The line is almost continuously anomalous and IP effects are

moderate to strong. Some depth to the source is indicated at 92E, 99E - 100E, and at the east end of the grid line at about 106+50E.

Line 106N, Dwg. IP 5164-8

Only a short section of Line 106N was surveyed. A resistivity change was indicated at about 92+50E with intermediate levels to the west. This may be an indication of a geological change to the northwest. The remainder of the line shows low resistivities and strong IP effects. Some depth to the source is suggested and estimated at about 25 - 50 meters.

6. SUMMARY AND CONCLUSIONS

An earlier IP and Resistivity survey of the Kispiox property has been extended to the west and north. As a result, the high resistivity core has been outlined and better defined and the surrounding lower resistivity areas are also better located.

The amount of follow-up investigation of the earlier IP survey is not known. Certainly the source of the moderate to strong IP effects which surround the high resistivity core are likely known as a result of earlier investigations. If not, an attempt should be made to determine the source material of these anomalous IP effects.

Very little IP response is obtained from the mineral molybdenite. Sometimes there are sufficient metallic sulfides such as pyrite and chalcopyrite with the molybdenite to cause recognizable IP anomalies. In other cases, the metallic sulfides occur as an aureole surrounding the molybdenite mineralied body. This causes a surrounding IP anomaly with little or no IP effect from the molybdenite containing body. For this reason, it is recommended that several vertical holes be drilled to investigate the high

resistivity core.

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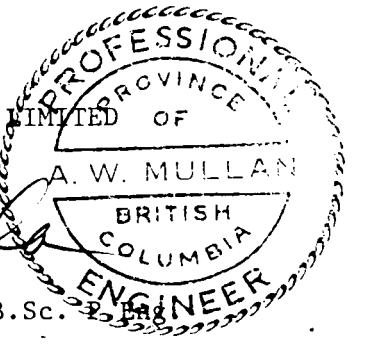
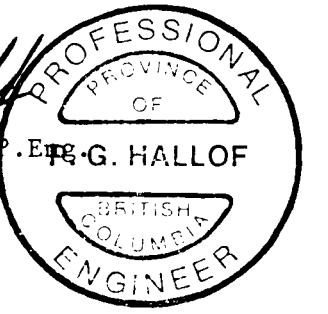


Ashton W. Mullan, B.Sc., P.Eng.
Geologist



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

Expiry Date: February 25, 1980

Dated: October 4, 1979

ASSESSMENT DETAILS

PROPERTY: Kispiox Property

MINING DIVISION: Omineca

SPONSOR: Amoco Canada Petroleum Co. Ltd.

PROVINCE: British Columbia

LOCATION: Hazelton Area

TYPE OF SURVEY: Induced Polarization & Resistivity

OPERATING MAN DAYS:	14.0	DATE STARTED: July 9, 1979
EQUIVALENT 8 HR. MAN DAYS:	21.0	DATE FINISHED: July 17, 1979
CONSULTING MAN DAYS:	2.0	NUMBER OF STATIONS: 120
DRAFTING MAN DAYS:	8.0	NUMBER OF READINGS: 873
TOTAL MAN DAYS:	31.0	KM OF LINE SURVEYED: 11.5

CONSULTANTS:

A.W. Mullan, 310 - 885 Dunsmuir Street, Vancouver, B.C.
P.G. Hallof, 15 Barnwood Court, Don Mills, Ontario.

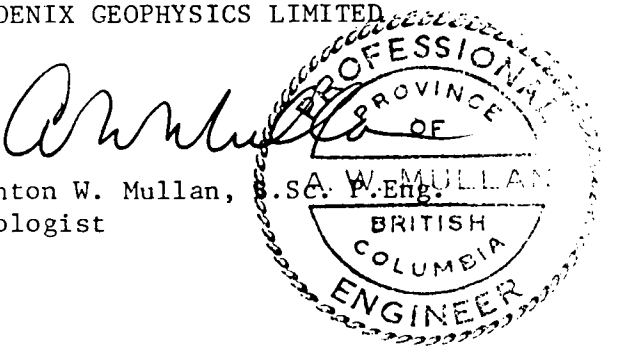
FIELD TECHNICIANS:

J. Marsh, 310 - 885 Dunsmuir Street, Vancouver, B.C.
G. Richardson, 4161 Crown Crescent, Vancouver, B.C.
Extra Labourer::
P. Mullan, 1440 Sandhurst Place, West Vancouver, B.C.

DRAUGHTSMEN:

R. C. Norris, 3000 - 106 Victoria Park Avenue, Willowdale, Ontario.
R.J. Pryde, R.R.#1, Sharon, Ontario.
P.J. Anderson, 40 Landfair Cres., Scarborough, Ontario.
B. Boden, R.R.#1, Omemee, Ontario.

PHOENIX GEOPHYSICS LIMITED



Ashton W. Mullan, B.Sc. P.Eng.
Geologist

Dated: October 4, 1979

STATEMENT OF COST

Amoco Canada Petroleum Company Ltd. - IP Survey
Omineca Mining Division, Hazelton, B.C.

CREW: J. Marsh - G. Richardson

PERIOD: July 9 - July 17, 1979

7 Operating days		@ $490.00/day	$3,430.00
1 Standby) 1 Bad Weather)	2 days	@ $190.00/day	380.00
Mobilization			1,285.00

EXPENSES:

Vehicle	18.50	
Meals	95.54	
Supplies	13.29	
Telephone	25.00	
	152.33	
+ 10%	15.23	167.56
EXTRA LABOURERS	450.00	
+ 20%	90.00	540.00
		$5,802.56

PHOENIX GEOPHYSICS LIMITED

Ashton W. Mullan, B.Sc. P.Eng
Geologist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. W. MULLAN

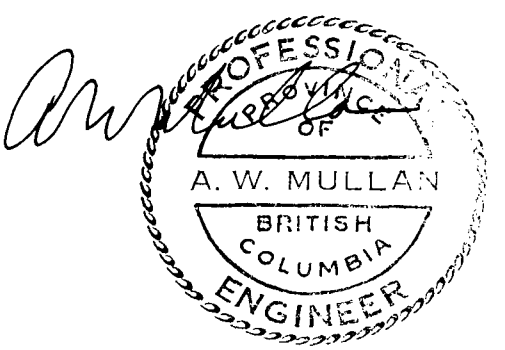
Dated: October 4, 1979

EVALUATION OF WORK : ADDENDUM

1. Linecutting: From June 1 to June 15, 1979, 6050 metres of line were cut and chained.

a) Costs:

9 days (18 mandays) at $230.00/day	=	$2070.
1 standby day at $50.00/day	=	50.
TOTAL		$2120.



CERTIFICATE

I, Ashton W. Mullan, of the City of Vancouver, in the Province of British Columbia, hereby certify:

1. That I am a geologist/geophysicist and a fellow of the Geological Association of Canada, Geophysics Division, with a business address at 310 - 885 Dunsmuir Street, Vancouver, B.C.

2. That I am registered as a member of the Association of Professional Engineers of the Provinces of Ontario and British Columbia.

3. That I hold a B.Sc. degree from McGill University.

4. That I have been practising my profession as a geologist/geophysicist for over twenty-five 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 Amoco Canada Petroleum Company 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 Vancouver

This 4th day of October, 1979

A.W. Mullan, B.Sc., P.Eng.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A.W. MULLAN

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 Amoco Canada Petroleum Company 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 4th day of October, 1979

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

PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
P. G. HALLOF

Expiry Date: February 25, 1980

CERTIFICATE

I, JOHN MARSH, of the Municipality of North York, Ontario, DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at 200 Yorkland Blvd., Willowdale, Ontario.

2. I am a graduate of the City of Norwich Technical College, U.K., ordinary National Certificate (Electrical Engineering)

3. I worked with McPhar Geophysics Company from 1968 to 1975 as a geophysical crew leader.

4. I am presently employed as a geophysical crew leader by Phoenix Geophysics Ltd. of 1424 - 355 Burrard Street, Vancouver, B.C.

Dated at Vancouver, B.C.

This 29th Day of July, 1977

John Marsh.

John Marsh

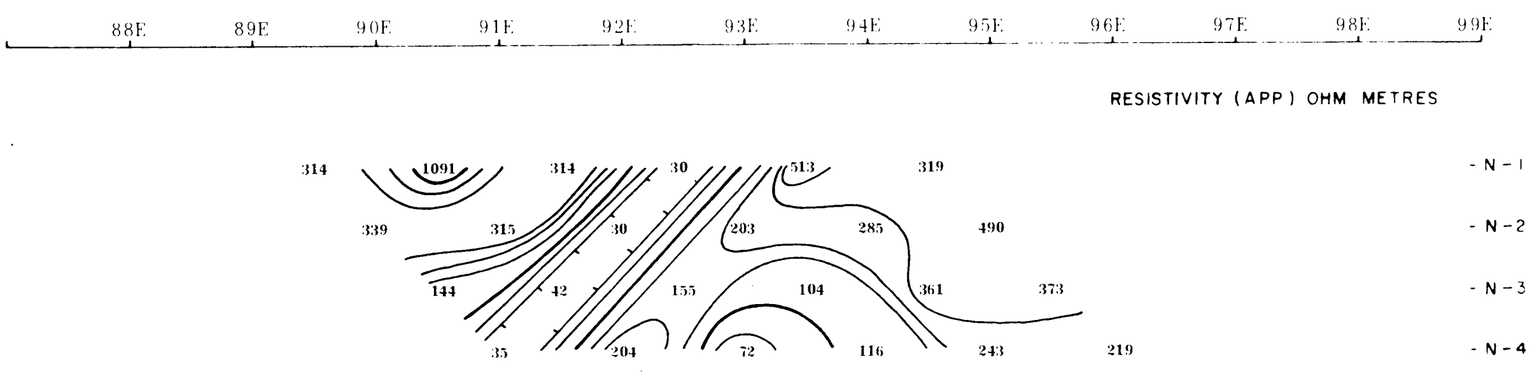
DWG. NO. - I.P. - 5164-1

AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO. - 94 N



ELECTRODE CONFIGURATION

PLOTTING POINT → X=100m

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE ——————

PROBABLE ··········

POSSIBLE ‹‹‹‹‹‹

FREQUENCIES 0.3 - 5.0 HZ

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

DATE SURVEYED JULY 1979

APPROVED P.G. Hallof

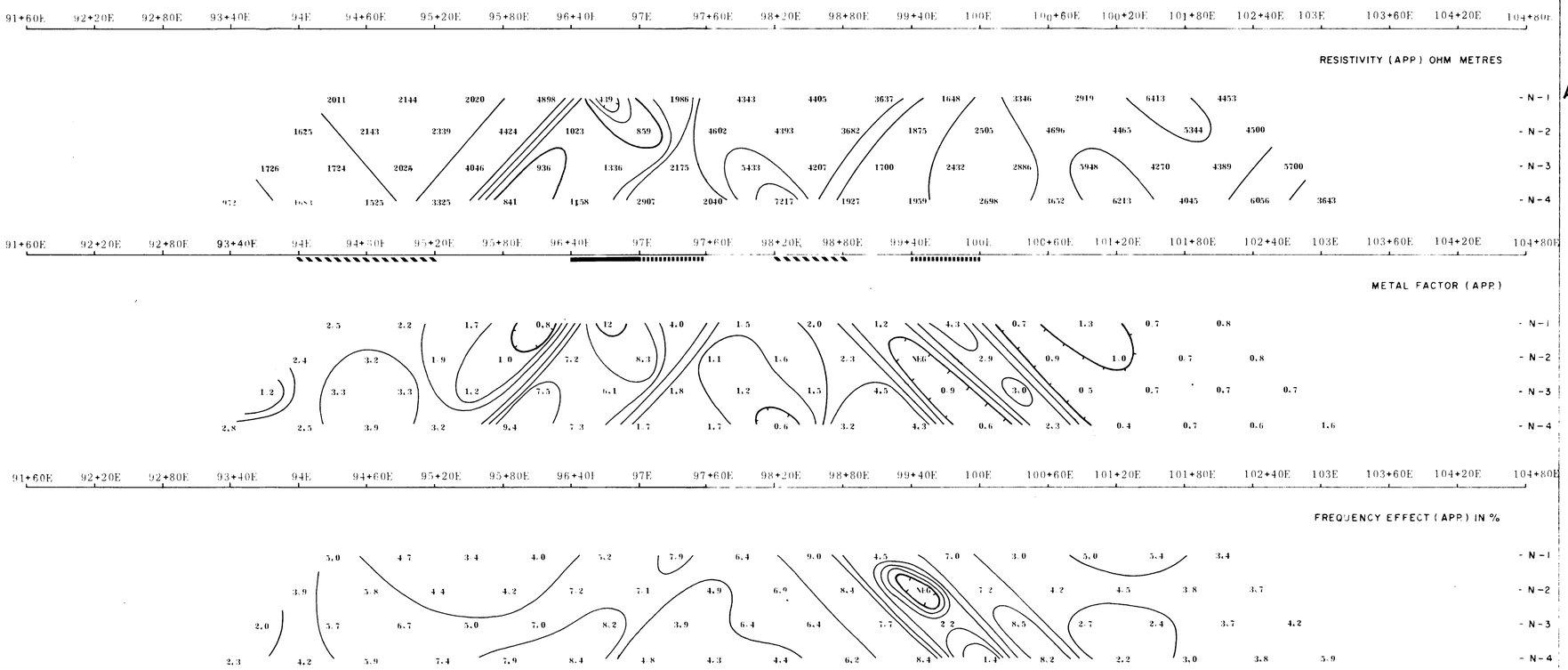
DATE 10/9/79

MINERAL OF ONTARIO ASSESSMENT

7864

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO. - I.P. - 5164-3

AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO. - 98N

ELECTRODE CONFIGURATION

X ← NX → X

V I

PLOTTING POINT → X=60m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0.3-5.0 HZ

DATE SURVEYED JULY 1979

APPROVED

DATE 16/9/79

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. - 5164-4

AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

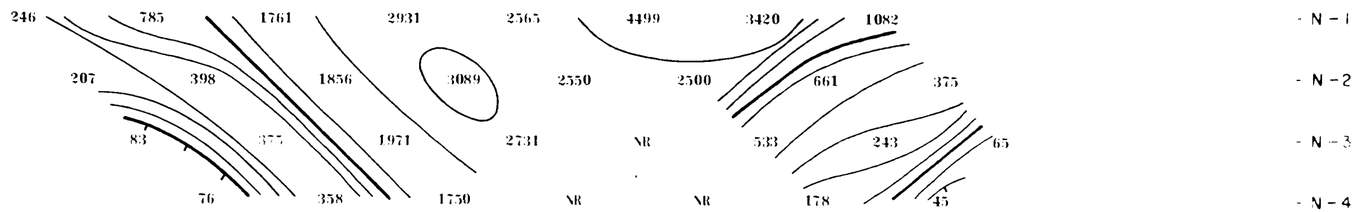
OMINECA MINING DIVISION , B.C.

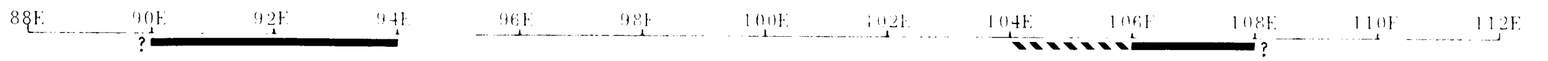
LINE NO.- 98N

ELECTRODE CONFIGURATION

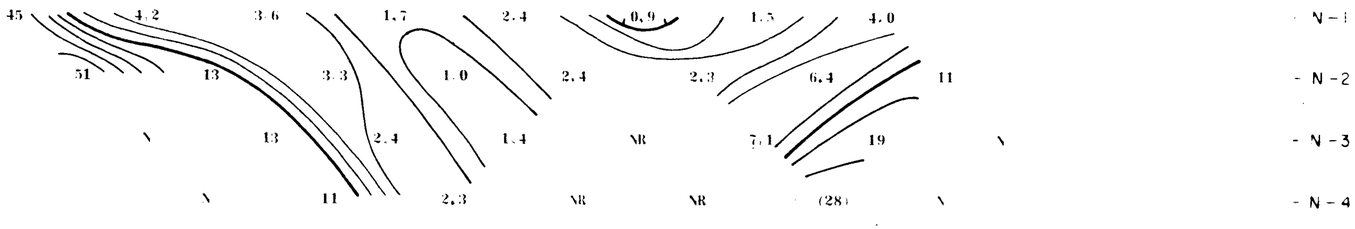
X ---- NX ---- X

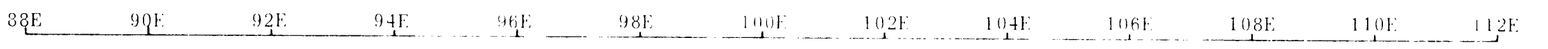
RESISTIVITY (APP.) OHM METRES



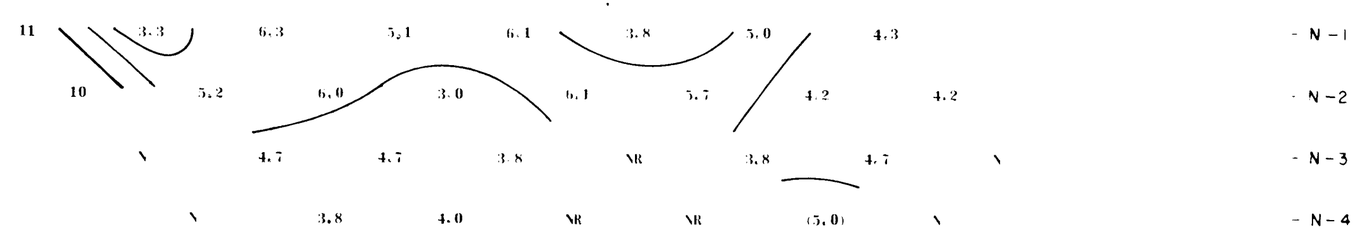


METAL FACTOR (APP.)





FREQUENCY EFFECT (APP.) IN %



PLOT NO.

POINT ——— X=200m.

SURFACE PROJECTION

GRAVITY MASS ZONE

DEEP TO

PROBABLE

POSSIBLE

FREQUENCIES 0.3-5.0 HZ

NOTE CONTOURS AT LOGARITHMIC INTERVALS (1, 1.5, 2, 2.5, 3, 4, 5, 6, 7.5, 10)

DATE SURVEYED JULY 1979

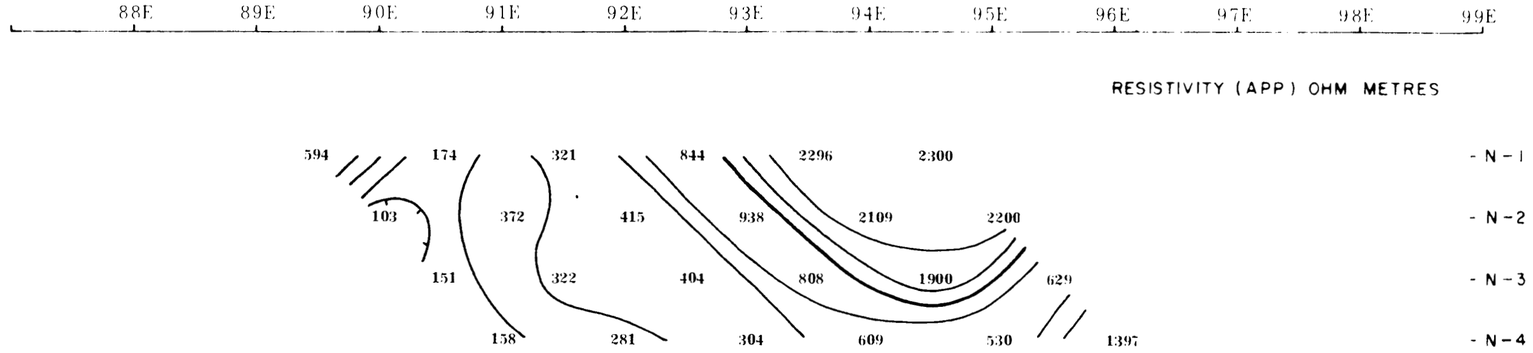
APPROVED P.G. Hallof

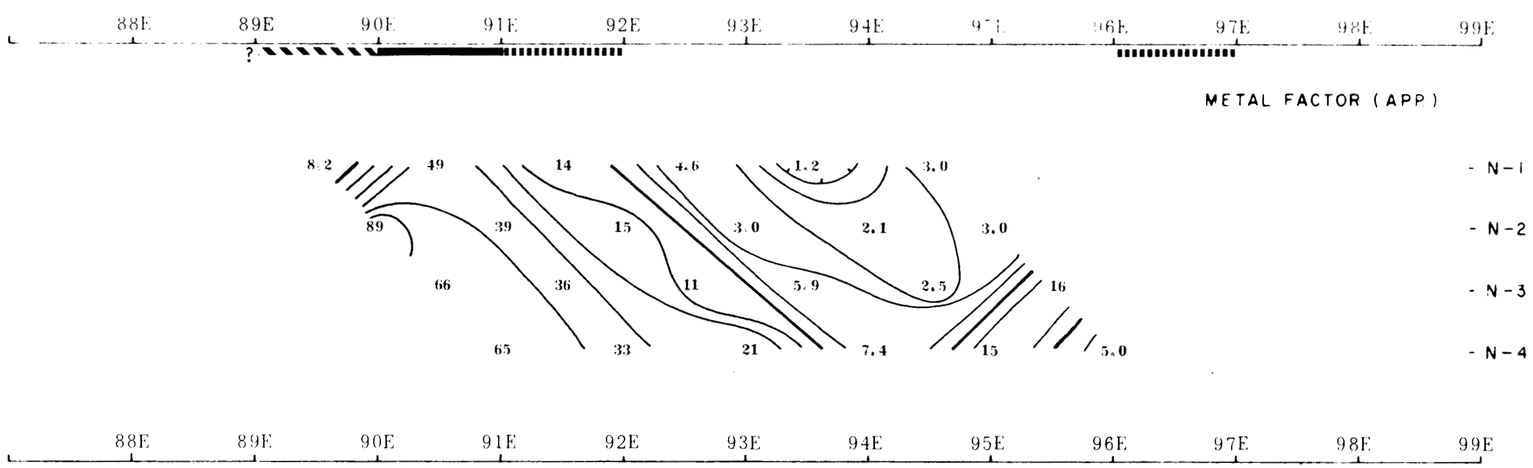
DATE 10/4/79

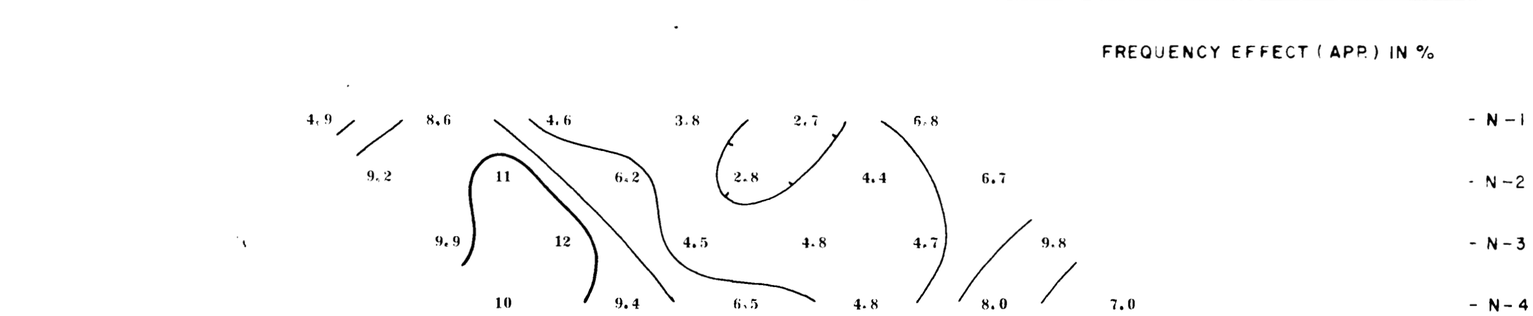
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7864

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY







DWG. NO. - I.P. - 5164-2

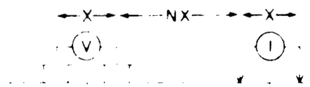
AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO.- 98N

ELECTRODE CONFIGURATION



PLOTTING POINT → X = 100 m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE ——

PROBABLE ·····

POSSIBLE - - - -

FREQUENCIES 0.3 - 5.0 HZ

DATE SURVEYED JULY 1979

APPROVED P.H. Kelly

DATE 10/9/79

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

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

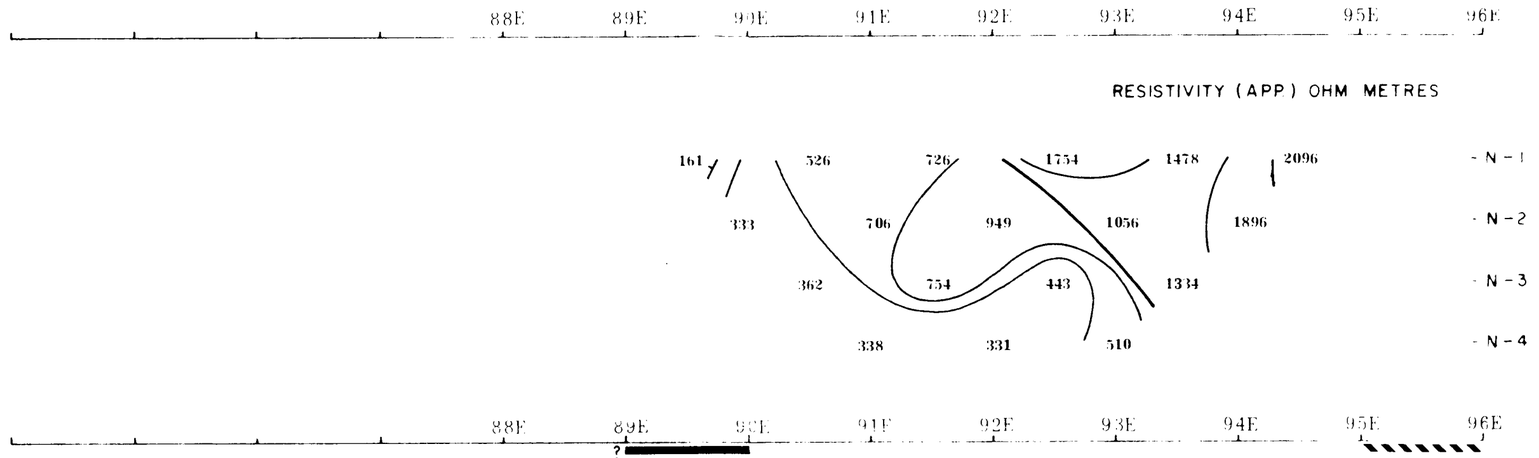
DWG NO. - I.P. - 5164-5

AMOCO CANADA PETROLEUM CO. LTD.

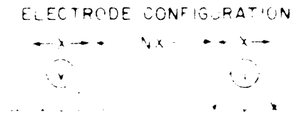
KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO. - 100 N



ELECTRODE CONFIGURATION



PLOTTING POINT → x-100m

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0.3 - 5.0 HZ

DATE SURVEYED JULY 1979

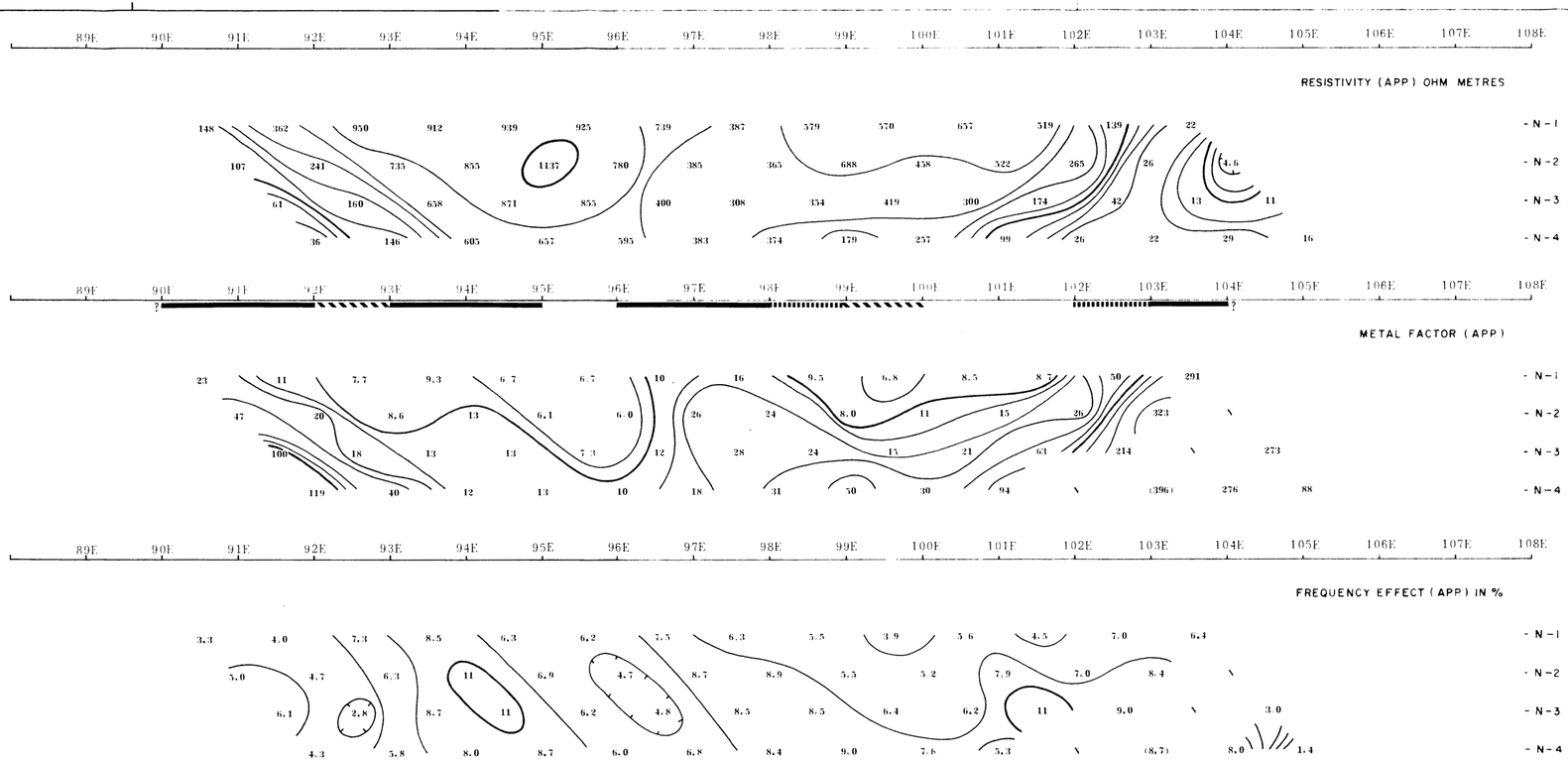
APPROVED P.A. Kelly

DATE 10/4/79

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, 1.5, 2, 2.5, 3, 3.5, 4, 5, 6, 7.5, 10

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO. - I.P. - 5164-6

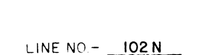
AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO - 102 N

ELECTRODE CONFIGURATION



PLOTTING POINT → X=100m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE ——

PROBABLE ·····

POSSIBLE ~~~~~

FREQUENCIES 0.3 - 5.0 HZ

DATE SURVEYED JULY 1979

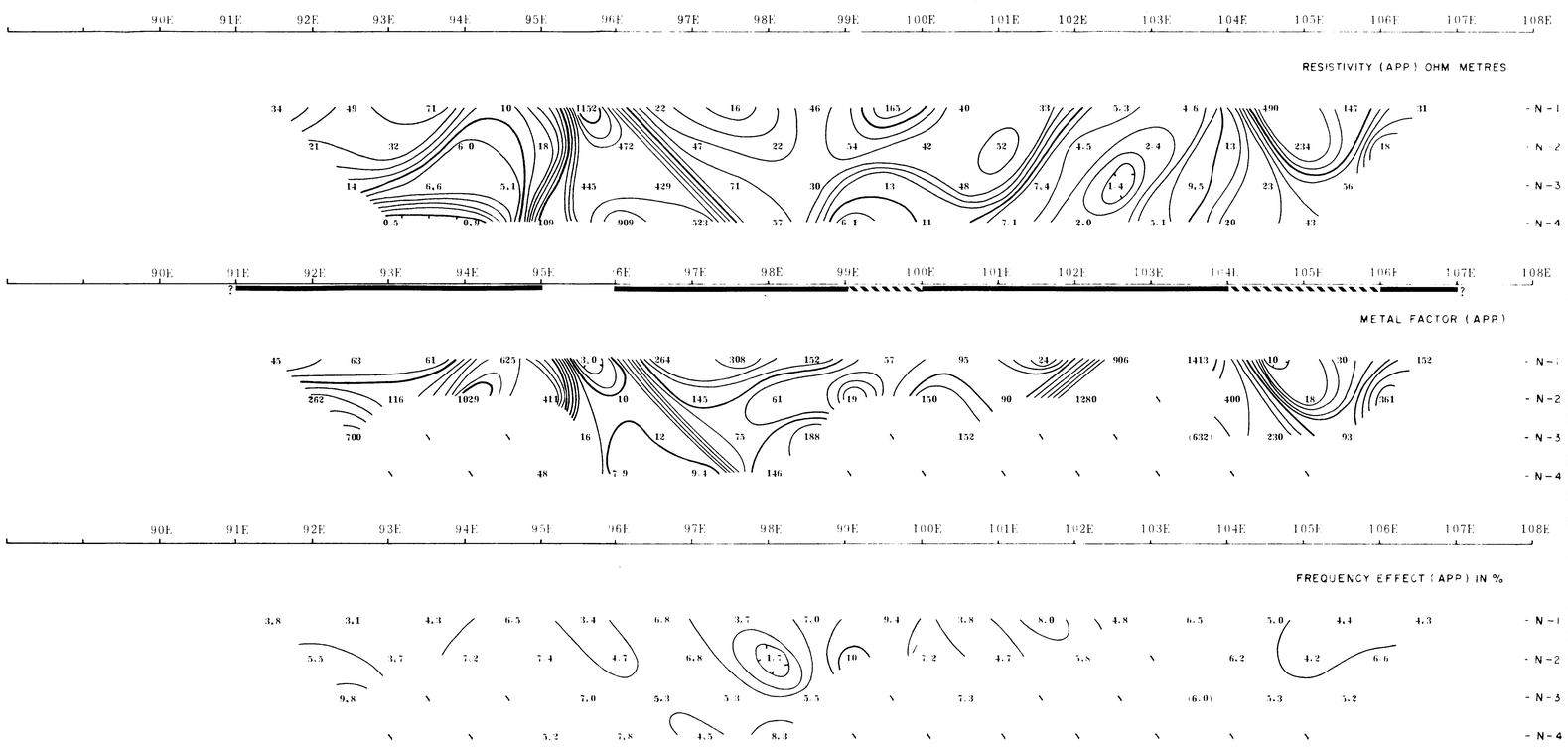
APPROVED D.K. Kelly

DATE 10/4/79

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. - 5164-7

AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO.- 104N

ELECTRODE CONFIGURATION

PLOTTING POINT → X=100m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

MINISTRY OF ENERGY, MINES & PETROLEUM RESOURCES

ASSESSMENT REPORT

7864

FREQUENCIES 0.3-5.0 HZ.

DATE SURVEYED JULY 1979

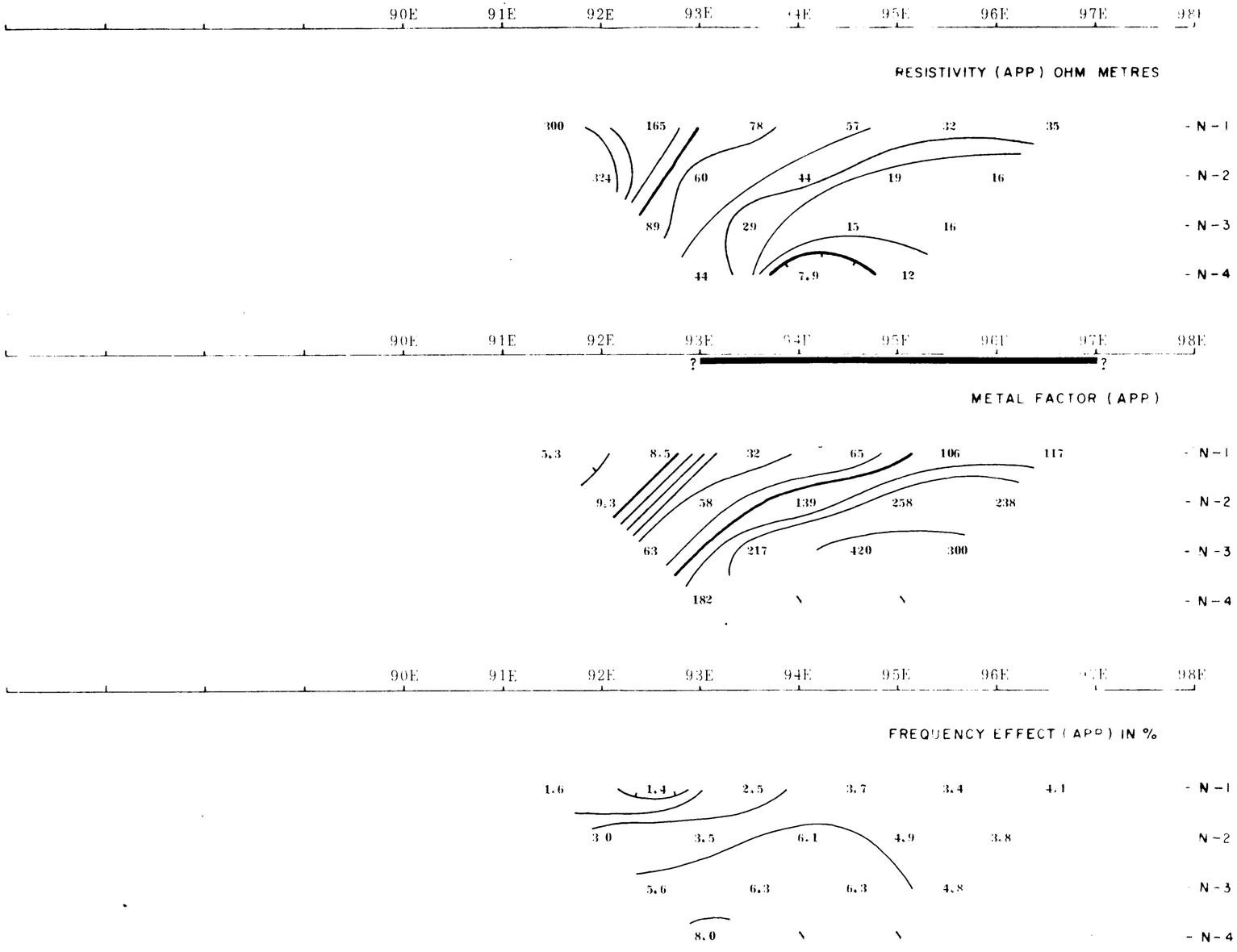
APPROVED

DATE 10/4/79

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. - 5164-8

AMOCO CANADA PETROLEUM CO. LTD.

KISPIOX PROPERTY , HAZELTON AREA

OMINECA MINING DIVISION , B.C.

LINE NO.- 106 N

ELECTRODE CONFIGURATION

X NX X

V I

PLOTTING POINT → X=100m.

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0·3 - 5·0 HZ

DATE SURVEYED JULY 1979

APPROVED P.H. Kelly

DATE 10/4/79

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1, 1·5, 2, 2·5, 3·75, 10

PHOENIX GEOPHYSICS LIMITED

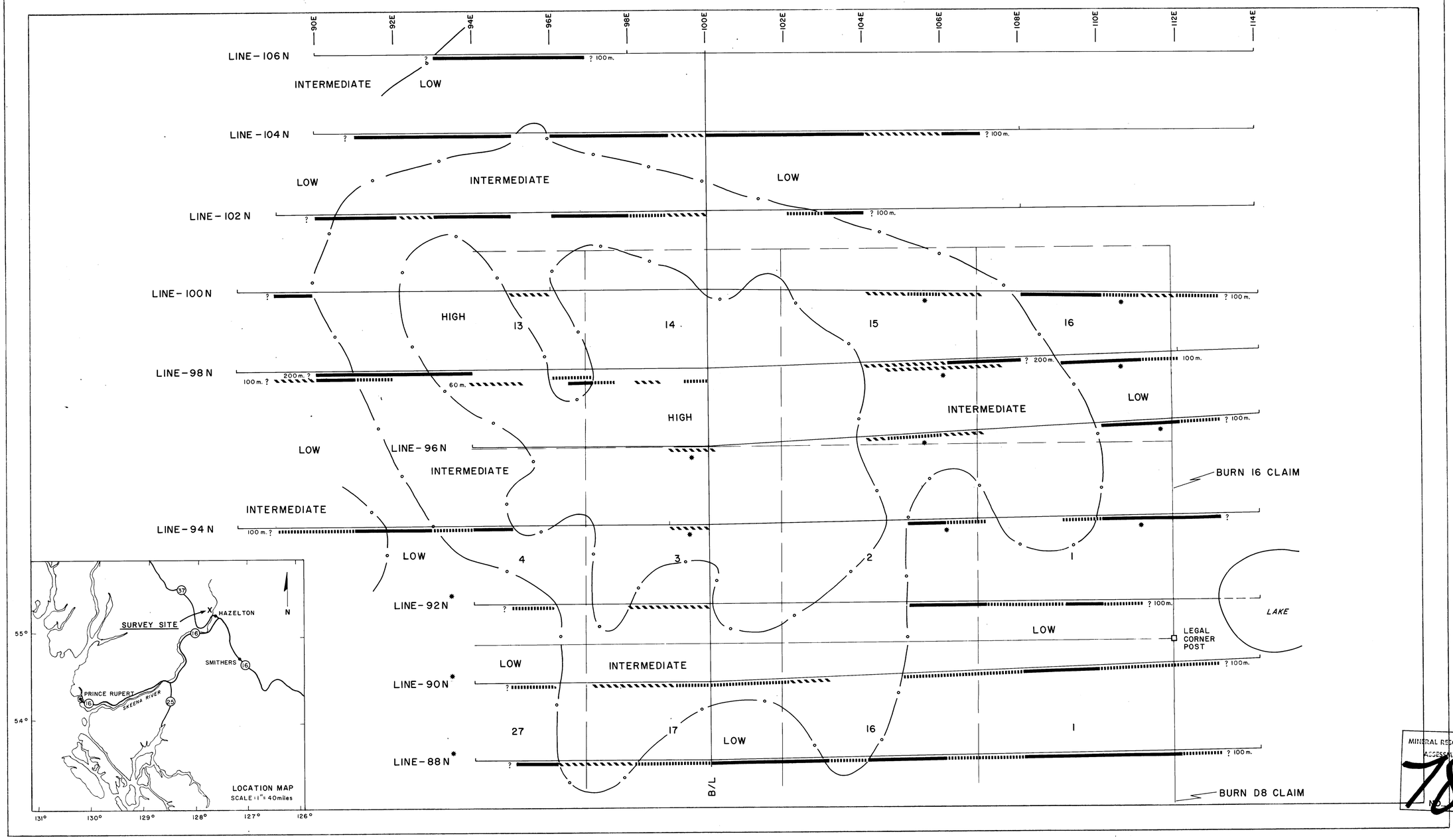
INDUCED POLARIZATION AND RESISTIVITY SURVEY

DWG NO.-I.P.P.-3071

PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
NO. 7864

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

NUMBER AT END OF ANOMALIES INDICATE SPREAD USED.

HIGH
INTERMEDIATE
LOW
→ PRONOUNCED RESISTIVITY CHANGE

AMOCO CANADA PETROLEUM COMPANY LTD.

KISPIOX PROPERTY, HAZELTON AREA

OMINECA MINING DIVISION, B.C.

SCALE

100 0 100 200 300 400 METRES

1:5000

NOTE- DATA FROM PREVIOUS SURVEY (DEC. 1975)*

NOTE-
TO ACCOMPANY GEOPHYSICAL REPORT FOR AMOCO CANADA PETROLEUM COMPANY LTD. ON THE KISPIOX PROPERTY, HAZELTON AREA IN THE OMINECA M.D., B.C., BY PHILIP G. HALLOF P. ENG. GEOPHYSICIST, AND A.W. MULLAN P. ENG. GEOLOGIST.

DATED – OCT. 4, 1979.

DRAWN: R.J.P
DATE: SEPT. 1979
APPROVED:
DATE: 10/4/79

DWG. NO.-I.P.P.-3071