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Report on the Induced Polarization and Resistivity Survey on the North Farrell Grid, Tullah Area.
Electrolytic Zinc Co of Australasia Ltd*; McPhar Geoph
Anon
EL1/62

See folio 45

(EL1/62)

99_4395

Report on the Induced Polarization and Resistivity Survey on the North Farrell Grid, Tullah Area.
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175002 EL 1162

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Department

MEMORANDUM

TO:— Superintendent

DATE:— 28th August, 1968.

FROM:— Chief Geologist

SUBJECT:— EXPLORATION - Tullah

This memorandum reviews the results of geophysical surveys carried out to the north of the Farrell Mine workings, and diamond drilling which has been done in the same area. Initially three drillholes are recommended at an estimated cost of $8,000.

1. Geophysics

Geophysical work has been carried out at Tullah with the object of outlining the position of the Farrell lode shear northwards from the present mine workings. There were two separate periods of activity.

In 1950-51 the Company conducted a self-potential survey over ground held under Special Prospectors Licence to the north of the New North Mount Farrell Mine leases. A report on this work was submitted by L. A. Richardson who acted as consultant to the Company. Possibly as an aid to interpretation, self potential work was also done within the leases over the known ore occurences immediately north of the mine shaft. In addition some magnetic and gravimetric work was done, though the results of these surveys were regarded as inconclusive.

The survey indicated a main anomaly zone which was regarded as representing the continuation of the Farrell lode shear, as well as a very strong anomaly which lay off the main anomaly line.

In 1958, at the request of the Mount Farrell Mining Company, the Bureau of Mineral Resources carried out a geophysical survey using self potential and electromagnetic methods. This work was in some respects complementary to the earlier work as it was done over ground not covered in the previous survey. The results again indicated the northern continuation of the Farrell lode shear, these being strong corroboration of the S.P. results by the E.M. work.

The results of both surveys are shown combined in Plate I.

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2. Diamond Drilling

Six holes have been drilled in the area under discussion. Between August 1946 and March 1948 four holes were drilled by the Department of Mines (1 to 4 Plate I) These were of course drilled prior to the geophysical surveys and were therefore not sited with respect to the geophysical anomalies, but it is to be expected that No.2 should have intersected the lode shear. The log of this hole does state:-

"317'0" - 329'0" Good lode channel, no values. Black lode slate, quartz seams. Iron sulphate in bands and splashes".

No.3 appears to have been collared too far to the east and was presumably drilled in footwall rocks. No.1 on the other hand was too far to the west and too steep to intersect the lode. In No.4 the log records:-

"242' - 254'. Heavily mineralised black lode matter of slate and quartz with traces of lead and zinc. Clearly defined walls."

This drilling tends to confirm the geophysical indications but it is not considered to constitute an adequate test of the geophysical results. Whilst economic ore was not intersected mineralisation was shown to be present where it might be expected to occur.

Two holes were drilled by the Company in 1951 to test the anomalies revealed by the early survey. The collar positions are shown in Plate I. These holes were sited to allow for a strong south pitch of a possible orebody. It is my opinion that this southerly pitch has been unduly emphasized, and that MP86 certainly, can not be said to have tested the anomaly. Richardson concurred with this view in discussions held earlier this year.

These holes revealed only feeble pyrite mineralisation but for the reason outlined above, I feel that no significance should be placed upon these results.

3. Geochemistry

It had been hoped to carry out a geochemical soil sampling programme over the area under discussion. Talus rubble was found to be almost universally present beneath the surface soil, and prevented penetration of the auger to bedrock. The survey was therefore abandoned.

Instead a bulldozer was used to remove the overburden across negative self potential centres. The costean positions are shown on Plate I (A,B and C). The exposed bedrock was examined and rock samples taken for analysis at intervals of five feet.

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Slightly anomalous values for lead and zinc (up to five times the background) were recorded from the costeans. No signs of lead or zinc sulphides were noted, but in view of the geophysical indication, these analyses could be of some significance.

4. Discussion

The E.M. anomaly is continuous for 1,600 feet and since it is in line with the known Farrell lode it is reasonable to assume that it arises from a northern extension of the lode system, though it should not be taken to be indicative of a continuous orebody. The ore bodies mined in the Farrell Mine are irregular and discontinuous though confined to the Farrell lode shear.

Tate (2) states that the E.M. anomaly could arise from the cumulative effect of the following factors -

1. The electrical effect from a dipping series of fractures along a persistent fault line (the Farrell lode), the effect arising chiefly from mineralised waters along the fracture.

2. The occurrence throughout the zone of disseminated pyrite.

3. The occurrence of graphitic black slates.

4. The occurrence of intermittent bands or shoots of sulphide minerals.

He concludes that the most important result of the E.M. survey is that the continuous steep dipping shear zone which is most favourable to deposition of ore bodies has been accurately outlined north of the Farrell Mine.

The self potential surveys have shown a strong negative centre in an area of proven mineralisation as well as similar anomaly centres in proximity to the E.M. anomalies. It should be borne in mind that self potential anomalies can also be brought about by a number of causes, but they can be produced where sulphide bodies are undergoing active oxidation.

I am therefore of the opinion that the coincident E.M. and S.P. anomalies, notwithstanding the inconclusive drilling results so far achieved, provide a well defined target for further testing by diamond drilling. Dr. A. Brant of Newmont Mining Corporation examined the geophysical results during the course of his visit to Rosebery in 1966 and expressed the opinion that they provided targets worthy of testing by drilling.

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Recommendations

The self potential anomalies indicate mineralisation close to the surface whilst the E.M. anomaly is indicative of somewhat deeper causes. It is for this reason that the E.M. anomaly is situated to the west of the S.P. centres, the Farrell lode dipping steeply to the west.

Therefore holes which are designed specifically to test the S.P. negative centres should aim for relatively shallow targets, i.e. 150 ft. below surface. Webster (see ER/113 27.10.67) calculated the optimum collar position for a drillhole to test the anomalies at C to a depth of 150 feet below surface. I recommend that this hole be drilled and that the anomalies at A and B also be tested with similar holes. This would involve approximately 750 feet of drilling at an estimated cost of $8,000.

This would still leave 1,000 feet of the E.M. anomaly untested, but a recommendation to carry out further drilling at intervals of 200 feet along the strike, and perhaps at greater depth, would be submitted in the light of the results of the proposed drillholes.

G.H. Griffiths

CHIEF GEOLOGIST

GHG/EBP

References:

1951 Richardson L.A. Geophysical Survey of Mackintosh Area Tullah, Tasmania. First Geophysical Report.

1958 Tate K.H. Geophysical Survey at the Mount Farrell Mine, Tullah, Tasmania. B.M.R. Records 1958/35

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175006

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
NORTH FARRELL GRID
TULLAH AREA, TASMANIA
FOR
ELECTROLYTIC ZINC COMPANY
OF AUSTRALASIA LIMITED

175007

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
NORTH FARRELL GRID
TULLAH AREA, TASMANIA
FOR
ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

1. INTRODUCTION

At the request of Electrolytic Zinc Company of Australasia Limited we have completed a brief induced polarization and resistivity survey in the Tullah Area, Tasmania. The four lines surveyed cross the Farrell Shear north of the North Farrell Shaft.

At the old Farrell Mine, the massive galena ore occurred as pods and veins along the Farrell Shear. The ore had widths of six inches to six feet, with ore shoots having strike lengths of 500 feet. The host rocks were black slates, containing disseminated pyrite.

Previously a self-potential survey and a Turan electromagnetic survey had been completed on the grid north of the North Farrell Shaft. Anomalies were located by both types of surveys, and several holes have been drilled in the area.

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	Electrode Intervals	Dwg. No.
123N	100 feet	IP -1
121N	100 feet	IP -2
119N	100 feet	IP -3
117N	100 feet	IP -4

Also enclosed with this report is Dwg. I. P. P.   , a plan map of the North Farrell 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 100' spreads the position of a narrow sulphide body can only be determined to lie between two stations 100' 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.

The topographic information shown on Dwg. I. P. P.   , and the geophysical information, have been taken from maps supplied by the staff of Electrolytic Zinc Company of Australasia Limited.

3. DISCUSSION OF RESULTS

The known mineralization at the Farrell Mine was massive; however, the zones were very narrow. As explained in the Appendix to this report, only weak apparent IP effects can be expected if relatively large electrode intervals are used in the survey. This would be the case, even using 100' electrode intervals, on the North Farrell Grid.

As explained in the Appendix, the narrow source can be better located, and evaluated, using shorter electrode intervals. However, if there is considerable overburden, or a well developed weathered layer, the depth to the top of the source will determine the minimum electrode interval that can be used.

The presence of disseminated pyrite in the black slate country rocks in the Tullah Area will definitely complicate the interpretation of the data. The true IP effects from this weak metallic mineralization will be less than the true IP effects from the massive ore. However, the widths of the pyritic slate bands will be greater than the widths of the ore zones; the apparent IP effects measured using 100' electrode intervals may be greater for the pyritic slate bands. (See Appendix).

Line 123N

This survey on this line gives a broad anomaly that extends from 107+50E to 111+50E. The edges of the anomaly are relatively weak and could be due to pyrite in the slates. There is a stronger, narrow, anomaly centred at 109+00E to 109+50E. This could be due to a narrow source of more concentrated metallic mineralization. It would have to be checked using shorter electrode intervals. (See Appendix).

Line 121N

Some of the IP measurements on this line were not reliable, due to noise. There is a shallow, narrow source at 108+00E to 109+00E that could be checked using 50' electrode intervals. It could be due to a very narrow zone of massive sulphide mineralization rather than to a wider zone of pyritic slate.

Line 119N

On this line, the IP anomaly centred at 108+50E correlates with those located on the lines to the north. The IP anomaly here is considerably weaker than to the north. The weak IP effects extend for a considerable distance to the east. There is an increase in the IP effects at depth, at about 113+00E to 114+00E.

These effects could represent an increase in the concentration of sulphide mineralization at depth in this area. The measurements should be extended to the east to complete the anomalous pattern.

Line 117N

The anomaly correlating with the main anomalous zone is centred at 107+00E to 108+00E. This is the weakest anomaly of those measured. This would indicate that the concentration of mineralization in Zone A is increasing to the north.

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There is a second anomaly at depth, to the east, on this line also. The source is centred, at considerable depth, at 110+00E to 111+00E. This anomaly has been correlated with the less definite anomaly on Line 119N, to form Zone B.

Since the n = 3 and n = 4 measurements are anomalous, the source is at considerable depth, perhaps as much as 200' to the top. In order to better evaluate the source, the measurements would have to be repeated using X = 150' and X = 200'. If the patterns are not definite, the measurements should be repeated with the electrode sites shifted one-half interval.

4. CONCLUSIONS AND RECOMMENDATIONS

IP anomalies were measured on each of the four lines surveyed on the North Farrell Grid. As shown on the plan map (Dwg. I. P. P.) the anomalies can be correlated into zones. Zone A correlates with the S. P. and E.M. anomalies previously located. It seems to be the northern extension of the Farrell Shear.

D.D.H. T.P.133 and D.D.H. T.P.134 seem to have adequately tested Zone A. The two holes did not intersect sulphide mineralization, but they did intersect the lode shear. The holes did intersect black slates, with pyrite. If the core from these holes is available, laboratory measurements would indicate the magnitude of the IP effects in the slate.

If a narrow zone, six inches to six feet, of massive sulphide mineralization is present within Zone A, measurements with very short electrode intervals could perhaps separate the anomalies from the two sources. There is no evidence of depth in the 100' spread data. The holes already drilled may have missed a narrow zone of sulphide mineralization that is present; however, it would have to have a limited strike length.

Zone B, at depth to the east, is much less definite than Zone A. If mineralization in this position could be of possible interest, further work would be warranted so that a drill test can be planned.

McPHAR GEOPHYSICS PTY. LTD.

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

E. Burnside,
Geophysicist.

Dated: June 17, 1970

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

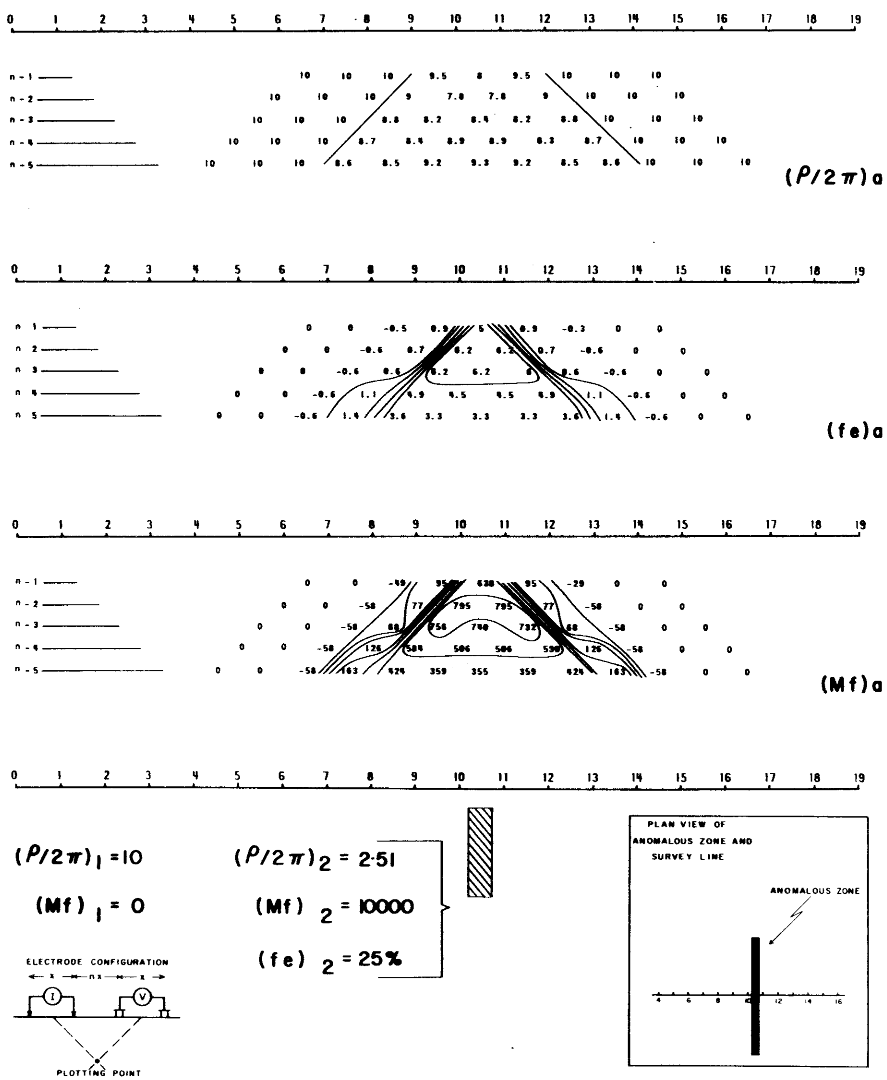

FIG 1

CASE II-0.5-BU-10-a

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Theoretical Induced Polarization and Resistivity Studies

Scale Model Cases

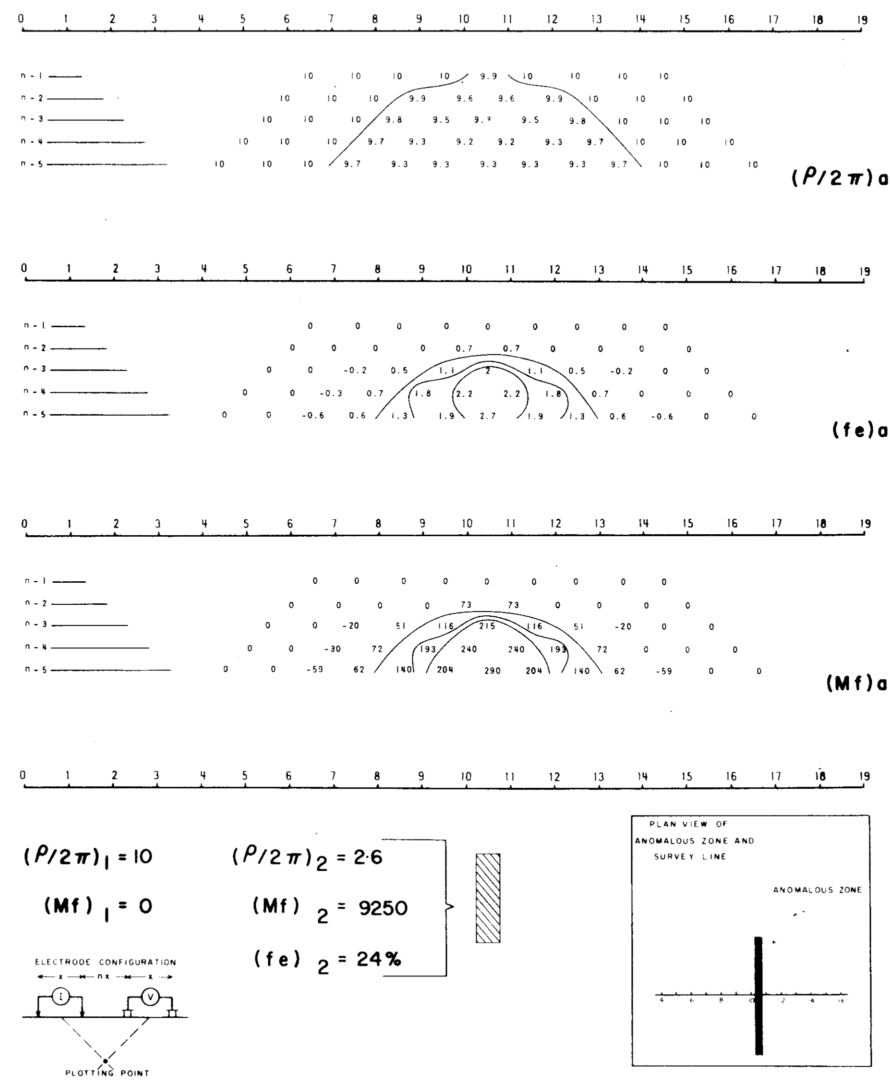

FIG 2

CASE II-1.5-BU-10-a

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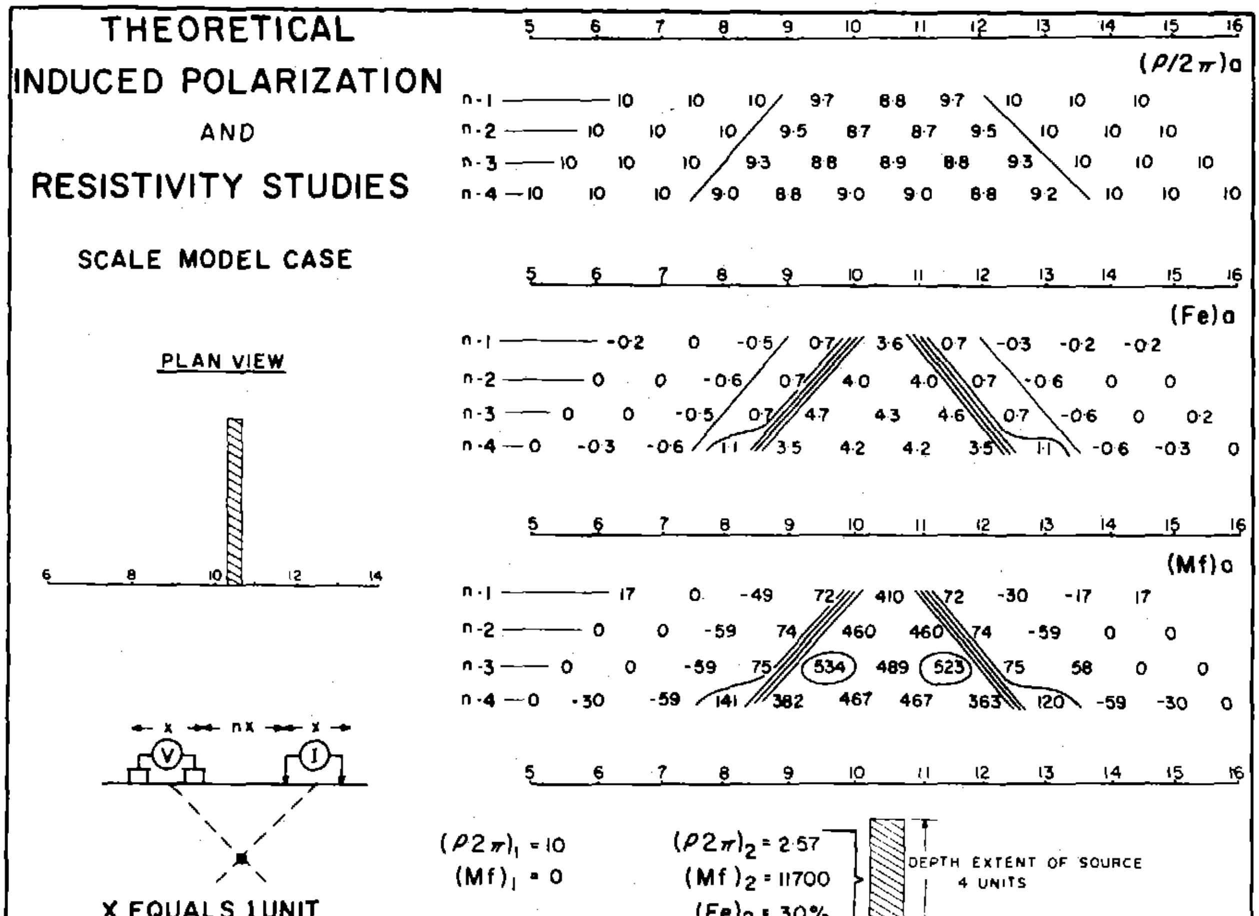

THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.7 8.8 9.7 10 10 10
n-2 10 10 10 9.5 8.7 8.7 9.5 10 10 10
n-3 10 10 10 9.3 8.8 8.9 8.8 9.3 10 10 10
n-4 10 10 10 9.0 8.8 9.0 9.0 8.8 9.2 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

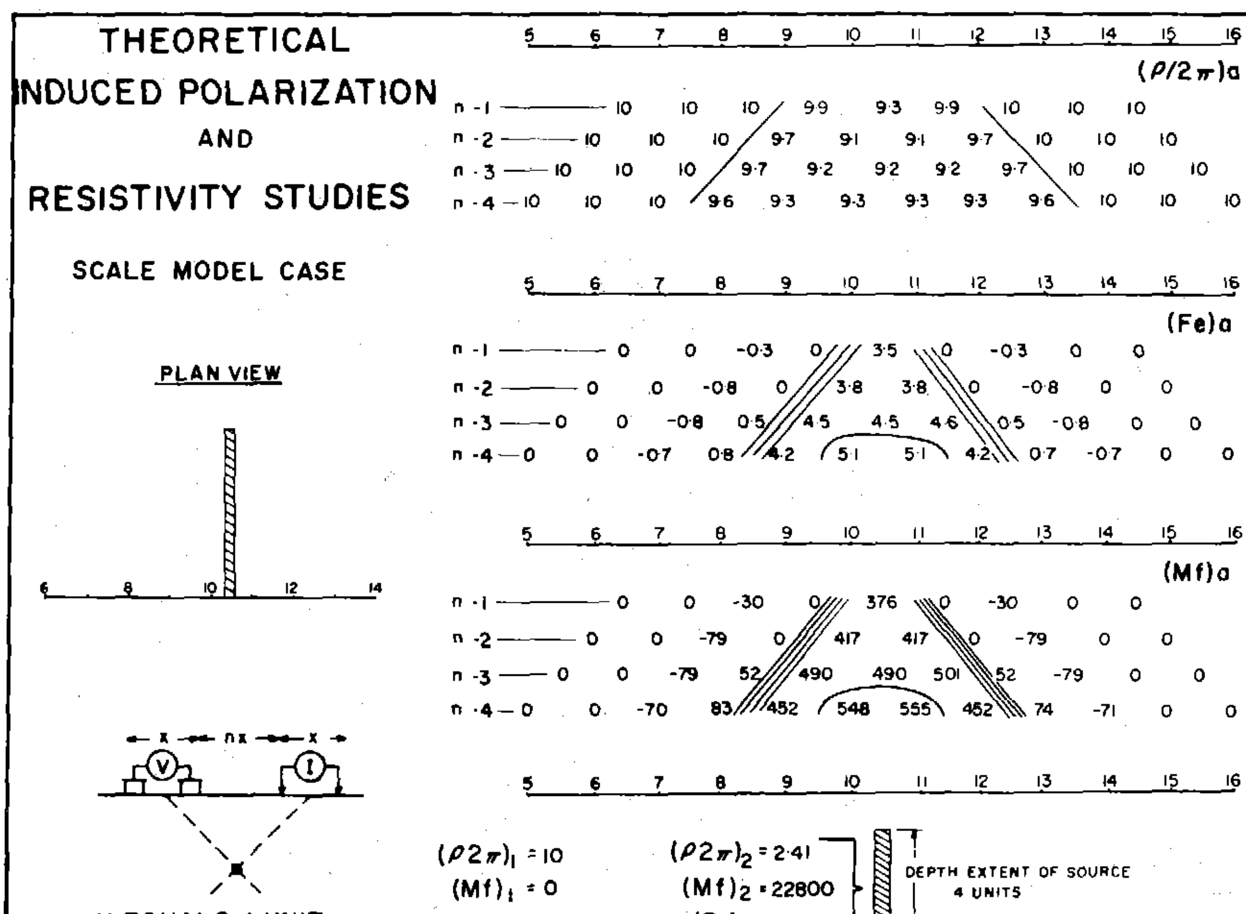

THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.9 9.3 9.9 10 10 10
n-2 10 10 10 9.7 9.1 9.1 9.7 10 10 10
n-3 10 10 10 9.7 9.2 9.2 9.2 9.7 10 10 10
n-4 10 10 10 9.6 9.3 9.3 9.3 9.3 9.6 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.

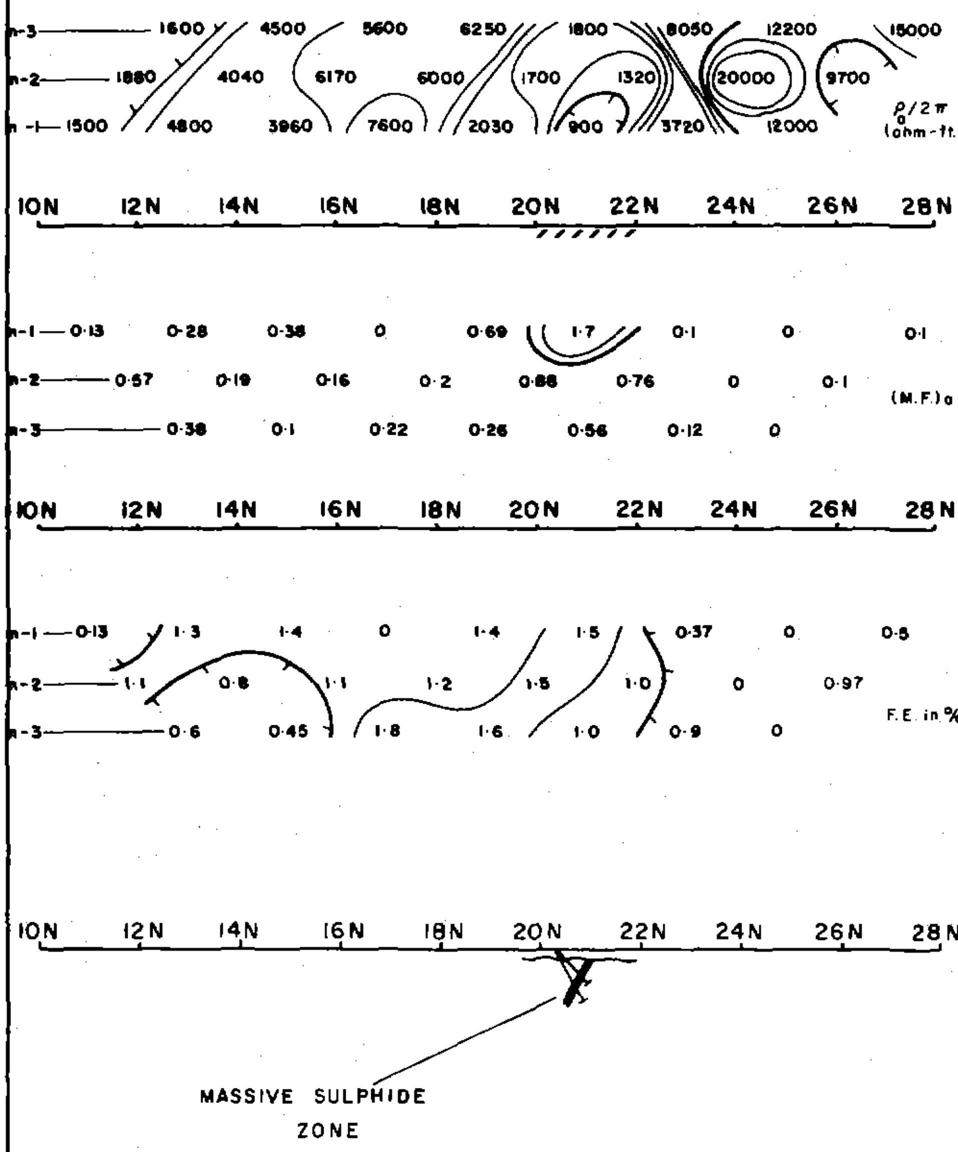


FIG. 5

INDUCED POLARIZATION AND RESISTIVITY RESULTS

BATCHELOR LAKE AREA, QUEBEC.

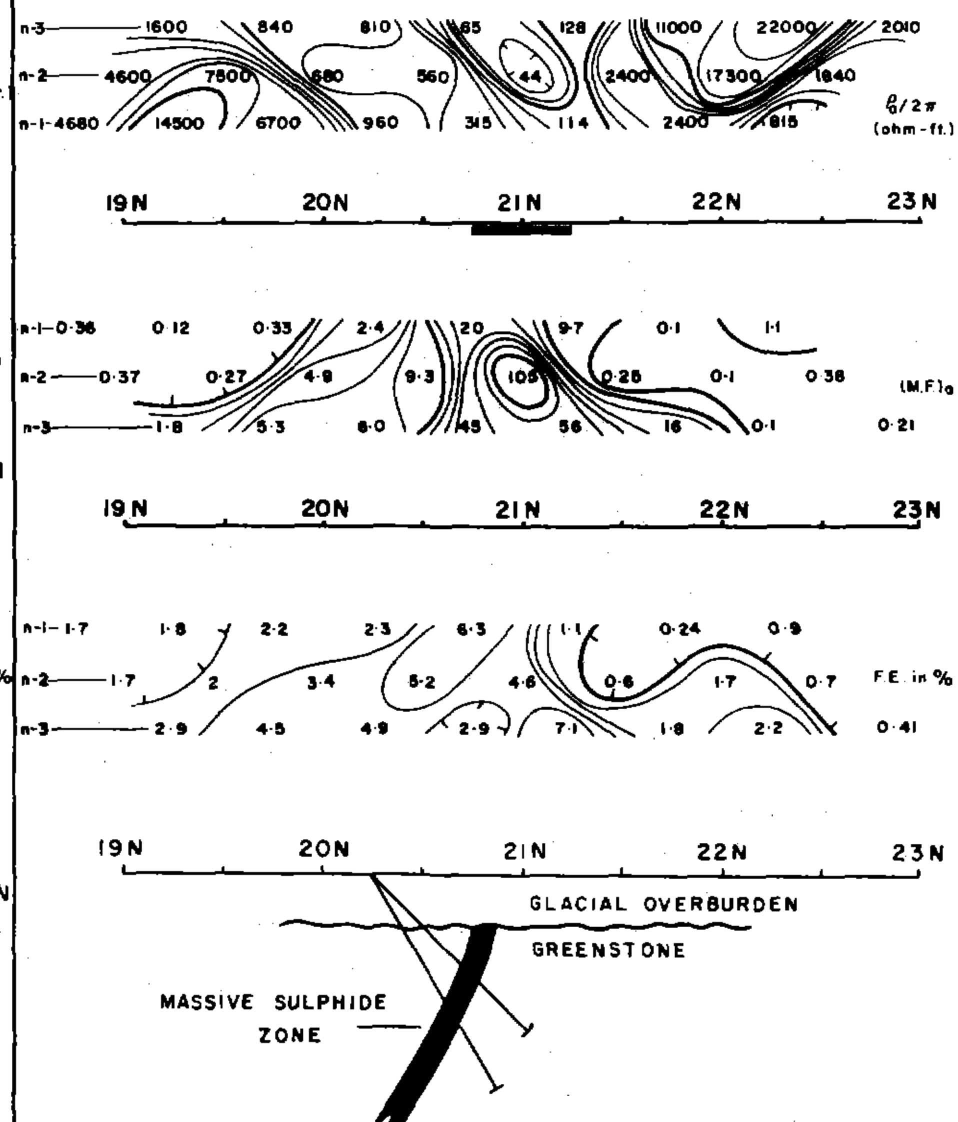
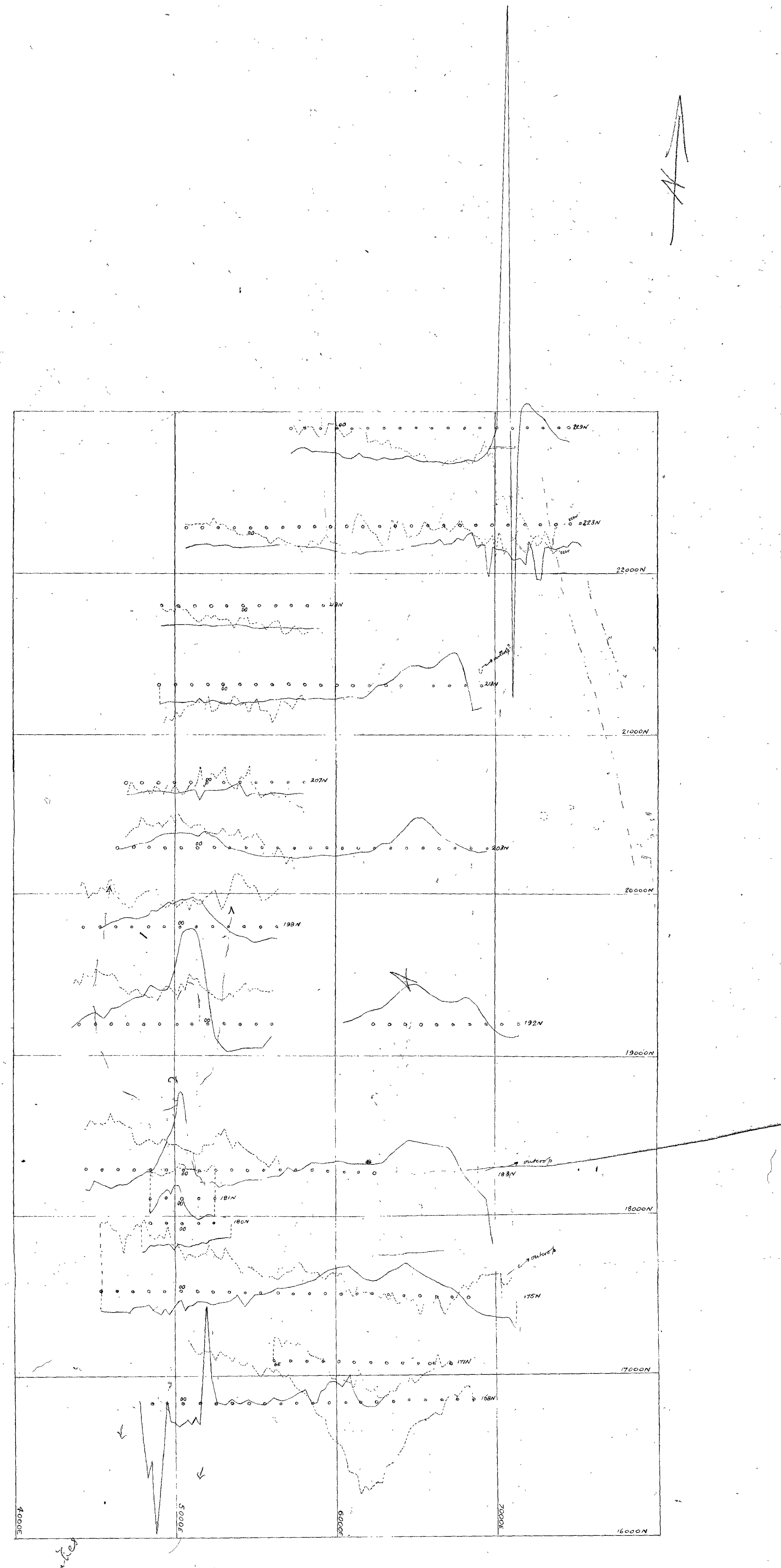


FIG. 6



Rough Sketch Map MURCHISON AREA – GEOPHYSICAL RESULTS

Obtained to date 30-5-1951

Horizontal Scale 1" = 200'

Magnetic Profiles shown thus ——— Scale 1" = 200γ

Self-potential Profiles shown thus .... Scale 1" = 100mv

Survey stations marked o where line paced, station shown, •.

Gravimeter has been observed on lines 168N, 175N, 183N, 192N, 198N, 203N

2-6-1951

Zones 1-4 are gravimetric anomalies

5 cm

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