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REPORT ON
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
NH CLAIMS, CARIBOU MOUNTAIN AREA
OMINECA M. D., BRITISH COLUMBIA
FOR
MANEX MINING LIMITED

93L-[illegible]

BY

ROBERT A. BELL

AND

DAVID K. FOUNTAIN

NAME AND LOCATION OF PROPERTY:

NH CLAIMS, CARIBOU MOUNTAIN AREA

OMINECA MINING DIVISION, BRITISH COLUMBIA 54°N, 127°W. SE.

DATE STARTED	JULY 10, 1968
DATE COMPLETED	JULY 20, 1968

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McPHAR GEOPHYSICS LIMITED

REPORT ON

INDUCED POLARIZATION

AND RESISTIVITY SURVEY

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NH CLAIMS, CARIBOU MOUNTAIN AREA

OMINECA M.D., BRITISH COLUMBIA

FOR

MANEX MINING LIMITED

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1. INTRODUCTION

At the request of Mr. Mike Beley, geologist for the Company, we have carried out a combined induced polarization and resistivity survey in the Caribou Mountain Area on behalf of Manex Mining Limited. The property is known as the NH Claim Group and is situated in the Omineca Mining Division in the northwest quadrant of the one degree quadrilateral whose southeast corner is at 54°N, 127°W.

According to information supplied by the Company, the area of interest is underlaine primarily by pyroclastics with thin intercalated andesite flows. The formations strike N to NE and dip 30° SE. The purpose of the IP survey was to trace out a fault-controlled copper-silver deposit, referred to as the A zone, and to search for additional concentrations of metallic minerals. Field work was done in July 1968 using a McPhar frequency-type IP system.

2. PRESENTATION OF RESULTS

The Induced Polarization and Resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line 0	100 foot spreads	Dwg. IP 5150-1
Line 1E	200 foot spreads	Dwg. IP 5150-2
Line 1E	100 foot spreads	Dwg. IP 5150-3
Line 2E	200 foot spreads	Dwg. IP 5150-4
Line 3E	200 foot spreads	Dwg. IP 5150-5
Line 4E	200 foot spreads	Dwg. IP 5150-6
Line 6E	200 foot spreads	Dwg. IP 5150-7
Line 8E	200 foot spreads	Dwg. IP 5150-8
Line 10E	200 foot spreads	Dwg. IP 5150-9
Line 12E	200 foot spreads	Dwg. IP 5150-10
Line 14E	200 foot spreads	Dwg. IP 5150-11
Line 16E	200 foot spreads	Dwg. IP 5150-12
Line 18E	200 foot spreads	Dwg. IP 5150-13
Line 20E	200 foot spreads	Dwg. IP 5150-14

Enclosed with this report is Dwg. I.P.P. 3321, a plan map of the grid at a scale of 1" = 200'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

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

3. DISCUSSION OF RESULTS

Line 0

These results show a shallow definite anomaly centred at station 1S, with a possible weaker extension to 0 or 1N. This is the strongest anomaly found on the grid and undoubtedly represents the "A" zone previously tested by drill holes 1, 2 and 4.

A single above-background value was measured at the north end of the line suggesting a second anomaly. The traverse should be extended to complete the pattern.

Line 1E

This line was surveyed with 200 foot and 100 foot electrode intervals. Using 200 foot dipoles there is a broad zone of weak IP effects from about 3S to at least 2N. Detailing with 100 foot dipoles indicated a probable anomaly at 1S to 3S and a possible weak source at 1N.

Line 2E

Here there is a low magnitude but definite anomaly centred between 0 and 2S. The source is shallow and narrow relative to the electrode interval i. e. less than 200 feet deep and 200 feet wide. It could be better evaluated by detailing with 100 foot dipoles as described in the Appendix. This feature should have been tested by DH-3 but apparently no mineralization was encountered; the core should be re-examined.

Line 3E

On this line the main zone is centred at the Base Line and there is a possible incomplete anomaly at 6N.

Line 4E

A definite anomaly, with some depth to the top of the source, occurs at 2S to 4S; this seems to be too far south to represent the main zones. There is also a probable shallow anomaly at 0 to 2N that correlates with the main zone but it is weaker than the anomalies to the west.

A single above-background value was measured at the south end of the line. This may correlate with anomalous effects farther east on the grid but the data would have to be extended to determine its importance.

Line 6E

Here there is only a possible weak anomaly at 0 to 2N.

Line 8E

Above background Metal Factor values were found at several points on this traverse. The most definite feature is a broad weak zone from about 11S to 15S.

Line 10E

On this line there is a possible weak anomaly at 2N to 4N.

Line 12E

Again there is a possible weak source at 2N to 4N and also a broad low magnitude anomaly at 11S to at least 15S.

Line 14E

The possible weak source is still evident at 2N to 4N and a similar feature occurs at 10S to 12S.

Line 16E and Line 18E

Only minor variations in the IP effects were measured on these two traverses.

Line 20E

Here there is a possible anomaly at 4N to 6N, indicating a narrow weak source.

4. SUMMARY AND RECOMMENDATIONS

Definite IP anomalies of low to moderate magnitude were found near the Base Line on the west part of the grid. These anomalies form a zone crossing the Base Line at a low angle and gradually becoming weaker to the east, which apparently correlates with the known copper - silver zone. The possible anomalies at 2N to 4N on Line 8E, Line 10E, Line 12E and Line 14E appear to form a weak extension of this zone. Since the strongest anomaly occurs on Line 0 it is recommended that several additional lines be run farther west if the terrain will permit. Drill Holes 1, 2 and 4 have tested the western part of the IP anomaly, and an additional hole might be drilled on Line 3E to pass under station 0+00 at a vertical depth of 150' - 200'.

The definite anomaly shown at 2S to 4S on Line 4E appears to be an isolated feature and hence the source may be too small to be of economic interest.

Weak anomalies occur on other sections of the grid but these are not considered to be of prime importance.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

Robert A. Bell,
Geologist.

David K. Fountain

David K. Fountain,
Geophysicist.

PROFESSIONAL ENGINEER D. K. FOUNTAIN BRITISH COLUMBIA
Expiry Date April 25, 1969

Dated: September 25, 1968

ASSESSMENT DETAILS

PROPERTY: NH Claim Group

MINING DIVISION: Om neca

SPONSOR: Manex Mining Limited

PROVINCE: British Columbia

LOCATION: Smithers, B.C.

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS:	32.5	DATE STARTED:	July 10, 1968
EQUIVALENT 8 HR. MAN DAYS:	48.5	DATE FINISHED:	July 20, 1968
CONSULTING MAN DAYS:	2	NUMBER OF STATIONS:	179
DRAUGHTING MAN DAYS:	8	NUMBER OF READINGS:	1340
TOTAL MAN DAYS:	58.5	MILES OF LINE SURVEYED:	5.8[illegible]

CONSULTANTS:

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

FIELD TECHNICIANS:

P. Makulowich, 44 Leahann Drive, Scarborough, Ontario.
J. Marsh, 118 Spencer Avenue, Toronto 3, Ontario.
Plus 3 helpers supplied by client

DRAUGHTSMEN:

F. Hurst, 230 Woburn Avenue, Toronto 12, Ontario.
N. Lade, 662 Emerson Court, Oshawa, Ontario.
B. Marr, 19 Kenewen Court, Toronto 16, Ontario.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

Robert A. Bell,
Geologist

Dated: September 25, 1968

SUMMARY OF COST

Manex Mining Limited
Caribou Mountain Area - B. C.

Crew

6-1/2 days	Operating		@ $240.00/day	$1,560.00
1/2 day	Travel)	4 days	@ $ 85.00/day	340.00
3-1/2 days	Standby)			

Expenses

Transportation	300.00
Taxi and Buses	19.40
Meals and Accommodation	42.00
Telephone and Telegraph	26.85
Supplies	8.54
	$2,296.79

McPHAR GEOPHYSICS LIMITED

Robert A. Bell.
Robert A. Bell,
Geologist.

Dated: September 25, 1968

CERTIFICATE

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

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

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

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

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

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

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

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

Dated at Toronto

This 25th day of September 1968.

Robert A. Bell

Robert A. Bell, Ph. D.

CERTIFICATE

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

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

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

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

4. I am a registered Professional Engineer in the Province of British Columbia and Ontario, and have been practising my profession for seven 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 Manex Mining Limited or any affiliate.

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

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

Dated at Toronto

This 25 day of September 1968.

D. K. Fountain

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: April 25, 1969

McPHAR GEOPHYSICS

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.

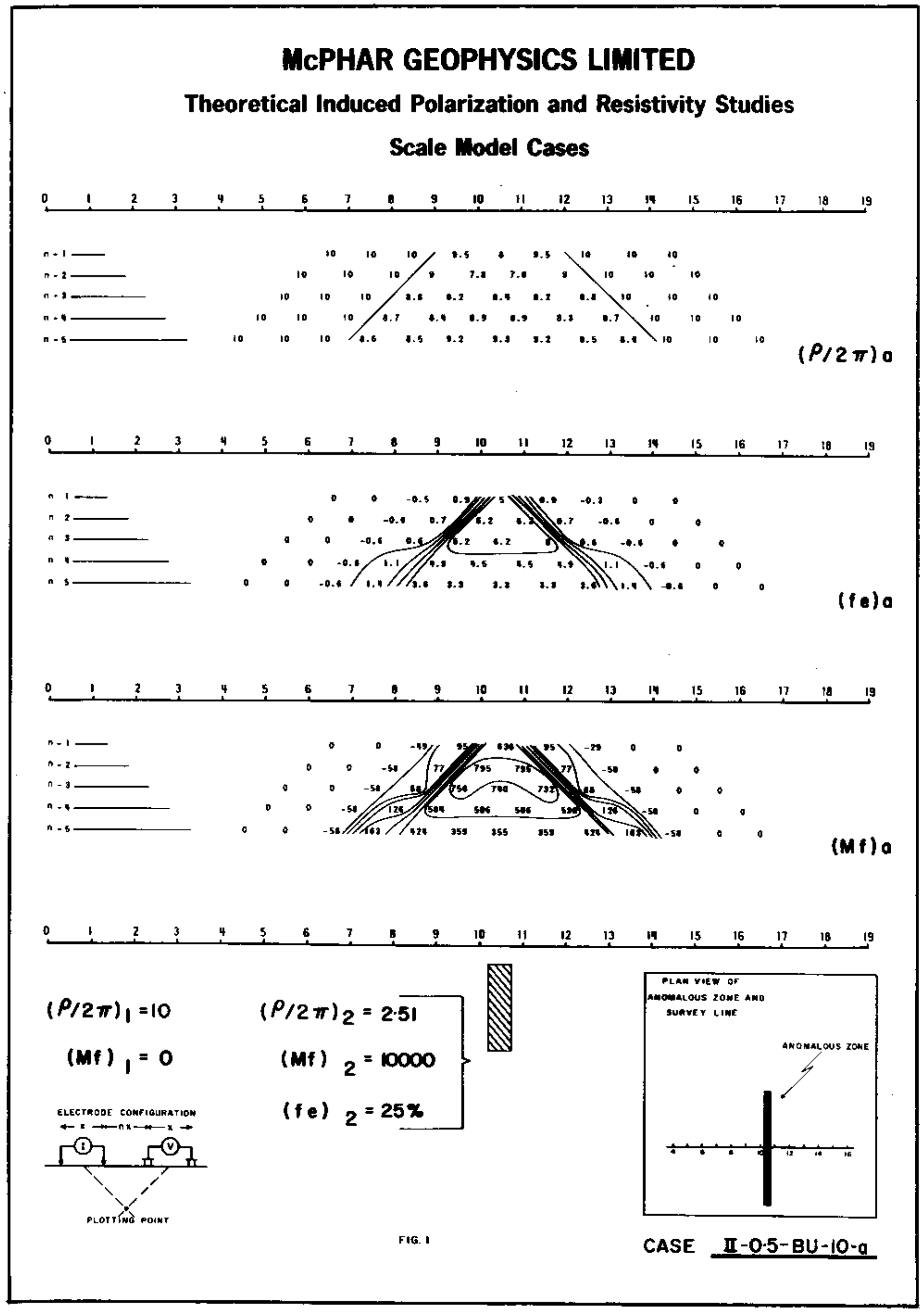

McPHAR GEOPHYSICS LIMITED
Theoretical Induced Polarization and Resistivity Studies
Scale Model Cases
(ρ/2π)a
(fe)a
(Mf)a
(ρ/2π)₁ = 10
(Mf)₁ = 0
(ρ/2π)₂ = 2.51
(Mf)₂ = 10000
(fe)₂ = 25%
ELECTRODE CONFIGURATION
PLOTTING POINT
PLAN VIEW OF ANOMALOUS ZONE AND SURVEY LINE
ANOMALOUS ZONE
CASE II-0.5-BU-10-a

FIG. 1

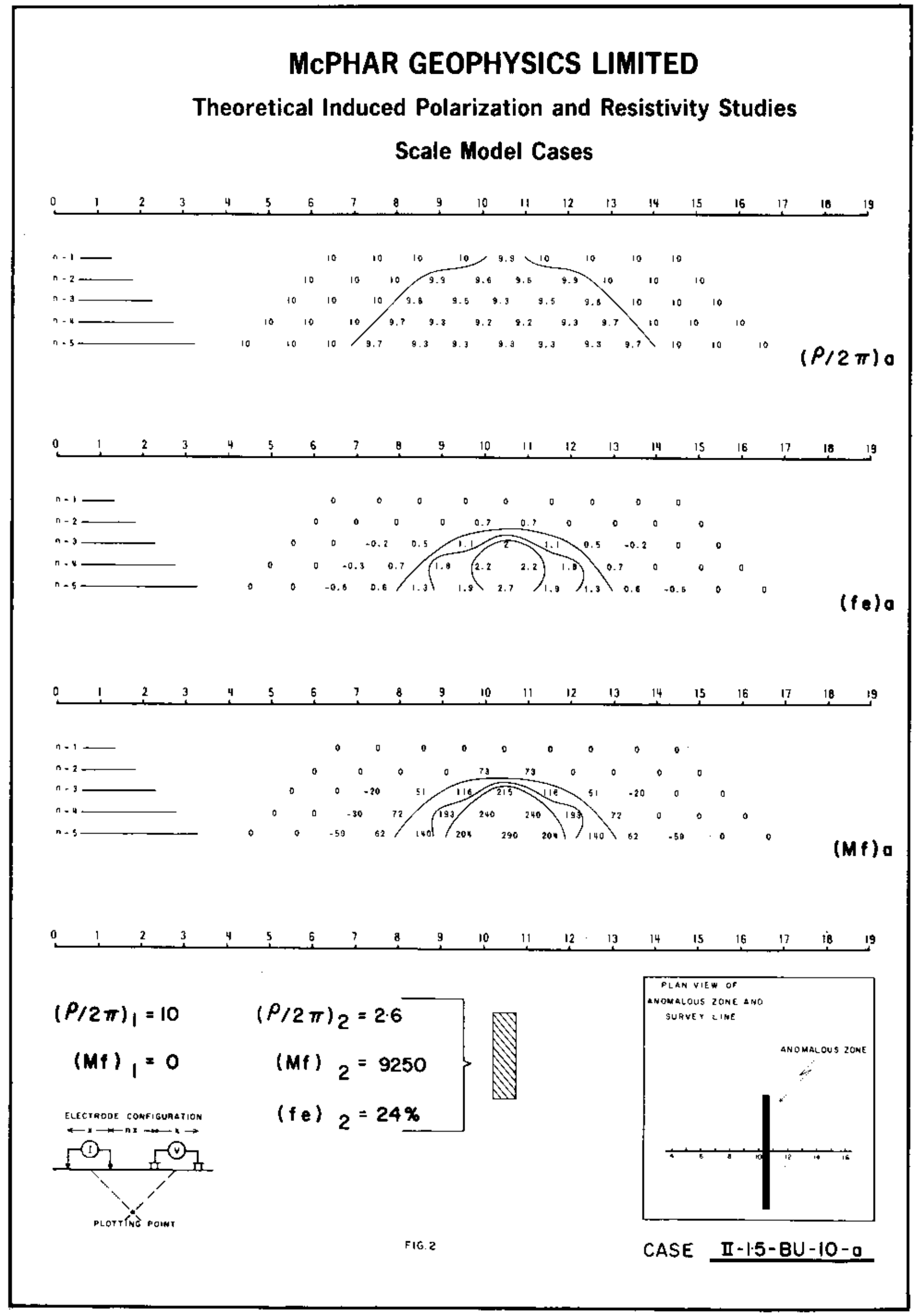
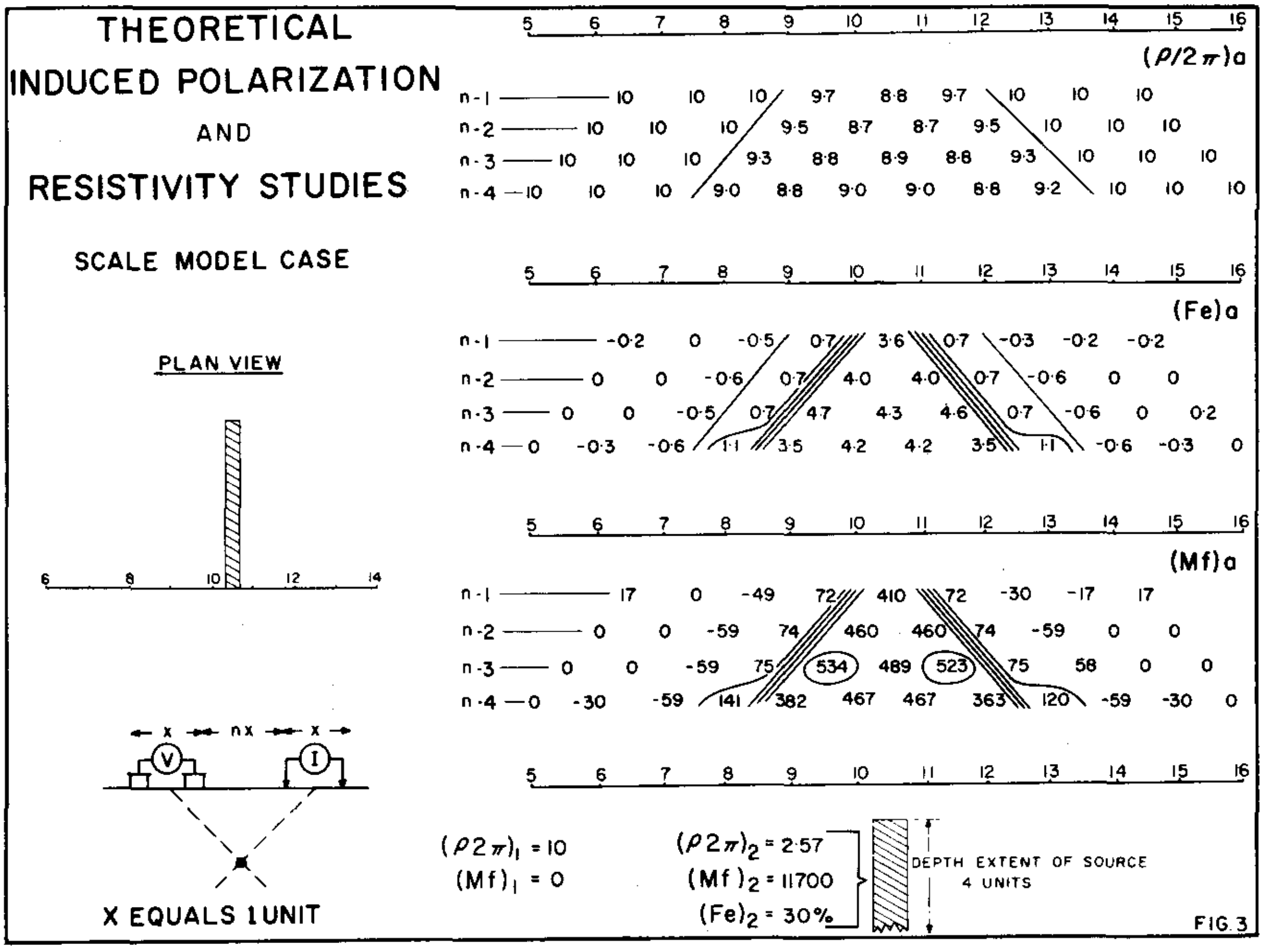
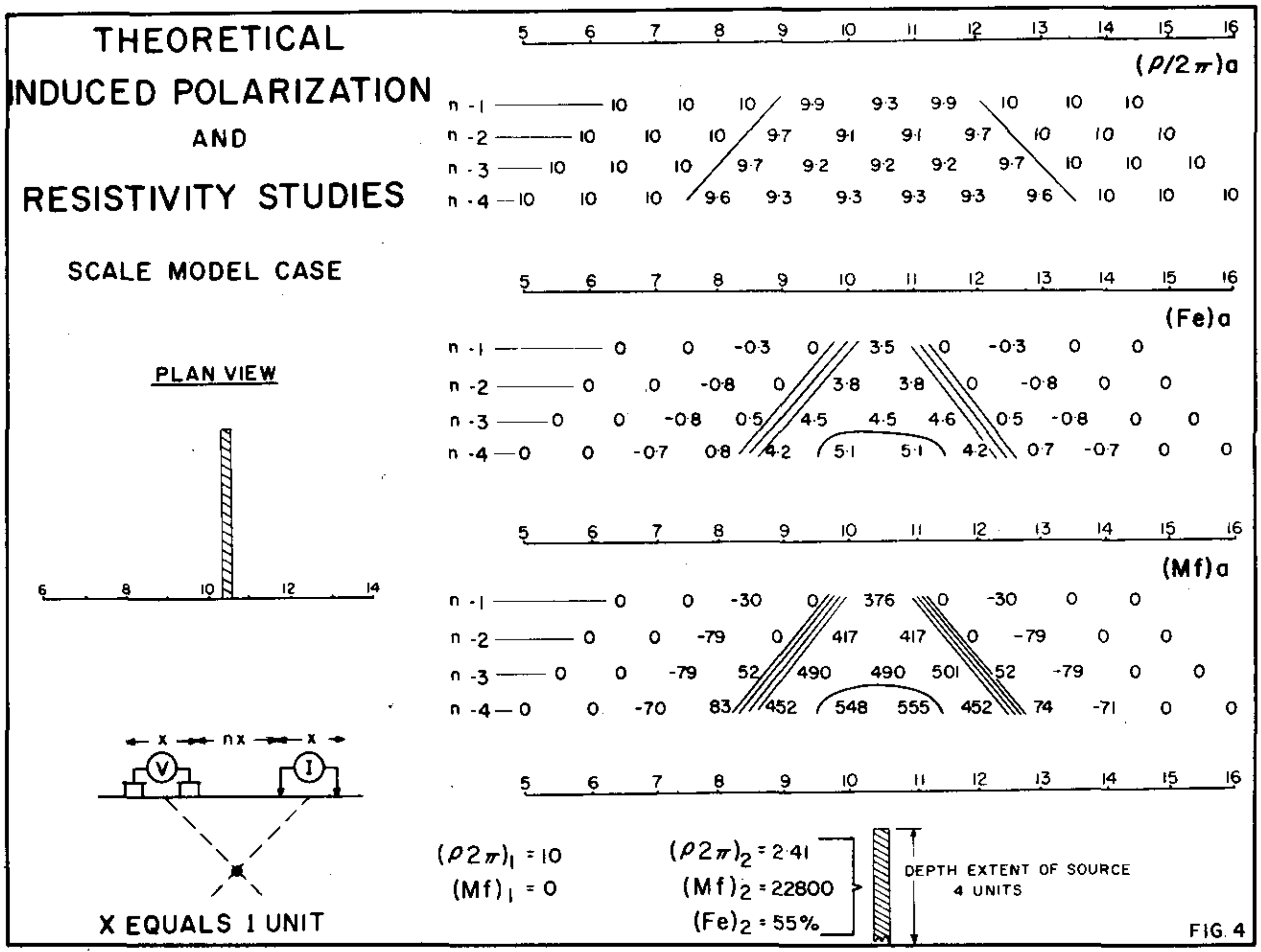

McPHAR GEOPHYSICS LIMITED
Theoretical Induced Polarization and Resistivity Studies
Scale Model Cases
(ρ/2π)a
(fe)a
(Mf)a
(ρ/2π)₁ = 10
(Mf)₁ = 0
(ρ/2π)₂ = 2.6
(Mf)₂ = 9250
(fe)₂ = 24%
ELECTRODE CONFIGURATION
PLOTTING POINT
PLAN VIEW OF ANOMALOUS ZONE AND SURVEY LINE
ANOMALOUS ZONE
CASE II-1.5-BU-10-a

FIG. 2


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X EQUALS 1 UNIT
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
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2·57
(Mf)2 = 11700
(Fe)2 = 30%
DEPTH EXTENT OF SOURCE
4 UNITS
FIG. 3


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X EQUALS 1 UNIT
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
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2·41
(Mf)2 = 22800
(Fe)2 = 55%
DEPTH EXTENT OF SOURCE
4 UNITS
FIG. 4

INDUCED POLARIZATION AND RESISTIVITY RESULTS

BATCHELOR LAKE AREA, QUEBEC.

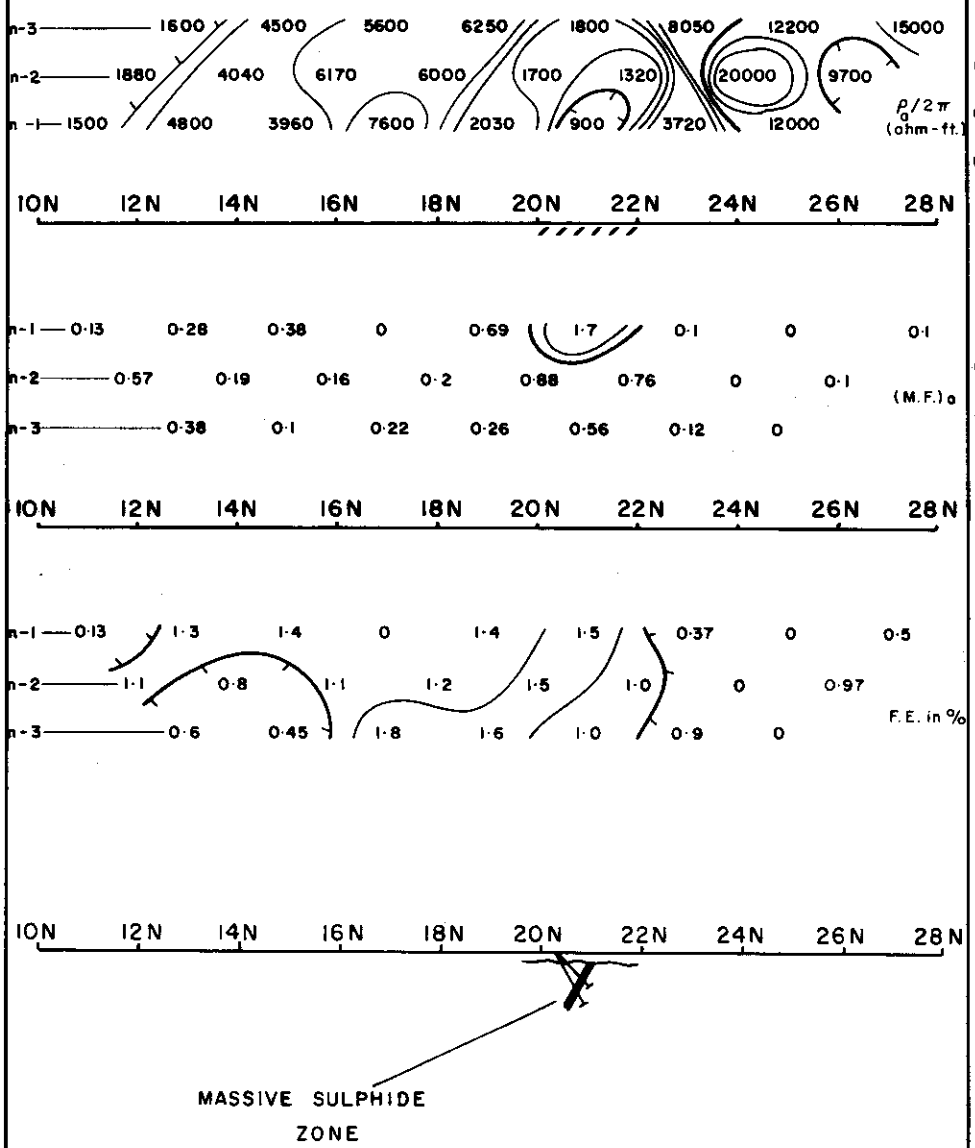


FIG. 5

INDUCED POLARIZATION AND RESISTIVITY RESULTS

BATCHELOR LAKE AREA, QUEBEC.

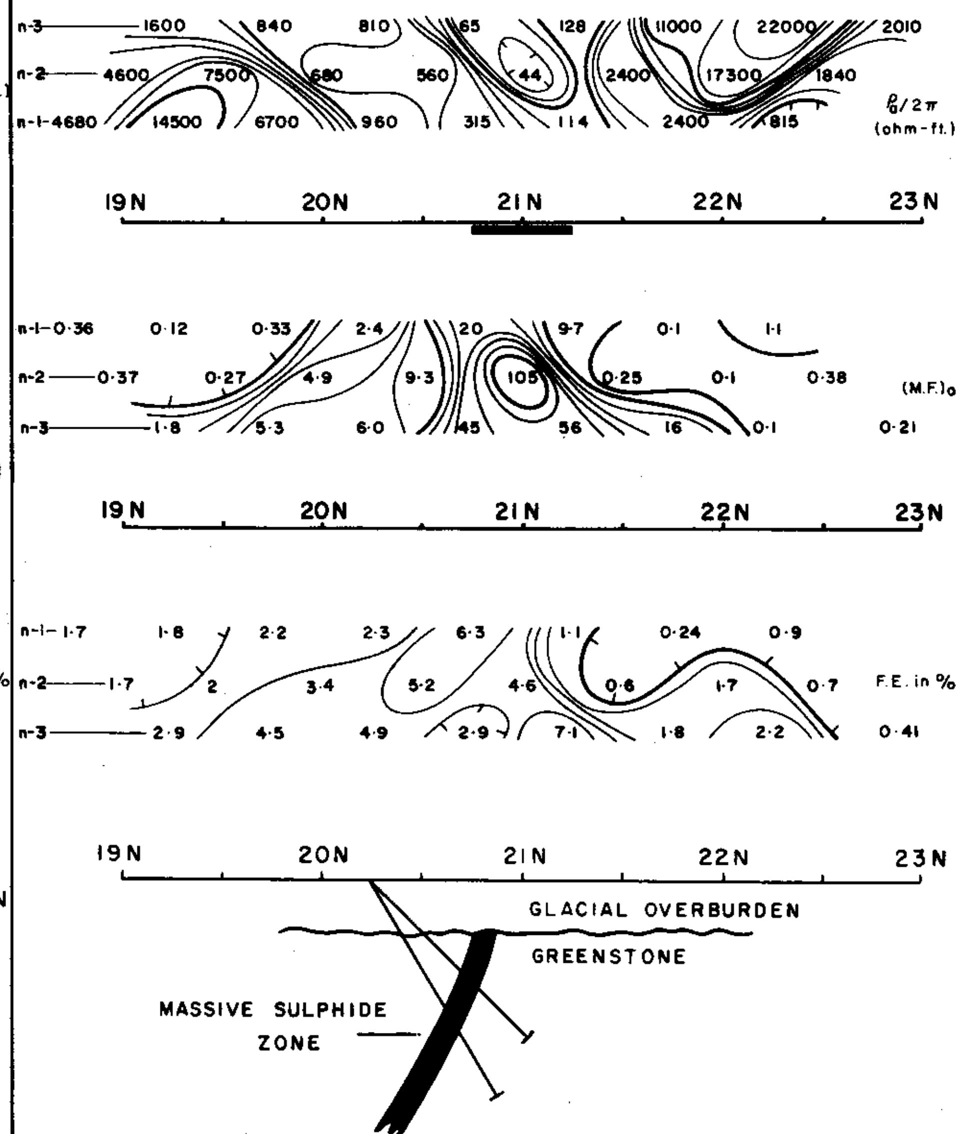


FIG. 6

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McPHAR GEOPHYSICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

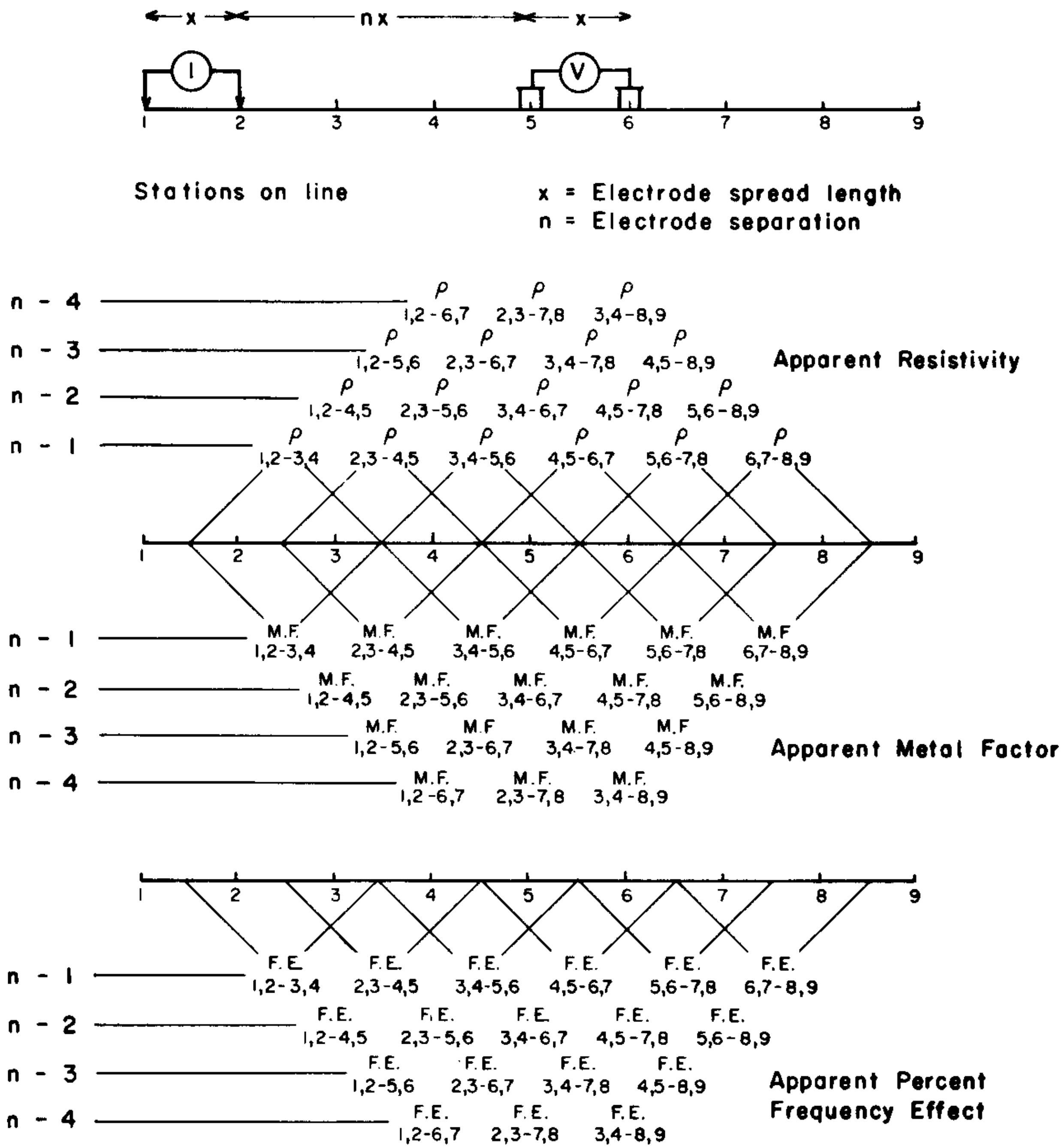
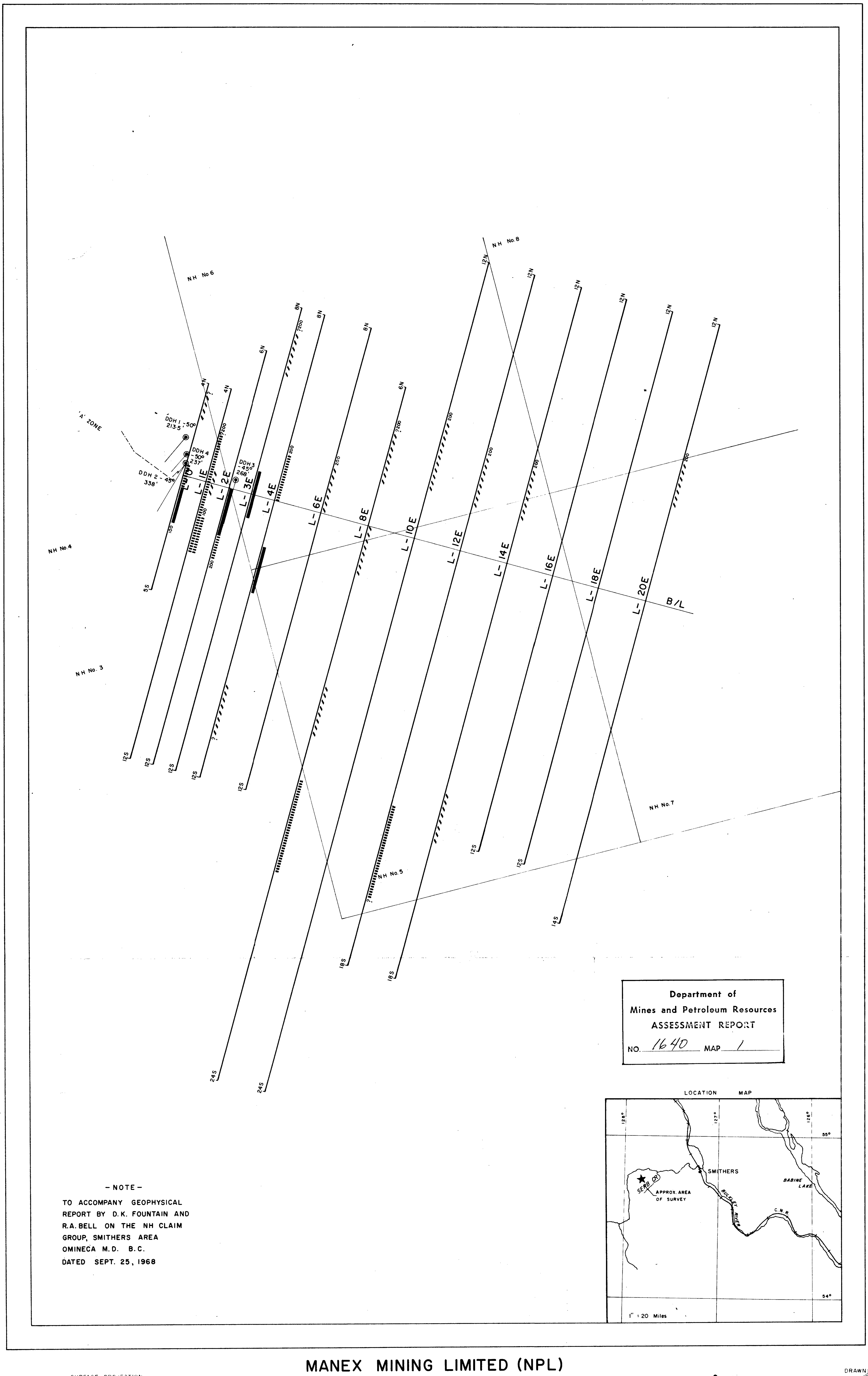


Fig. A

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

Numbers at the end of the anomalies indicate spread used.

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

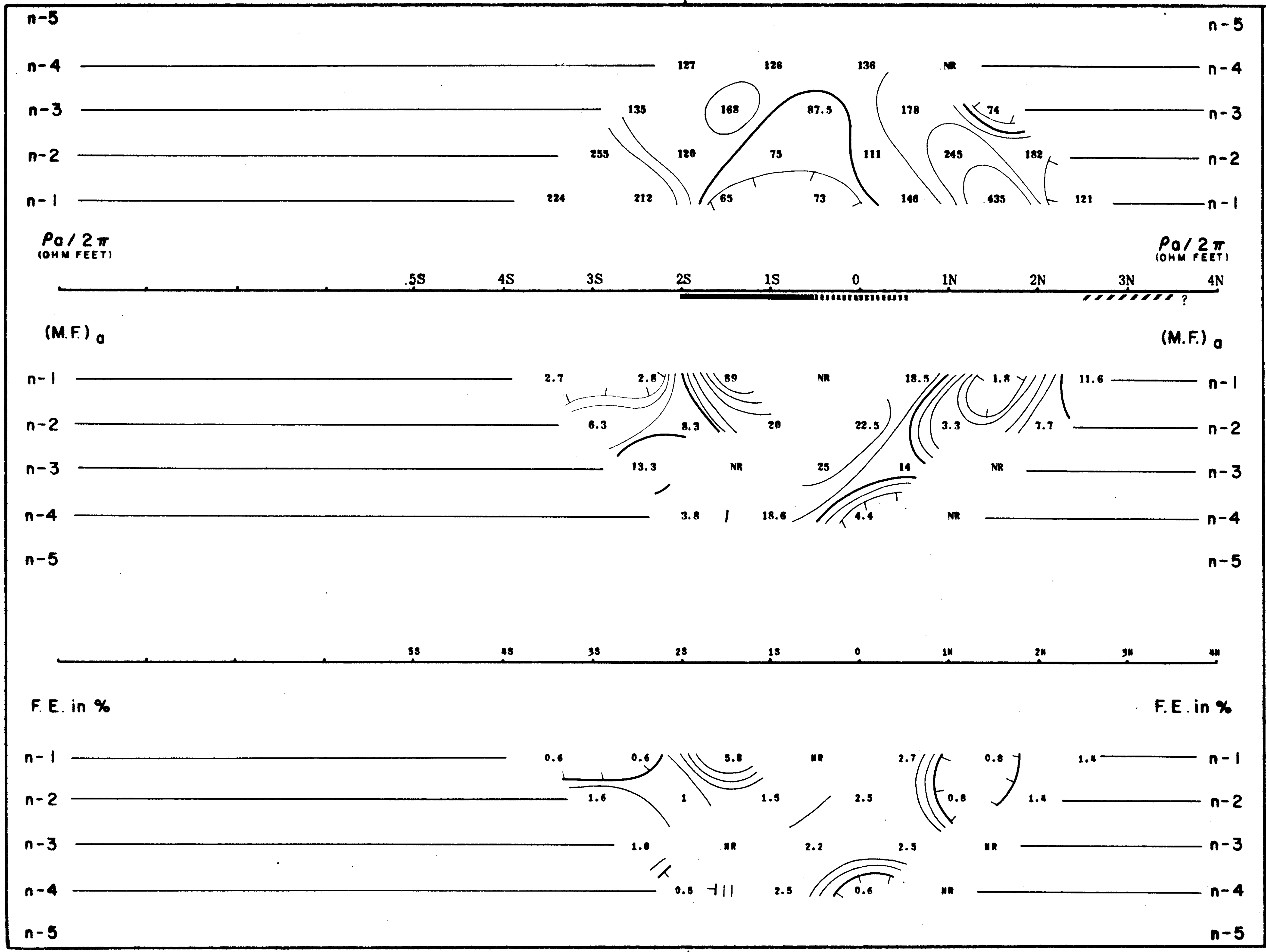
SMITHERS B.C.

SCALE

ONE INCH EQUALS TWO HUNDRED FEET

1640

DRAWN
DATE SEPT. '68
APPROVED
DATE Sept 25/1968



DWG. NO.- I.P - 5150-1

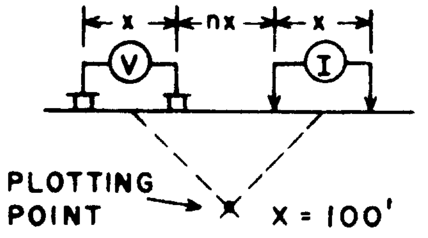
MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31 - 5.0 cps

DATE SURVEYED: JULY/1968

APPROVED: D. K. Fountain

DATE: August 16/1968

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

PROFESSIONAL ENGINEER — D. K. FOUNTAIN — PROVINCE OF BRITISH COLUMBIA

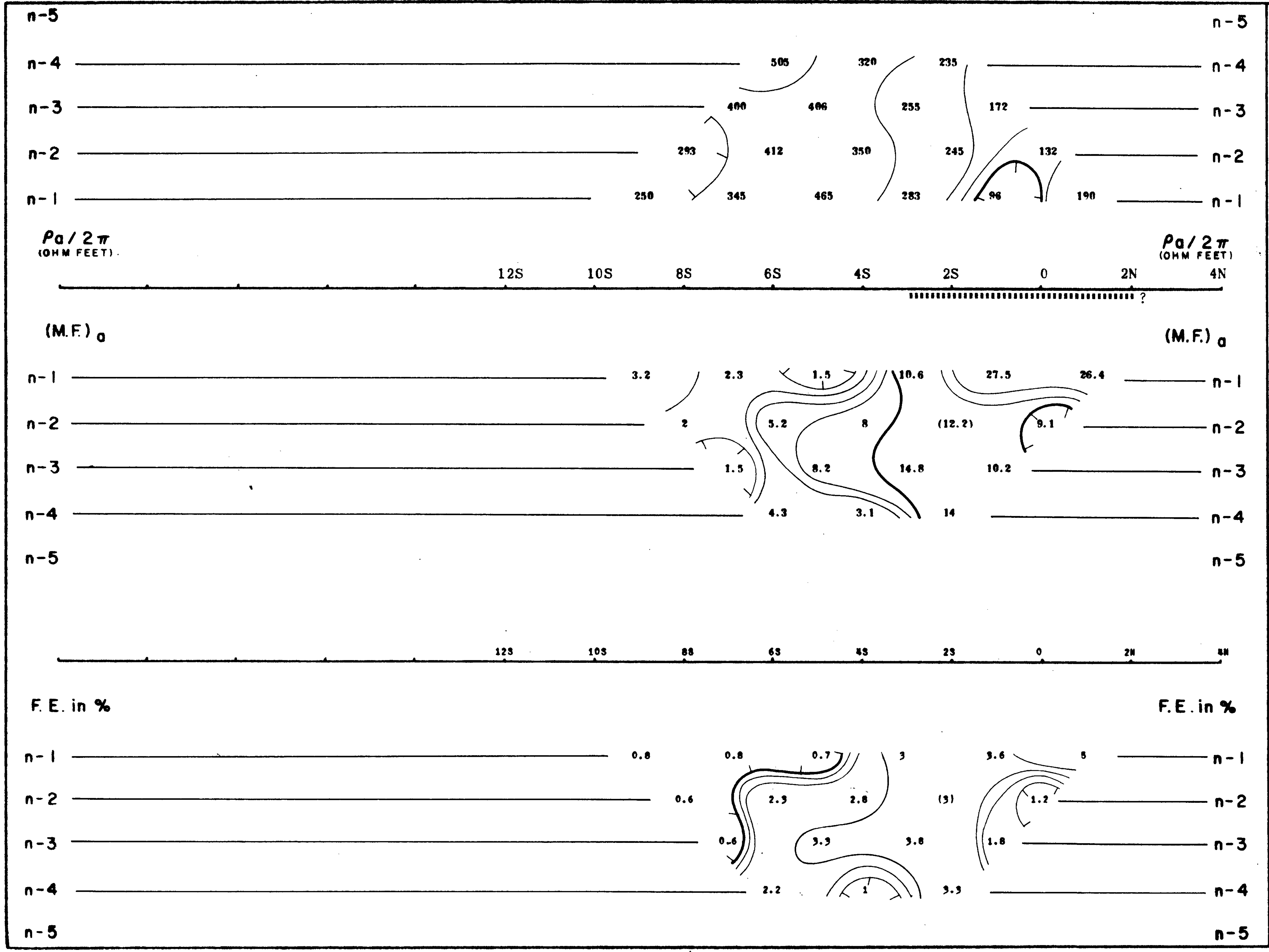
1640

McPHAR

Date: April 25, 1969

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-2

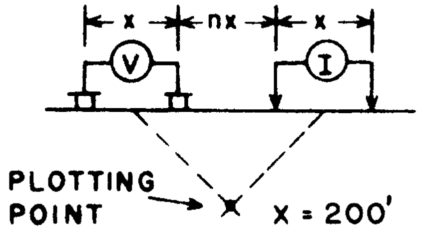
MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 1E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬

PROBABLE ''''''''''''''

POSSIBLE ////////

FREQUENCIES: 0.31 - 5.0 cps

DATE SURVEYED: JULY/1968

APPROVED: [signature]

DATE: August 16/1968

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

1640

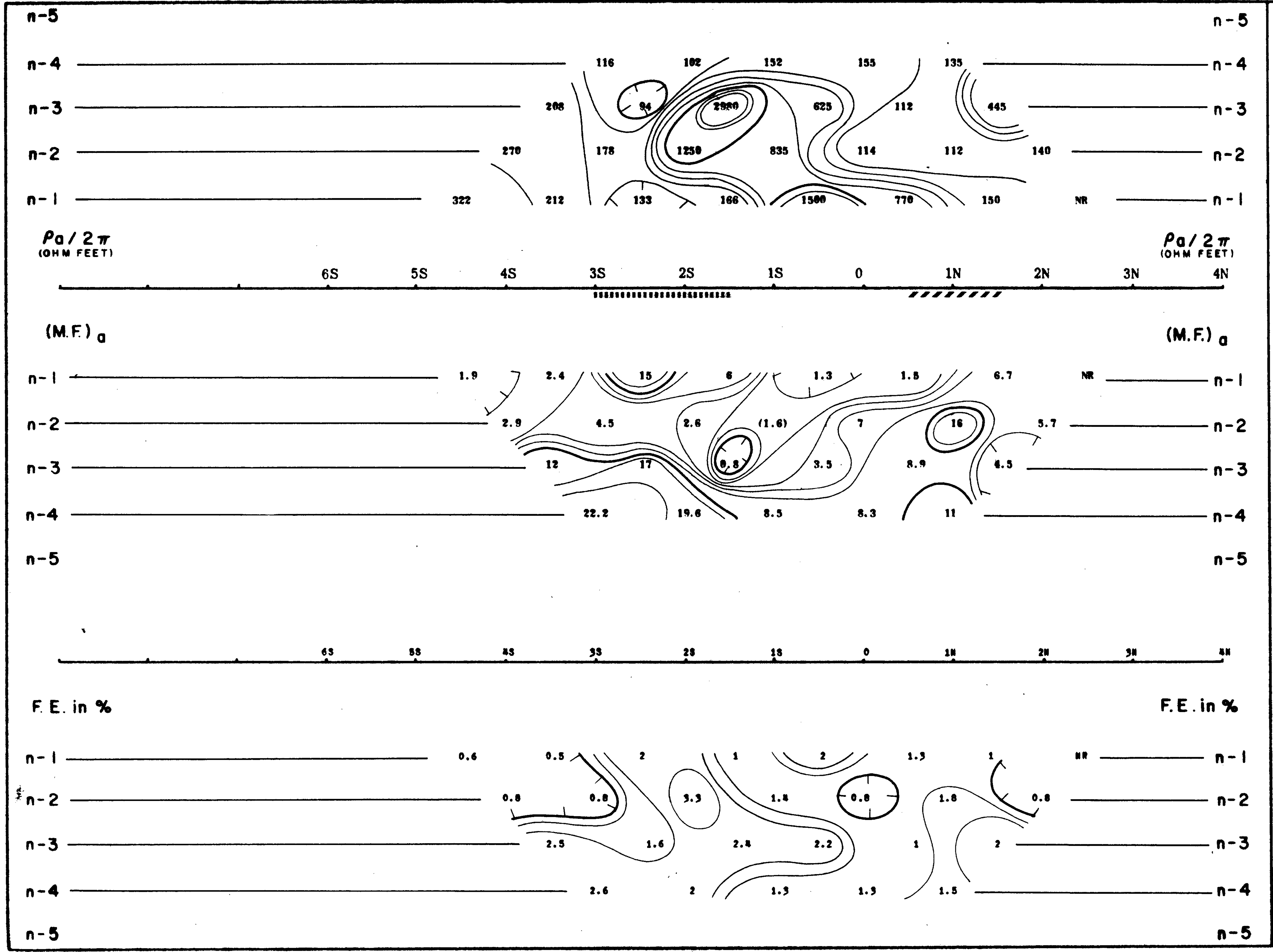
PROFESSIONAL ENGINEER D. K. FOUNTAIN PROVINCE OF BRITISH COLUMBIA

Date: April 25, 1969

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-3

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 1 E

ELECTRODE CONFIGURATION

x — nx — x

PLOTTING POINT

X = 100'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31 - 5.0 cps

DATE SURVEYED: JULY / 1968

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. K. FOUNTAIN

Date: April 25, 1969

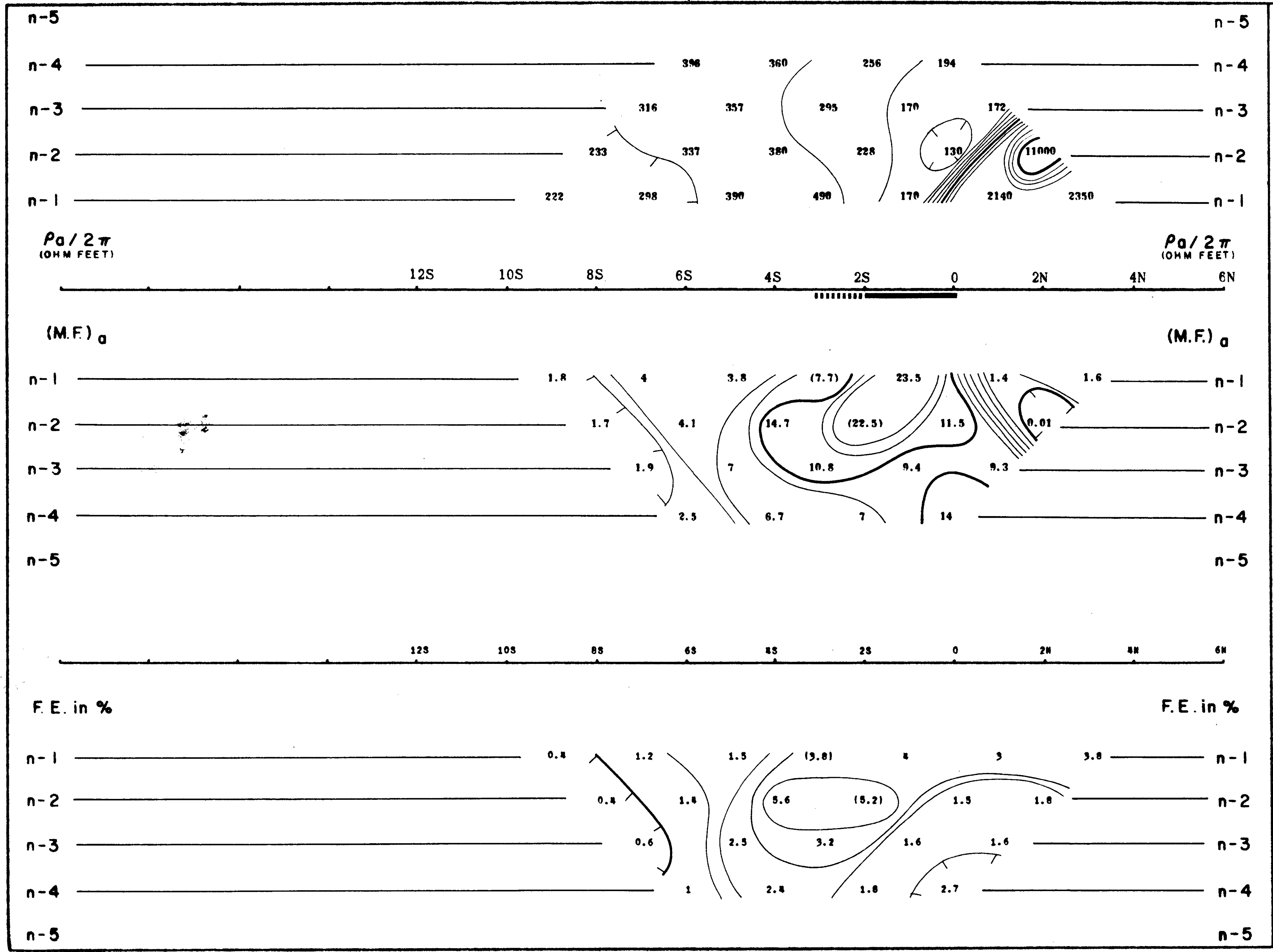
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1.5-2-3-5-7.5-10

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-4

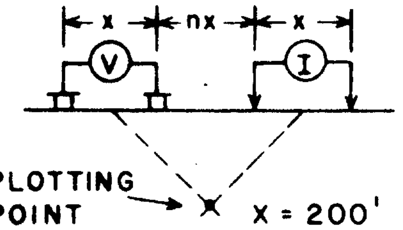
MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 2 E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER, D.K. FOUNTAIN, BRITISH COLUMBIA

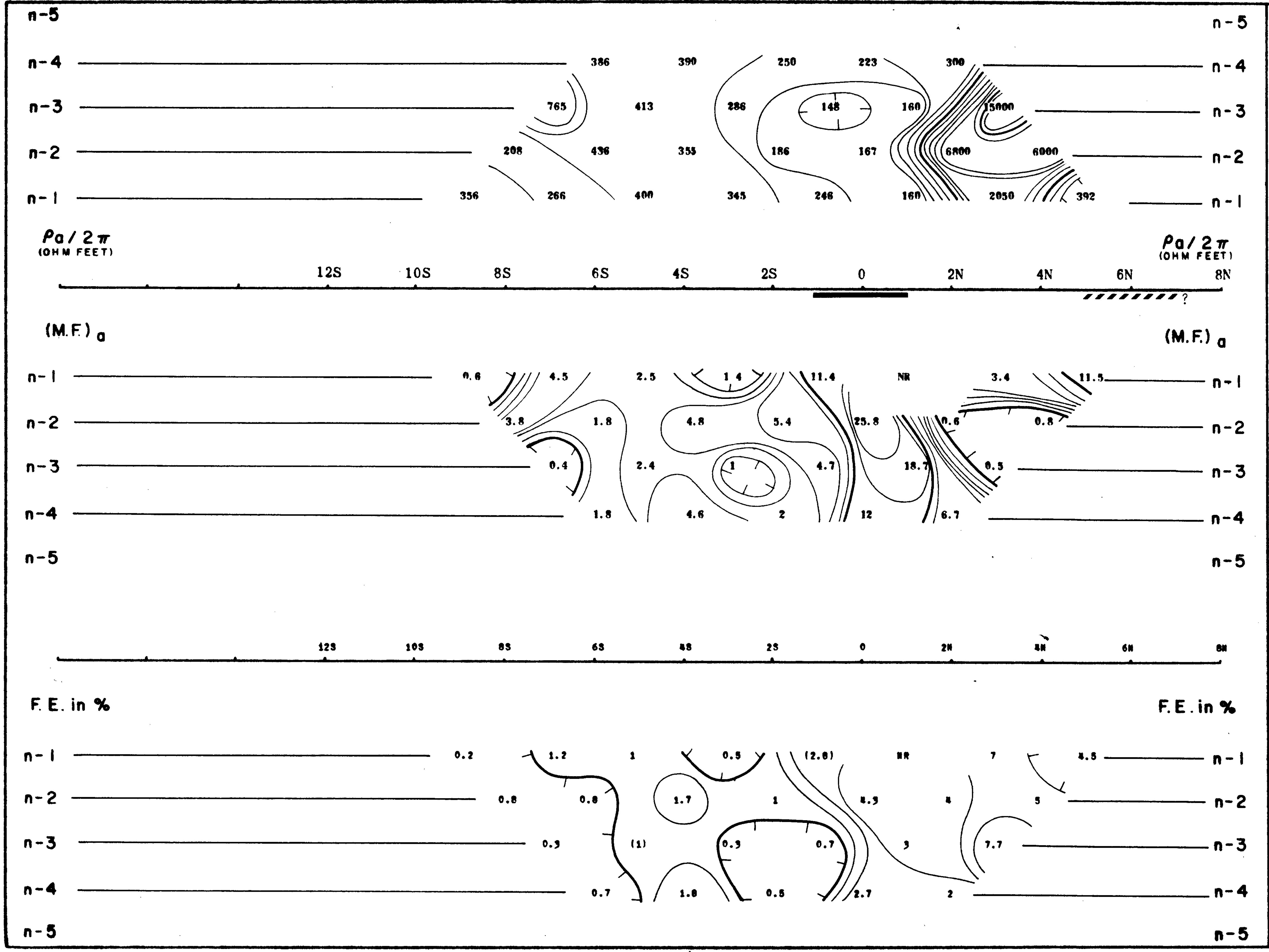
...: April 25, 1969

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P - 5150-5

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 3 E

ELECTRODE CONFIGURATION

x nx x

PLOTTING POINT

x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

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

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. K. FOUNTAIN

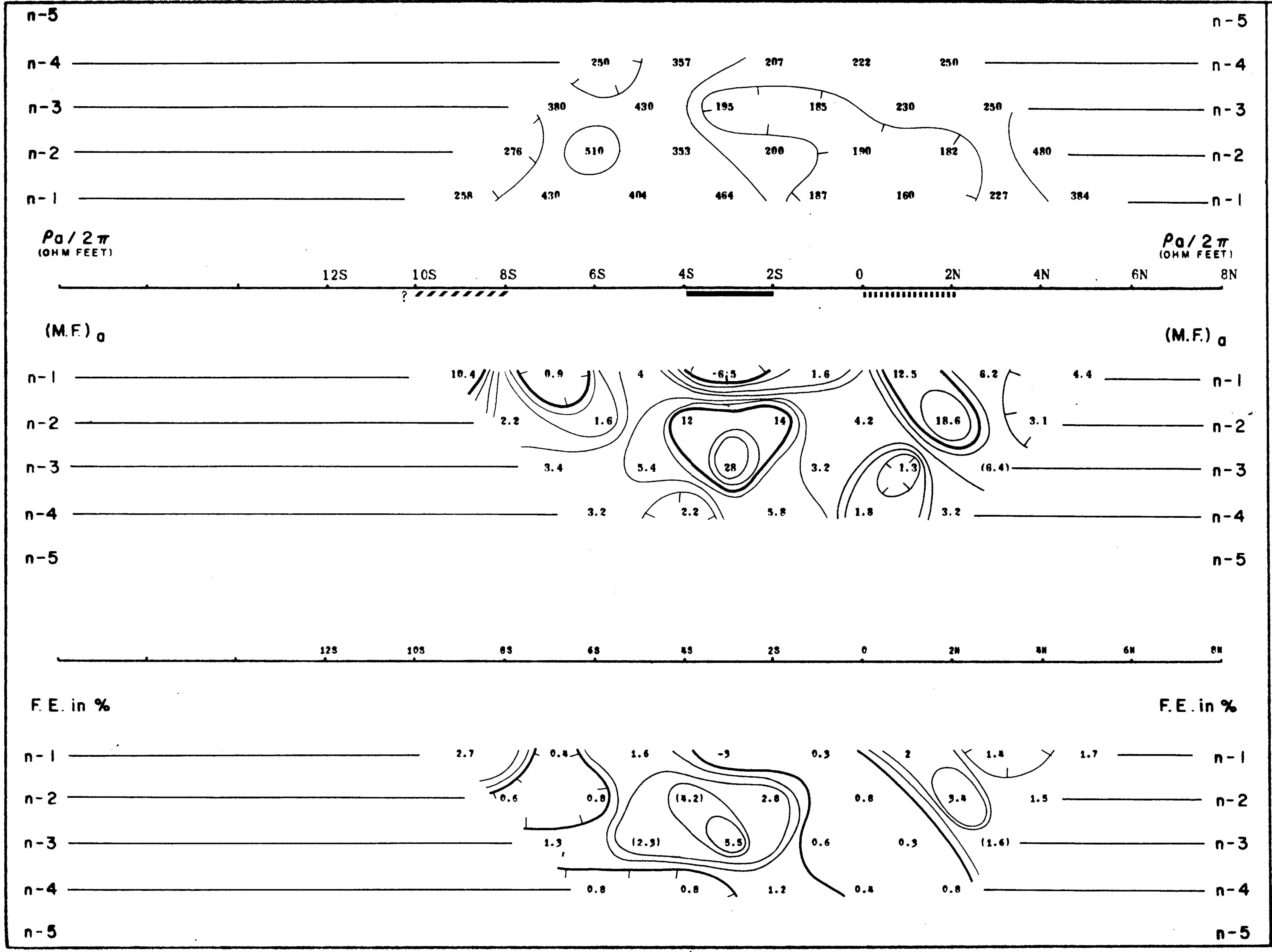
Date: April 25, 1969

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



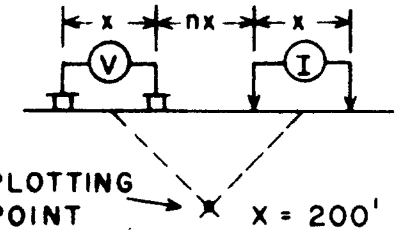
DWG. NO.- I.P.- 5150-6

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 4E



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

DATE: August 16, 1968

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

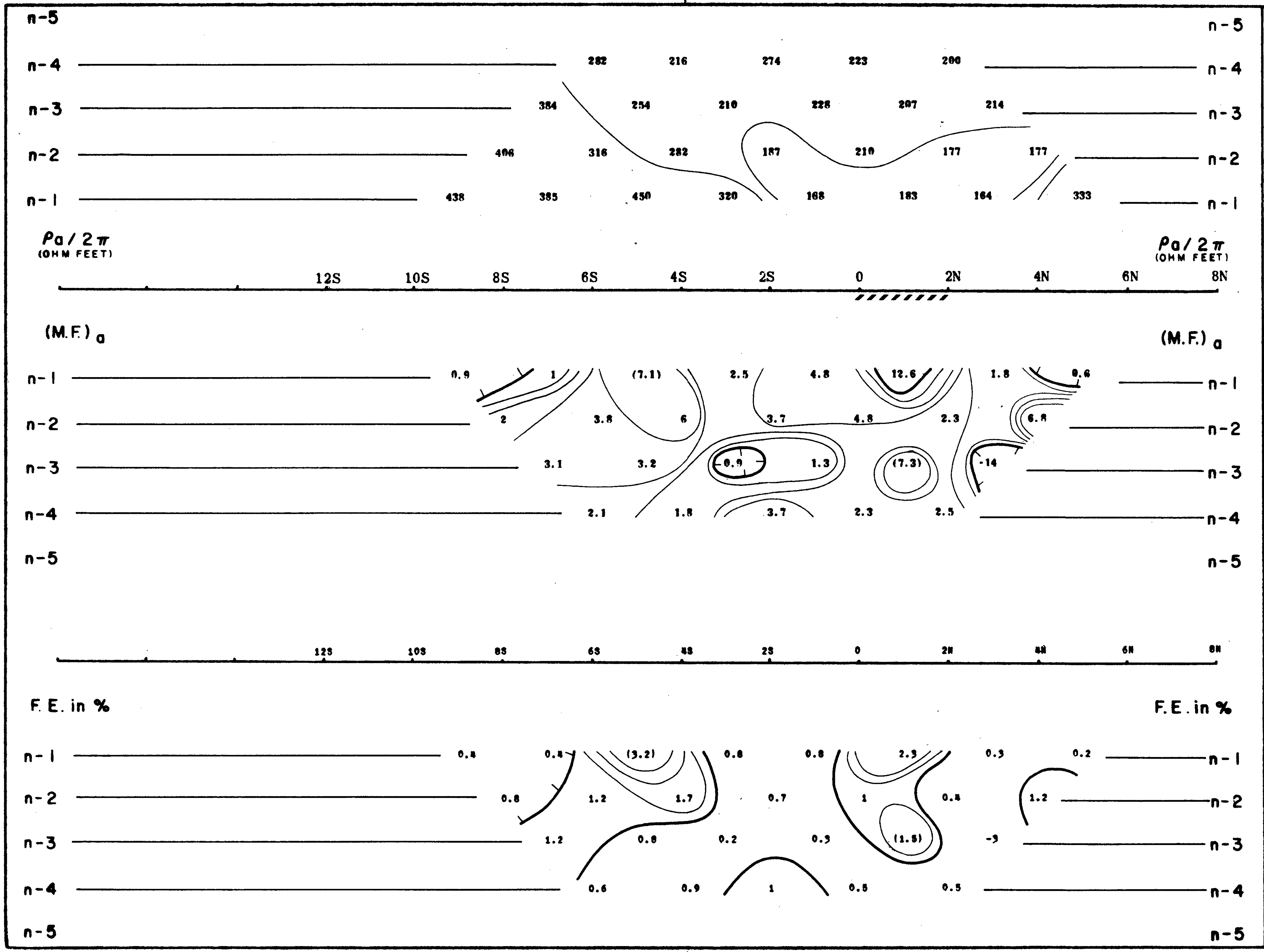
1640

McPHAR

Date: April 25, 1969

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-7

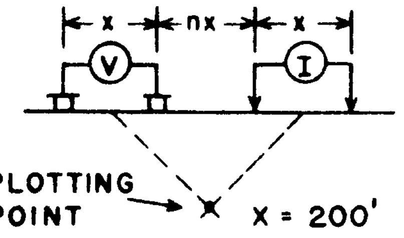
MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 6 E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

DATE:

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

Date: April 25, 1969

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DWG. NO.- I.P.- 5150-8

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 8 E

ELECTRODE CONFIGURATION

PLOTTING POINT x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES 0.31 - 5.0 cps

DATE SURVEYED: JULY/1968

APPROVED

DATE

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, D.K. FOUNTAIN

Expiry Date: April 25, 1969

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

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DWG. NO.-IP-5150-9

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 10 E

ELECTRODE CONFIGURATION

PLOTTING POINT x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES 0.31-5.0 cps

DATE SURVEYED JULY/1968

APPROVED

DATE

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

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DWG. NO.- I P- 5150-10

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 12 E

ELECTRODE CONFIGURATION

PLOTTING POINT x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED

DATE

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D.K. FOUNTAIN

Expiry Date: April 25, 1969

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

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

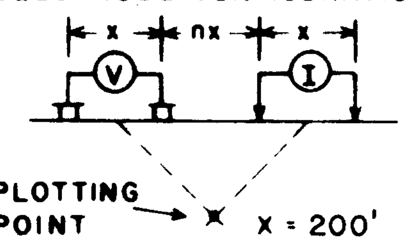
DWG. NO.-I.P.- 5150-11

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 14 E



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES 0.31-5.0 cps

DATE SURVEYED: JULY/1968

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

APPROVED David K. Fountain

DATE August 1968

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. K. FOUNTAIN

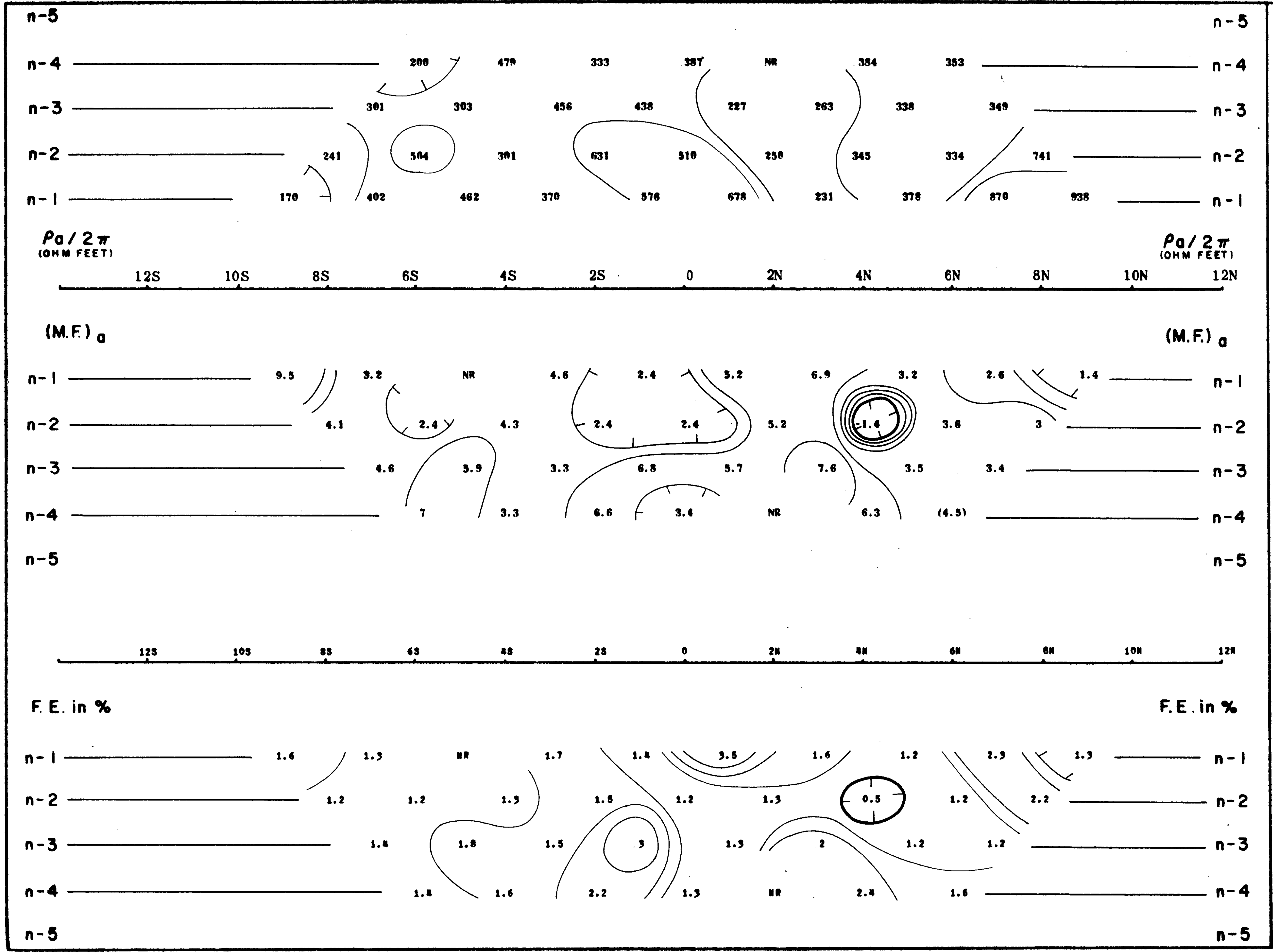
Expiry Date: April 25, 1969

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-12

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 16 E

ELECTRODE CONFIGURATION

x nx x

V I

PLOTTING POINT X x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31 - 5.0 cps

DATE SURVEYED: JULY/1968

APPROVED: [signature]

DATE: August 1968

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. K. FOUNTAIN

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

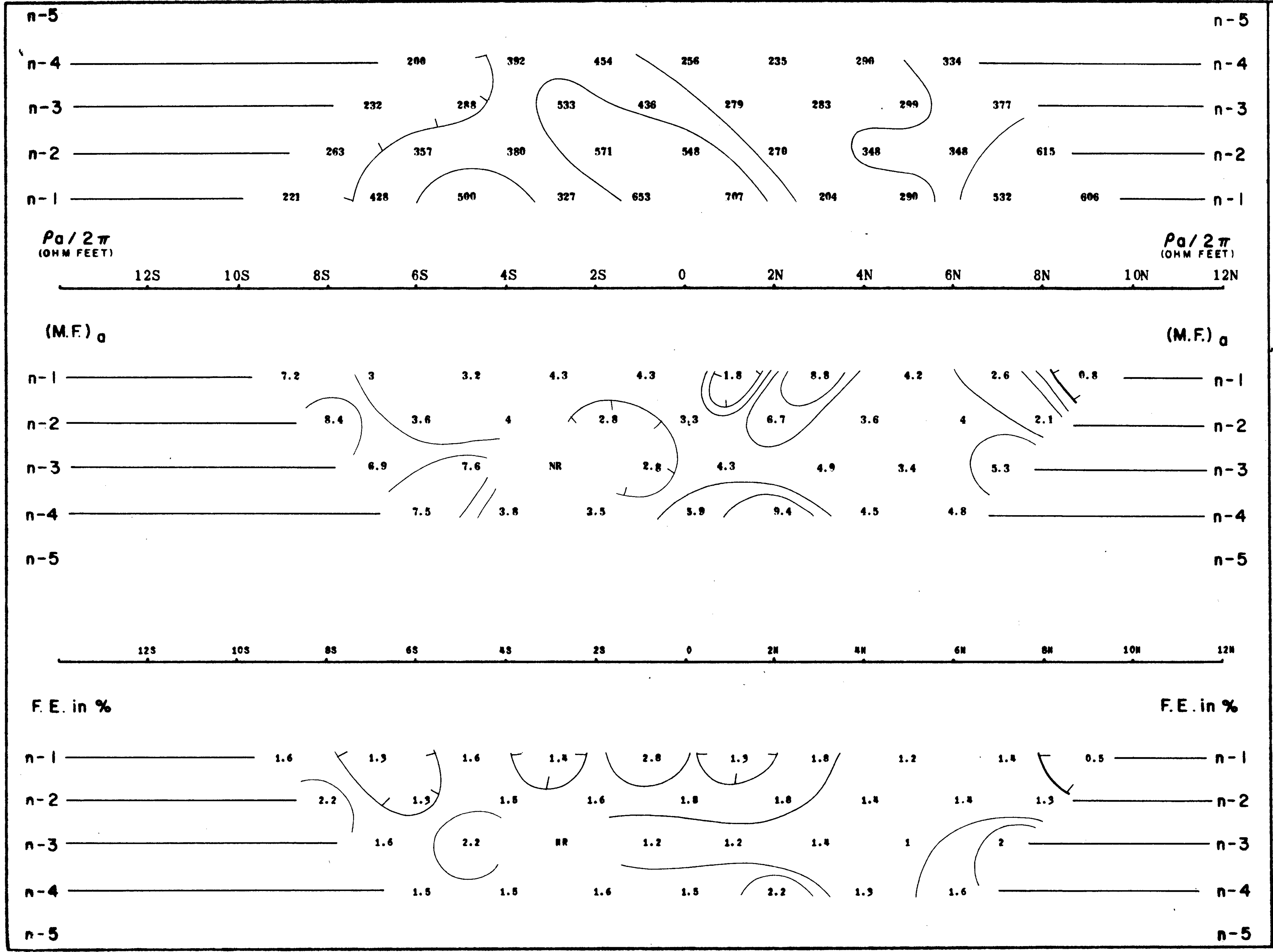
1640

Date: April 25, 1969

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-13

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 18 E

ELECTRODE CONFIGURATION

x — nx — x

PLOTTING POINT x = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

DATE:

PROFESSIONAL ENGINEER — D. K. FOUNTAIN — PROVINCE OF BRITISH COLUMBIA

Date: April 25, 1969

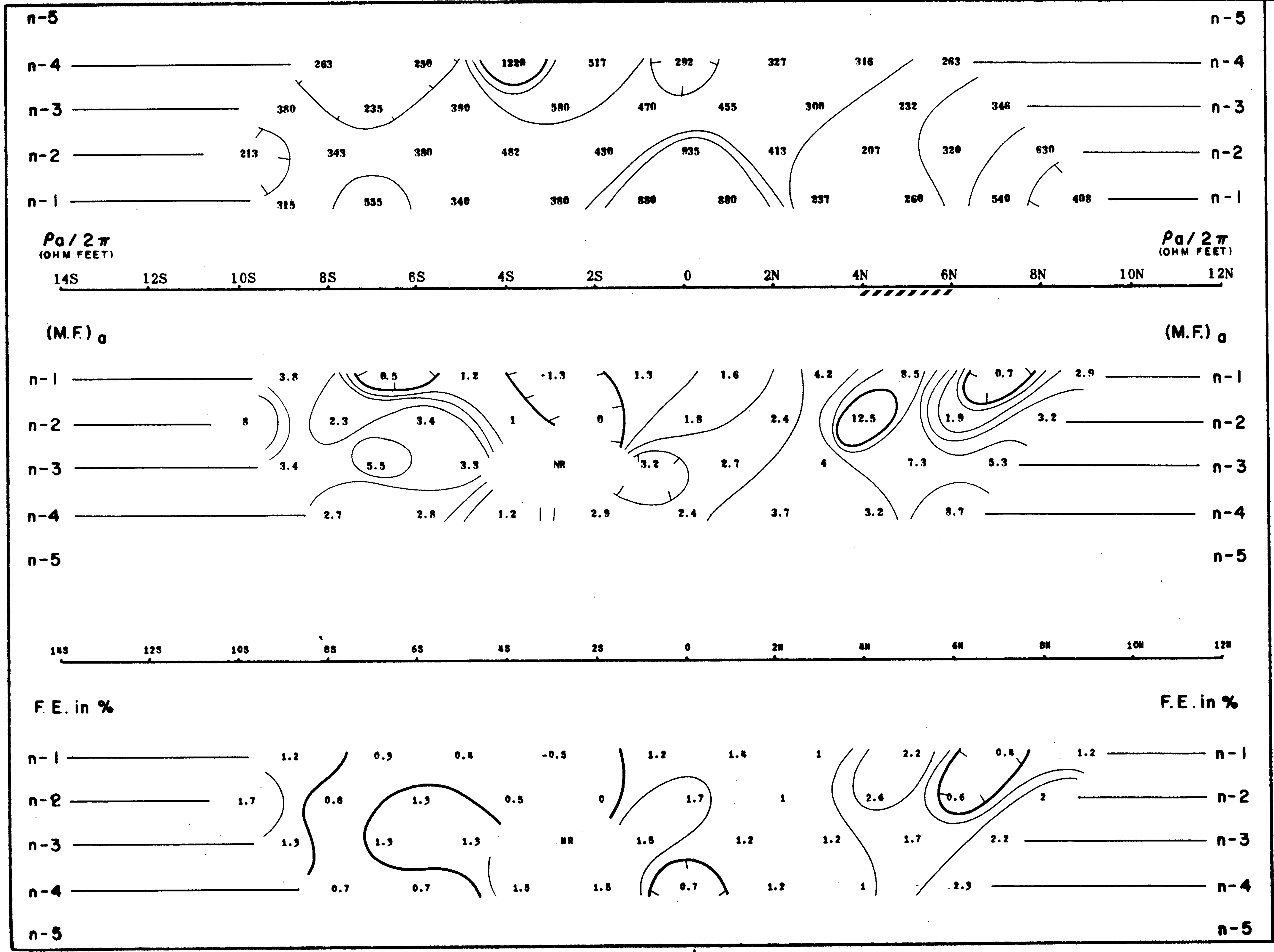
NOTE: CONTOURS AT LOGARITHMIC INTERVALS
1-1.5-2-3-5-7.5-10

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.- 5150-14

MANEX MINING LIMITED (NPL)

CARIBOU MTN. AREA, OMINECA M.D.

SMITHERS, B.C.

LINE NO.- 20 E

ELECTRODE CONFIGURATION

x — nx — x

PLOTTING POINT

X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 cps

DATE SURVEYED: JULY/1968

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — D. K. FOUNTAIN

Date: April 25, 1969

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

1640

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY