506

55°; 125°; N.W.

REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE LORRAINE CLAIM GROUP, HOGEM AREA OMINECA MINING DIVISION, B.C. FOR

93N/14W

KENNCO EXPLORATIONS (WESTERN) LTD.

BY

P. G. HALLOF, PH.D.

NAME AND LOCATION OF PROPERTY:

LORRAINE CLAIM GROUP, HOGEM AREA,

OMINECA MINING DIVISION, B.C., 55° N, 125° SE

DATE STARTED - AUGUST 3, 1963

DATE COMPLETED - AUGUST 16, 1963

TABLE OF CONTENTS

McPHAR GEOPHYSICS LIMITED

NOTES ON THE THEORY OF INDUCED POLARIZATION AND THE METHOD OF FIELD OPERATION

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 effectively stop all 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 "metal factor" or "M. F." are a measure of the amount of polarization present in the rock mass being surveyed. This parameter has been found to be very successful in mapping areas of sulphide mineralization, even those in which all other geophysical methods have been unsuccessful. The induced polarization measurement is more sensitive to sulphide content than other electrical measurements because it is much more dependent upon the sulphide content. As the sulphide content of a rock is increased, the "metal factor" of the rock increases much more rapidly than the resistivity decreases.

Because of this increased sensitivity, it is possible to locate and outline zones of less than 10% sulphides that can't be located by E. M. Methods. The method has been successful in locating the disseminated "porphyry copper" type mineralization in the Southwestern United States.

Measurements and experiments also indicate that it should be possible to locate most massive sulphide bodies at a greater depth with induced polarization than with E. M.

Since there is no I. P. effect from any conductor unless it is metallic, the method is useful in checking E. M. anomalies that are suspected of being due to water filled shear zones or other ionic conductors. There is also no effect from conductive overburden, which frequently confuses E. M. results. It would appear from scale model experiments and calculations that the apparent metal factors measured over a mineralized zone are larger if the material overlying the zone is of low resistivity.

Apropos of this, it should be stated that the induced polarization measurements indicate the total amount of metallic constituents in the rock. Thus all of the metallic minerals in the rock, such as pyrite, as well as the ore minerals chalcopyrite, chalcocite, galena, etc. are responsible for the induced polarization effect. Some oxides such as magnetite, pyrolusite, chromite, and some forms of hematite also conduct by electrons and are metallic. All of the metallic minerals in the rock will contribute to the induced polarization effect measured on the surface.

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 a distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes. The distance between the nearest current and potential electrodes is an integer number (N) times the basic distance (X).

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

In plotting the results, the values of the apparent resistivity 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. The resistivity values are plotted above the line and the metal factor values below. 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. These 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, model and theoretical investigations. The position of the electrodes when anomalous values are measured must be used 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 100 feet to 1000 feet for (X). In each case, the decision as to the distance (X) and the values of (N) 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 1 below demonstrates the method used in plotting the results. Each value of the apparent resistivity and the apparent "Metal factor" 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.

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

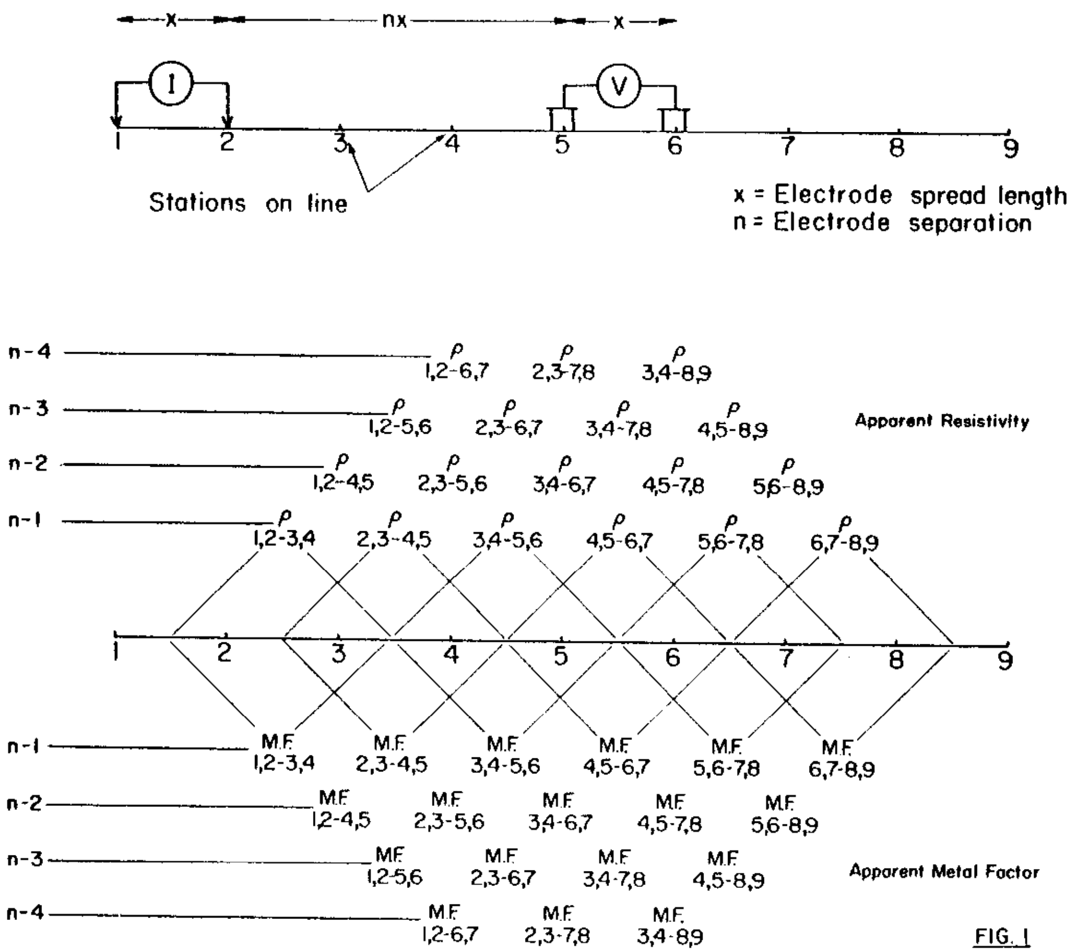


FIG. 1

B

McPHAR GEOPHYSICS LIMITED

REPORT ON THE

INDUCED POLARIZATION

AND RESISTIVITY SURVEY

ON THE

LORRAINE CLAIM GROUP, HOGEM AREA,

OMINECA MINING DIVISION, B.C.

FOR

KENNCO EXPLORATIONS (WESTERN) LTD.

I. INTRODUCTION

A previous report dated July 19, 1962 and entitled, "Report on the Induced Polarization and Resistivity Survey on the Lorraine Claim Group, Hogem Area, Omineca Mining Division, B.C. for Kennco Explorations (Western) Ltd." describes the previous geophysical work carried out on the Lorraine Claim Group. The Claim Group is located in the northeast quadrant of the one degree quadrilateral whose southeast corner is at 55° N-125° W.

The previous I.P. measurements on the Lorraine Claim Group were made using a light-weight I.P. unit. Because of the high level of the electrical noise in the Hogem Area, many of the measurements for the larger values of (n) were uncertain. The measurements during the 1963 field season were made using a standard I.P. unit, and the voltages measured were large enough to have made the electrical noise negligible.

2. 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.

Line 18W	200' electrode separations	Dwg. I.P. 2099-1
Line 8W	200' electrode separations	Dwg. I.P. 2099-2
Line N-S	200' electrode separations	Dwg. I.P. 2099-3
Line 8E	200' electrode separations	Dwg. I.P. 2099-4
Line A	200' electrode separations	Dwg. I.P. 2099-5
Line E-W	200' electrode separations	Dwg. I.P. 2099-6
Line B	200' electrode separations	Dwg. I.P. 2099-7
Test Line	200' electrode separations	Dwg. I.P. 2099-8

Enclosed with this report is Dwg. Misc. 3033, a plan map of the Lorraine Claim Group. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i.e.

when using 200' spreads the position of a narrow sulphide body can only be determined to lie between two stations 200' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainties of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

3. DISCUSSION OF RESULTS

The first I.P. survey on the Lorraine Claim Group was carried out to locate any sub-surface metallic mineralisation that might be the source of the geochemical anomaly previously located in the area. The results with the light-weight I.P. unit indicated a slightly anomalous area. The 1963 results, using the more powerful standard I.P. unit agree very well with the previous results, and confirm the presence of several weakly anomalous zones.

As shown on Dwg. Misc. 3033, the anomalies do not correlate particularly well, and no definite zones are established. The I.P. anomalies are not large enough in magnitude to be due to massive mineralization; the magnitude and shape of the anomalous patterns suggests irregular zones of more disseminated metallic mineralization.

The most definite of the weak anomalies are centered at

30S on Line 8E, 13E on Line E-W, and 14E on Line B. These anomalous indications do not, in themselves, appear to be important enough to warrant drilling. The decision concerning whether or not to drill them will have to be based on their correlation with the geochemical anomalies.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

Dated: September 12, 1963.

ASSESSMENT DETAILS

PROPERTY: **Lorraine Claim Group** MINING DIVISION: **Omineca**

SPONSOR: **Kennco Explorations (Western) Ltd.** PROVINCE: **British Columbia**

LOCATION: **Hogem Area**

TYPE OF SURVEY: **Induced Polarization**

OPERATING MAN DAYS:	36.0	DATE STARTED:	August 3, 1963
EQUIVALENT 8 HR. MAN DAYS:	54.0	DATE FINISHED:	August 16, 1963
CONSULTING MAN DAYS:	1.5	NUMBER OF STATIONS:	139
DRAUGHTING MAN DAYS:	5.0	NUMBER OF READINGS:	803
TOTAL MAN DAYS:	60.5	MILES OF LINE SURVEYED:	4.8

CONSULTANTS:
Philip G. Hallof, 5 Minorca Place, Don Mills, Ontario

FIELD TECHNICIANS:
J. Lee, 264 Oriole Parkway, Toronto 7, Ontario
B. McNulty, 3 Ecclestone Drive, Toronto, Ontario
Four Helpers supplied by client

DRAUGHTSMEN:
R. Martin, 107 Atlas Street, Toronto, Ontario
J. Cowdy, 21 Tordale Crescent, Scarborough, Ontario
R. MacKenzie, 55 Shandon Drive, Scarborough, Ontario
D. Grant, 1987A Lawrence Avenue, East, Scarborough, Ontario

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

Dated: September 12, 1963.

SUMMARY OF COST

Lorraine Claim Group

6 days Operating	@ $164.75/day	$ 988.50

Expenses

Airfare	$96.22	
Excess Baggage	3.80	
Meals and Accommodation	25.50	
Telephone and Telegraph	4.84	
Supplies	6.00	
Taxis, etc.	3.80	
Vehicle Rental	11.66	
Airfreight	23.86	
Miscellaneous	.38	
Credit - Extra Labour	(8.48)	167.58
		$1,156.08

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

Dated: September 12, 1963.

CERTIFICATE

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

1. I am a geophysicist residing at 5 Minorca Place, Don Mills (Toronto), Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.S. 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 Exploration Geophysicists.

4. I have been practising my profession for ten years.

5. I have no direct or indirect interest, nor do I expect to receive any interest, direct or indirect, in the property or securities of Kennco Explorations (Western) Limited.

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

Dated at Toronto

This 12th day of September, 1963

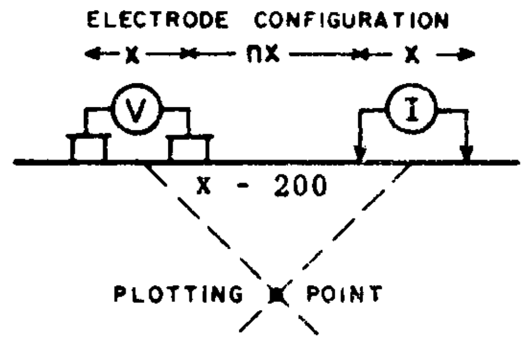
Philip G. Hallof

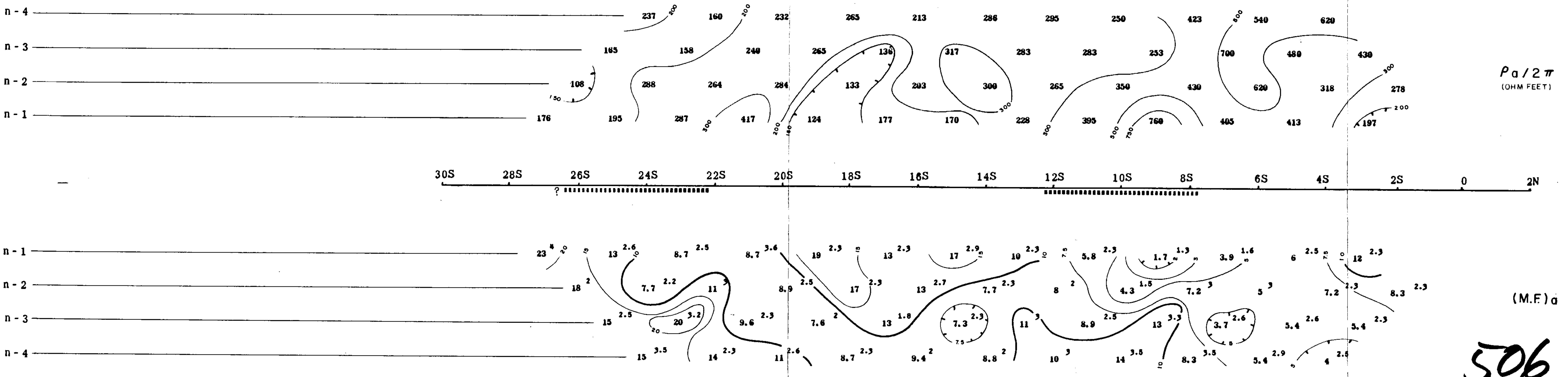
Philip G. Hallof, Ph.D.

DWG. NO.-I.P.-2099-1

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





506

(M1)

FREQUENCY-31 - 5 CPS.

DATE SURVEYED-AUG'63

APPROVED PH

DATE 9/11/63

KENNCO EXPLORATIONS (WESTERN) LIMITED

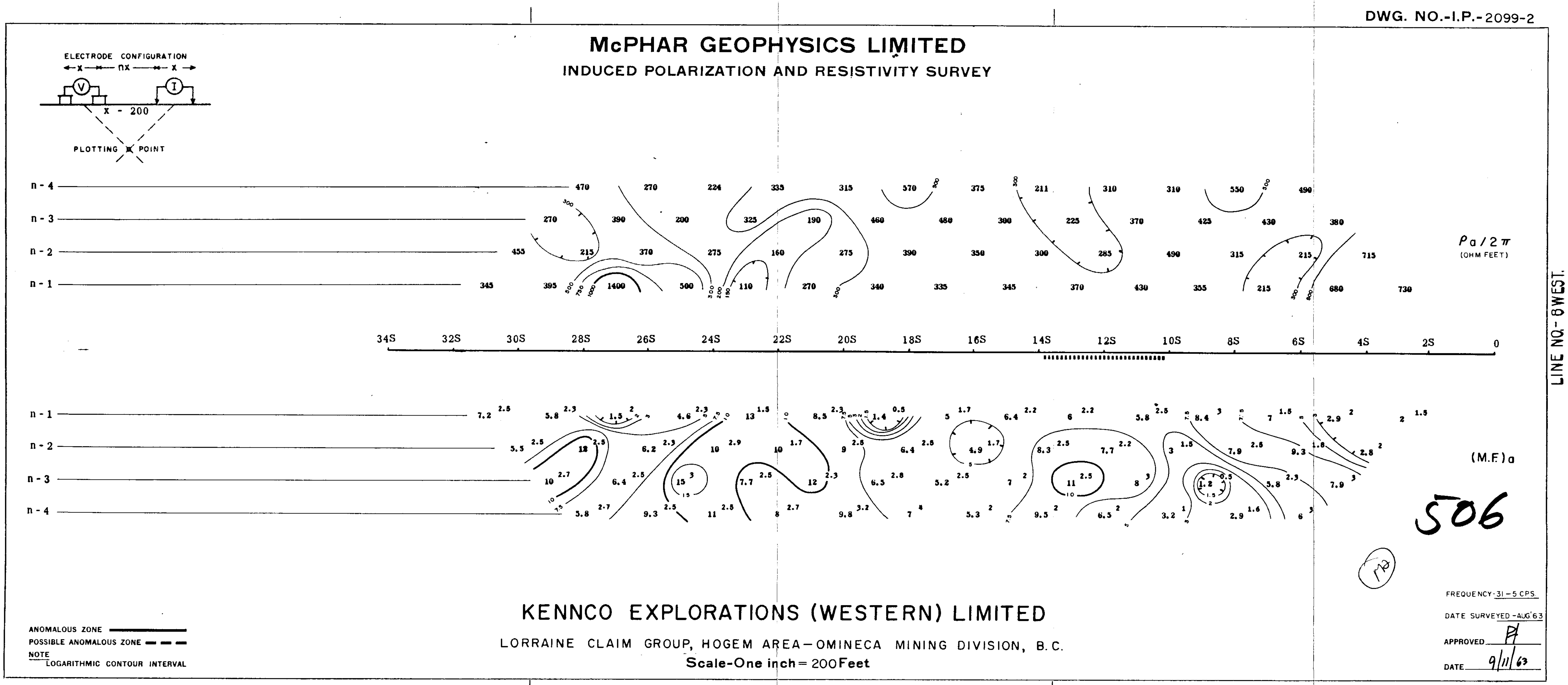
LORRAINE CLAIM GROUP, HOGEM AREA—OMINECA MINING DIVISION, B.C.

Scale-One inch = 200 Feet

ANOMALOUS ZONE ———

POSSIBLE ANOMALOUS ZONE — — —

NOTE
LOGARITHMIC CONTOUR INTERVAL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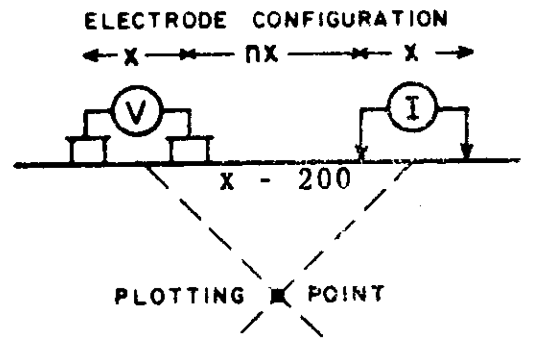
McPHAR GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
ELECTRODE CONFIGURATION
x - 200
PLOTTING POINT
ρa/2π
(OHM FEET)
(M.F.)a
LINE NO.-8WEST.
506
KENNCO EXPLORATIONS (WESTERN) LIMITED
LORRAINE CLAIM GROUP, HOGEM AREA—OMINECA MINING DIVISION, B.C.
Scale-One inch = 200 Feet
ANOMALOUS ZONE
POSSIBLE ANOMALOUS ZONE
NOTE
LOGARITHMIC CONTOUR INTERVAL
FREQUENCY-31-5 CPS.
DATE SURVEYED-AUG'63
APPROVED
DATE 9/11/63

DWG. NO.-I.P.-2099-3

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



506

M3

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA—OMINECA MINING DIVISION, B.C.

Scale- One inch= 200 Feet

ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

NOTE
LOGARITHMIC CONTOUR INTERVAL

FREQUENCY-31-5 CPS.

DATE SURVEYED-AUG.63

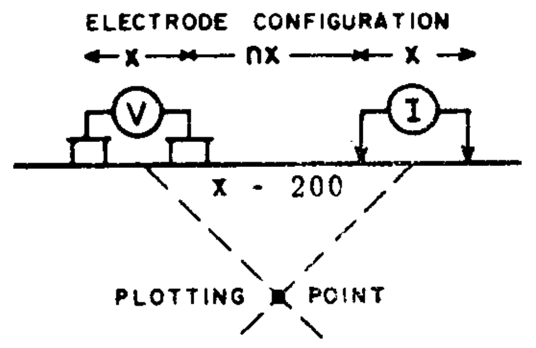
APPROVED

DATE 9/11/63

DWG. NO.- I.P.- 2099-4

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



506

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA — OMINECA MINING DIVISION, B.C.

Scale — One inch = 200 Feet

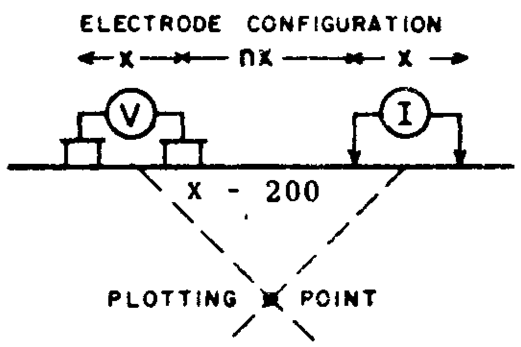
ANOMALOUS ZONE
POSSIBLE ANOMALOUS ZONE
NOTE
LOGARITHMIC CONTOUR INTERVAL

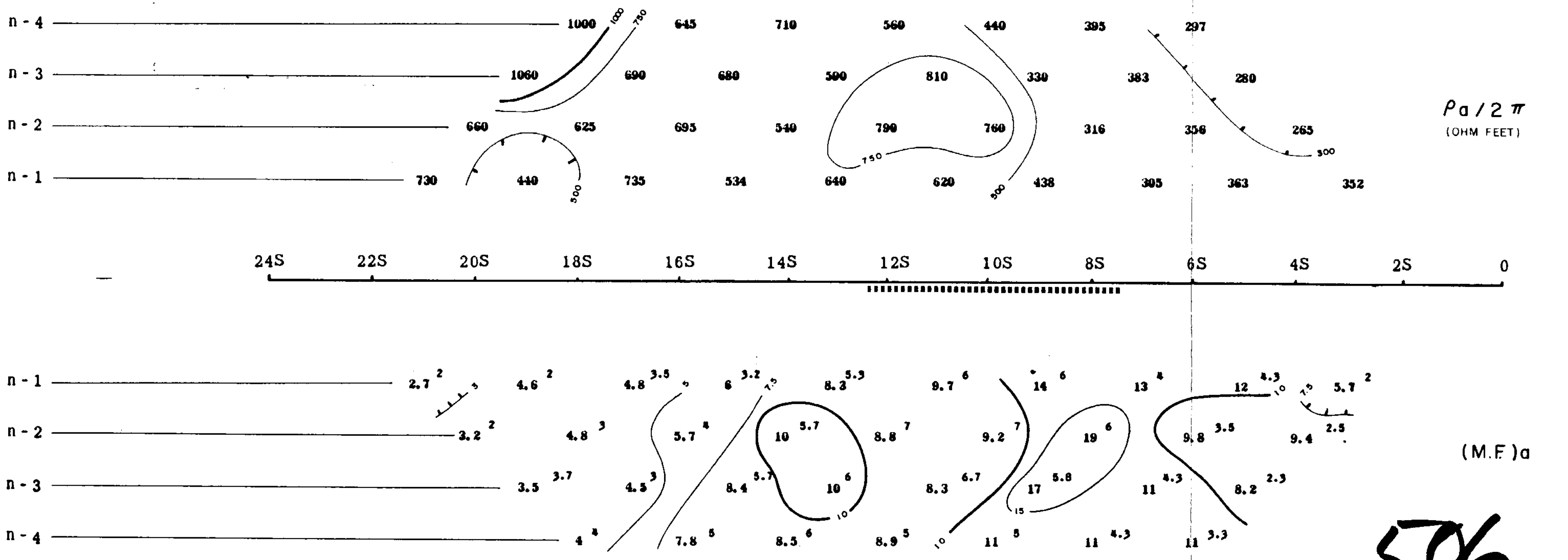
FREQUENCY - 31 - 5 CPS.
DATE SURVEYED - AUG. 63
APPROVED PH
DATE 9/11/63

DWG. NO.- I. P.-2099-5

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-"A"

506

(MS)

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA - OMINECA MINING DIVISION, B. C.

Scale - One inch = 200 Feet

ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

NOTE

LOGARITHMIC CONTOUR INTERVAL

FREQUENCY - 31 - 5 C.P.S.

DATE SURVEYED - AUG.'63

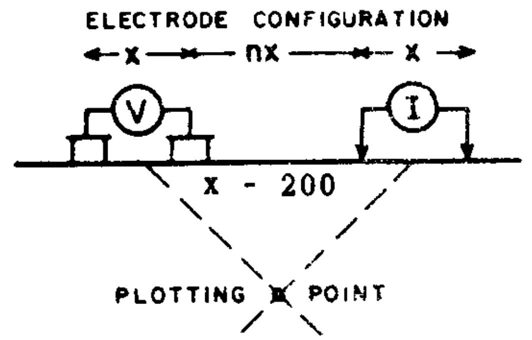
APPROVED PH

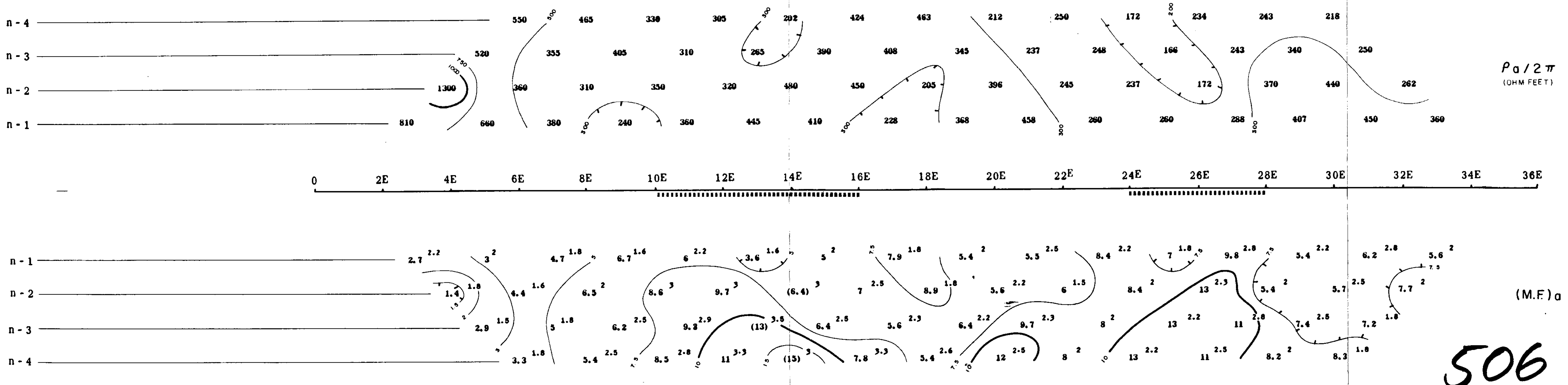
DATE 9/11/63

DWG. NO.-I.P.- 2099-6

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-E-W.

506

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA—OMINECA MINING DIVISION, B.C.

Scale-One inch = 200 Feet

ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

NOTE

LOGARITHMIC CONTOUR INTERVAL

FREQUENCY-31-5 CPS

DATE SURVEYED-AUG '63

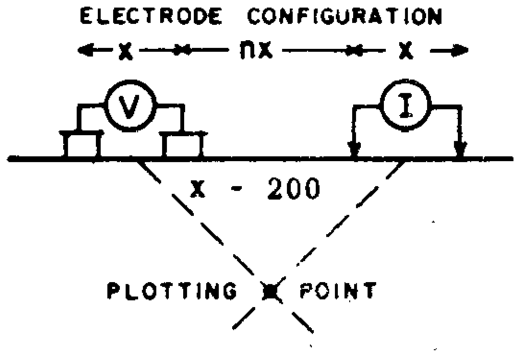
APPROVED P

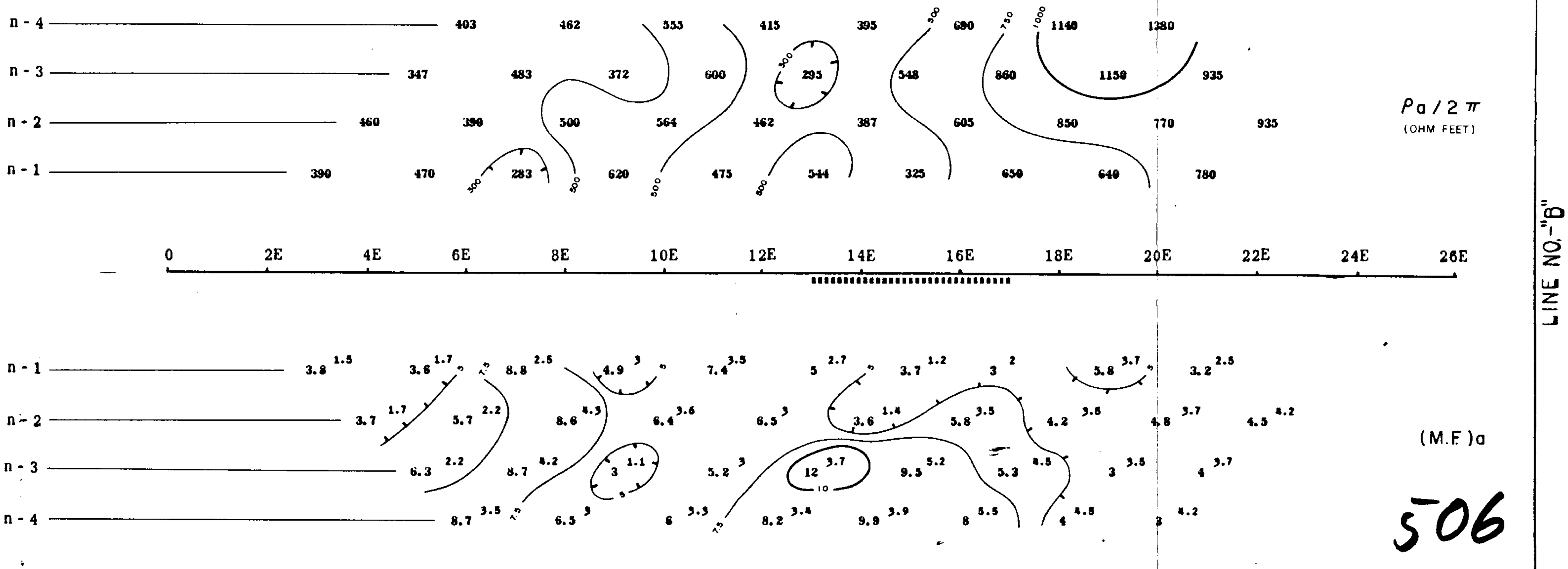
DATE 9/11/63

DWG. NO.- I.P.-2099-7

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





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KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA – OMINECA MINING DIVISION, B. C.

Scale – One inch = 200 Feet

ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

NOTE
LOGARITHMIC CONTOUR INTERVAL

FREQUENCY - 3·1 - ·5 CPS.

DATE SURVEYED – AUG '63

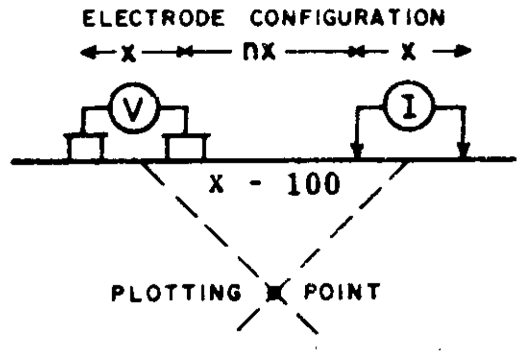
APPROVED

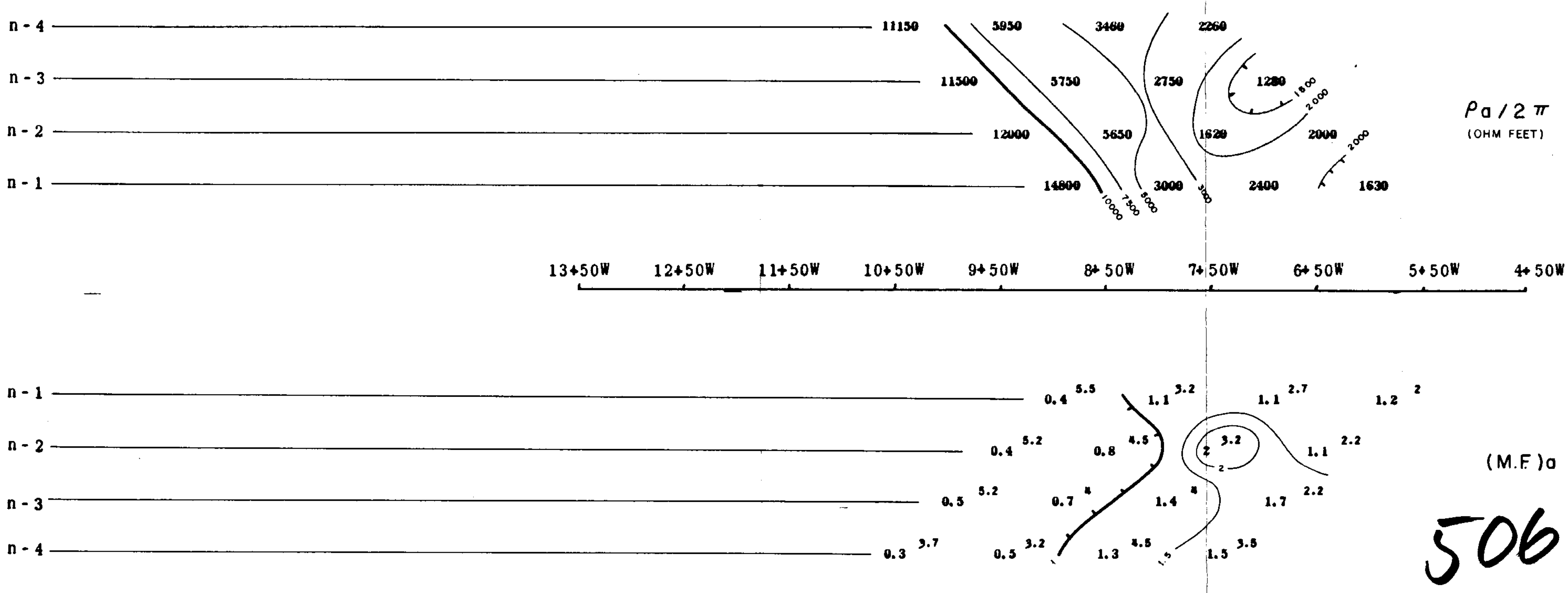
DATE 9/11/63

DWG. NO.-I.P.-2099-8

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-TEST LINE

(M8)

FREQUENCY-31-5 C.P.S.

DATE SURVEYED-AUG '63

APPROVED [signature]

DATE 9/11/63

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP, HOGEM AREA-OMINECA MINING DIVISION, B.C.

Scale-One inch = 100 Feet

ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

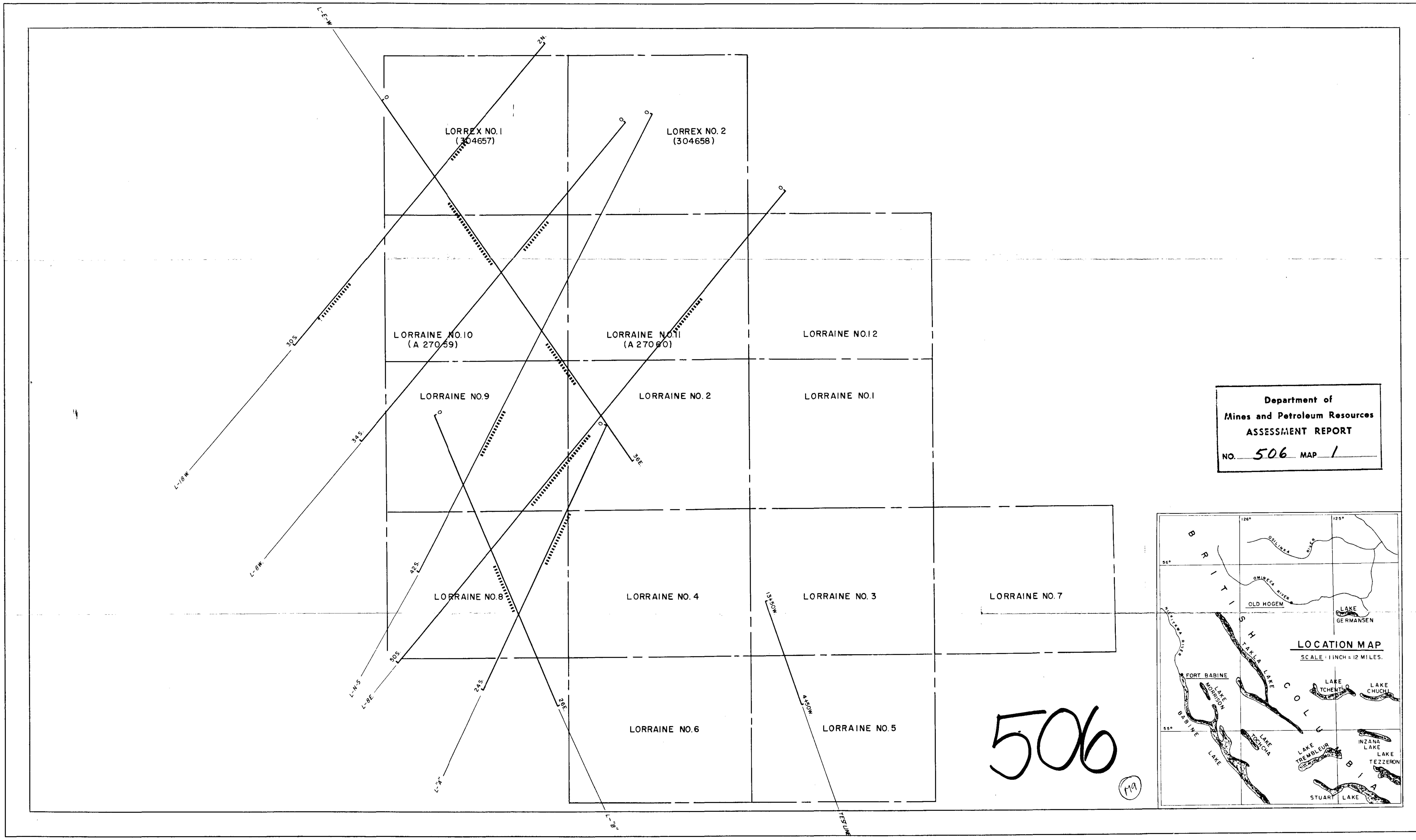
NOTE
LOGARITHMIC CONTOUR INTERVAL

DWG. MISC. - 3033

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

LOCATION MAP



N

ANOMALOUS ZONE
POSSIBLE ANOMALOUS ZONE
CLAIM BOUNDARY

KENNCO EXPLORATIONS (WESTERN) LIMITED

LORRAINE CLAIM GROUP

HOGEM AREA – OMINECA MINING DIVISION, B. C.

SCALE

400 200 0 400 800 1200 1600 2000
FEET

One Inch = Four Hundred Feet

TO ACCOMPANY GEOPHYSICAL REPORT BY PHILIP G. HALLOF, Ph. D., ON THE LORRAINE CLAIM GROUP, HOGEM AREA, OMINECA MINING DIVISION, BRITISH COLUMBIA.

DATED: SEPTEMBER 12th, 1963.

DRAWN: R.J.M.
DATE: AUG. 1963
APPROVED: PH
DATE: 9/11/63

DWG. MISC. - 3033