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SOME COMMENTS ON
 SCHLUMBERGER ELECTRICAL SOUNDINGS
 CARRIED OUT ON THE MT. LYELL GRID
 ON BEHALF OF
 THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

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SCHLUMBERGER ELECTRICAL SOUNDINGS
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BY

A.W. HOWLAND-ROSE
M.Sc., DIC, AMAusIMM, FGS.
GEOPHYSICIST

SYDNEY, N.S.W.

MARCH, 1973

TAS-016A

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Plate 1 - Electrical Soundings

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SCINTREX PTY. LTD.

Formerly

SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.

GEOPHYSICAL CONSULTANTS AND CONTRACTORS

S U M M A R Y

Electrical soundings were carried out on Mt. Lyell by Scintrex Pty. Ltd. to investigate the depth to the prospective Mt. Read volcanic group. Local inhomogeneity in the surface zones precluded meaningful data from depth being obtained.

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INTRODUCTION

On 2½ production days between 7th and 9th March, 1973, a Scintrex Pty. Ltd. geophysical crew under the direction of Mr. B. Ekstrom assisted by Mr. D. Robson, B.Sc. carried out three electrical soundings on the upper slopes of Mt. Lyell. The geophysical crew was assisted by personnel kindly supplied by The Mount Lyell Mining & Railway Company Ltd., and a helicopter was used to gain access to the area.

The objective of the survey was to ascertain the thickness of the Jukes breccia which lie unconformably above the Mt. Read volcanics in this area.

The induced polarization and resistivity methods are briefly discussed in Appendix 'I.P.'.

DISCUSSION OF RESULTS

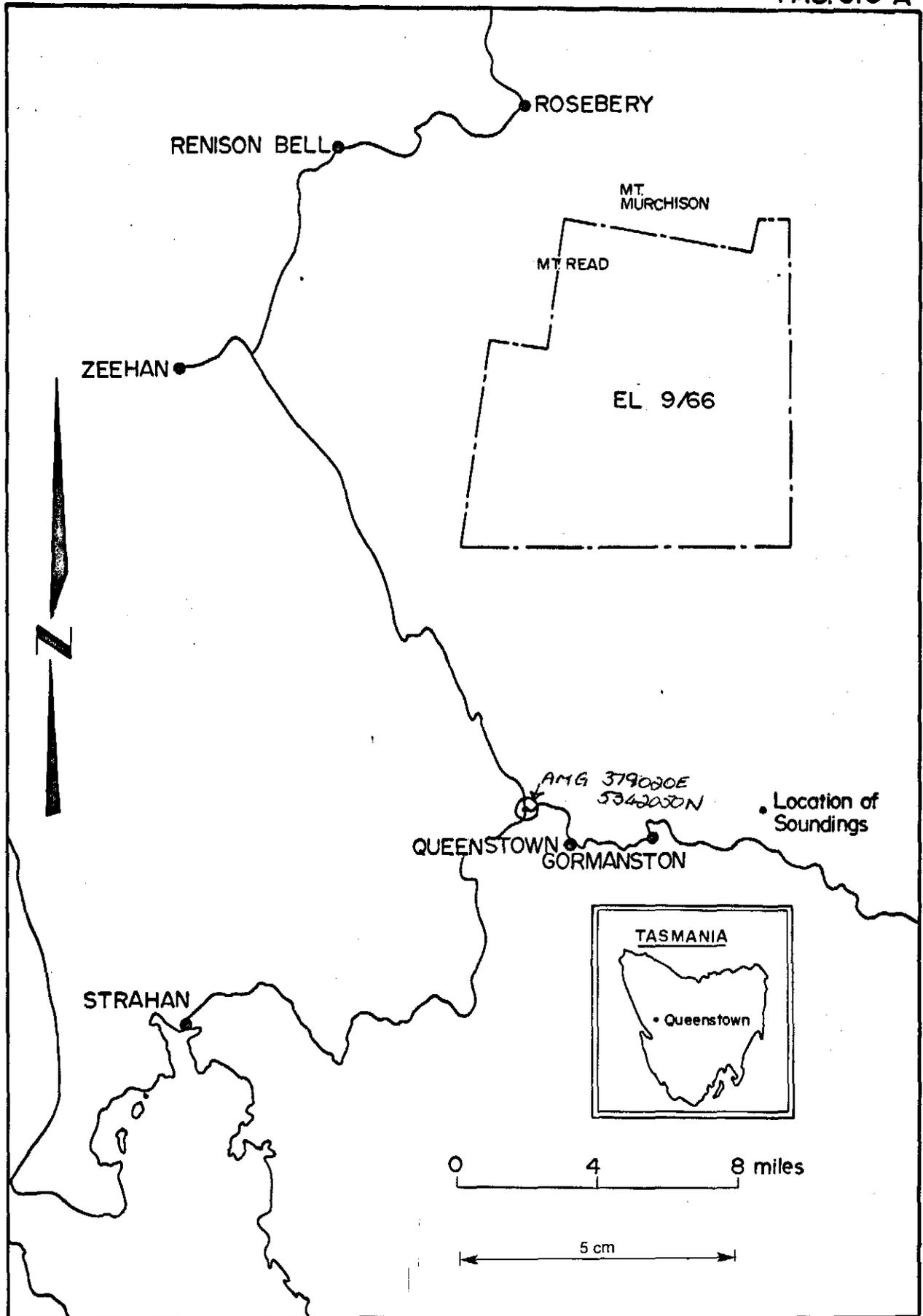
The three Schlumberger electrical soundings are presented on Plate 1. The resistivity and spacing data are presented

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LOCALITY PLAN

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AMG REFERENCE POINTS ADDED

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on a 5 inch log cycle and expressed in ohm-meters and feet respectively. The induced polarization data is shown at the vertical scale of 1 inch = 10 milliseconds. Also shown on the same plate is a diagrammatic plan of the sounding locations.

Sounding 1 - Centred at 00/00, run East/West

This sounding shows apparent resistivities ranging between 1000 and 2000 ohm-meters in the shallow sections. The larger spacings indicate resistivities in excess of 4000 ohm-meters. The data is certainly affected by surface inhomogeneity but two contacts can be interpreted at about 25 feet and 200 to 250 feet. The chargeability ranges between 3 and 9 milliseconds with the suggestion of a minor source at about 50 to 100 feet below the surface.

Sounding 2 - Centred at 00/00, run North/South

The absolute resistivities recorded, even around the centre of the expander, were 10% to 15% of those recorded in the east/west sounding. This is somewhat unusual and is probably due to gross inhomogeneity within the Jukes breccia unit. The current flow in the north-south direction is much easier than in the east-west direction. The inferred strike direction therefore is north-south, assuming the normal situation

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of less resistive current flow along strike.

Gross inhomogeneity was observed in the near surface layer as the current electrodes traversed north-south, which tend to obscure the detail. However, a significant change in resistivity is inferred from 50 feet to 70 feet below surface. The closer spaced data shows normal chargeabilities. However, the effectively larger spacings are subject to some electromagnetic coupling, or an abnormal decay form.

Sounding 3 - Centred at 00/2500S, run North/South

This sounding carried out some 2500 feet grid south of 1 and 2 shows a contact at depth of about 60 feet below surface. The resistivities over the whole length of the sounding remain between 500 ohm-meters and 2000 ohm-meters, but the chargeabilities are abnormally low, being in the 1 to 3 millisecond range. The L/M ratio shows this to be a feature of rock type and not electromagnetic coupling.

CONCLUSIONS

1. The soundings indicate resistive conditions favourable for the execution of fixed source electromagnetic surveys such as Turam and Turair.

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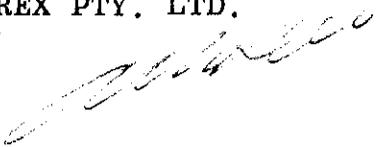
2. The soundings carried out 00/00 show surface inhomogeneity which has masked the information from depth.
3. The sounding carried out at 00/2500S indicates a significant contact at about 55 to 70 feet and shows little evidence of surface inhomogeneity.

RECOMMENDATIONS

The results on the whole are not considered diagnostic as they were not able to unambiguously locate the Jukes breccia/Mt. Read volcanics contact which is expected to be at a depth of 500 feet in this area due to local surface inhomogeneity. Therefore, this data should not influence the decision as to whether or not Turair should be carried out in this area, other than to confirm it as a suitably electrically resistive environment.

Respectfully submitted on behalf of:

SCINTREX PTY. LTD.



A.W. HOWLAND-ROSE, M.Sc., D.I.C., AMAusIMM, FGS.

GEOPHYSICIST

APPENDIX 'I.P.'

INTRODUCTION

For the benefit of those who are unfamiliar with the Induced Polarization method in general, or with the pulse-type method in particular, a few introductory remarks will be directed on the Induced Polarization, or overvoltage, phenomenon. Those who wish a fuller treatment of the subject are directed to Seigel (1962), which paper also includes an extensive list of references.

Induced Polarization in its broadest sense means a separation of charge to form an effective dipolar (polarised) distribution of electrical charges throughout a medium under the action of an applied electric field. When current is caused to pass across the interface between electrolyte and a metallic conducting body, double layers of charge are built up at the interface, in the phenomenon known to electrochemists as "overvoltage". This is the phenomenon which can be utilised for the detection of metallic conducting, rock-forming, minerals such as most sulphides, arsenides, a few oxides and, unfortunately, graphite. In addition, effective dipolar charge distribution occurs to some extent in all rocks, due to ion-sorting in the fine capillaries in which the current is passing.

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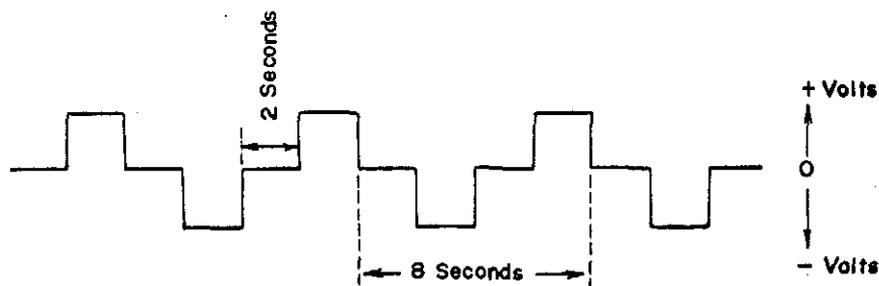
Induced Polarization responses may therefore arise from metallic or non-metallic agencies. Fortunately, the latter generally falls within fairly low and narrow limits for almost all rock types, although there is still no reliable criterion for differentiating overvoltage responses from graphite and metallic sulphides, or for distinguishing between the responses of one type of sulphide and another. Despite these limitations the Induced Polarization method has amply demonstrated its value in mineral exploration since its initial development as a useful exploration tool in 1948 (ed. Wait, 1959).

DESCRIPTION OF METHOD AND EQUIPMENT

For the present programme the pulse or time domain system was employed, using a Scintrex Induced Polarization unit. The standard current-wave form with the unit is two seconds on-time and two seconds off-time. (see Figure 1). This unit features the Newmont type self-triggered receiver which operates remote from the current transmitting equipment. Three fundamental quantities are measured with this unit - the chargeability of 'M' measurement, the 'L' measurement and the resistivity.

The receiver integrates the area under the decay curve during the time interval from 0.45 seconds to 1.1. seconds

MEASUREMENTS TAKEN



Energising frequency is a square wave having a frequency of 0.125 cps.

FIELD MEASUREMENTS MADE

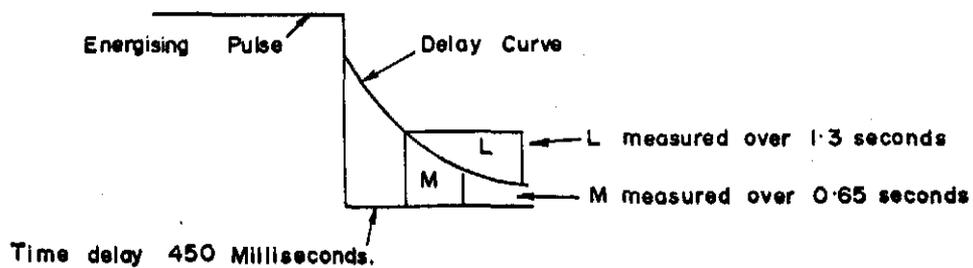


Fig. 1

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after termination of the primary current pulse. This integral normalised with respect to its corresponding primary voltage is the chargeability or 'M' measurement, that is, the fundamental Induced Polarization characteristic. It is in units of milliseconds. The Induced Polarization phenomena is dependent on the existence of electronically conducting material within the matrix of ionically conducting material. The chargeability is therefore a measure of the presence of electronically conducting material within the ground being tested.

The second quantity measured is the area over the transient decay curve between 0.45 seconds and 1.75 seconds of the current off-time. This measurement is designated the 'L' measurement and is also in units of milliseconds. The ratio L/M gives a curve factor related to the shape of the transient voltage curve, and is a measure of the rate of decay of the transient voltage. This is of secondary diagnostic value in that the rate of decay of the transient voltage is partially a function of particle size. A large L/M ratio reflects a short time constant, commonly associated with finely disseminated sulphide or graphite, whereas a small L/M ratio reflects the longer time constants associated with the larger sized metallic particles.

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The L/M ratio is also effective in determining the presence of electromagnetic coupling effects. With the Scintrex Induced Polarization unit, electromagnetic coupling effects are essentially eliminated by an 0.45 second delay-time following termination of the primary current pulse before measurement of the transient voltage commences. However, in extremely low resistivity areas coupling may occur. Under these conditions the presence of electromagnetic coupling can distort the Induced Polarization response, and it is extremely important to know when this occurs. The presence of such coupling is immediately recognizable from the L/M ratios.

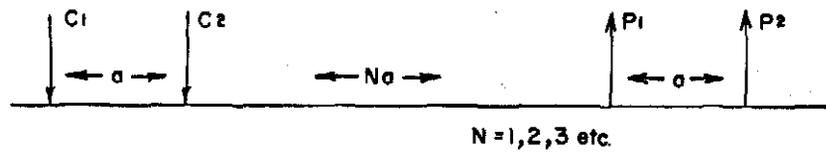
Resistivity measurements are also made as an integral part of all Induced Polarization measurement using the Scintrex Induced Polarization unit. The resistivity values are of primary importance in determining subsurface geological features such as contact zones, faulting, etc., and are of assistance in mapping the geology in general.

Electrode geometries (see Figure 2) utilised in obtaining field measurements are important and no one electrode array is applicable for all conditions. In areas where a low resistivity oxidised surface layer overlies a much higher resistivity freshrock, a high degree of

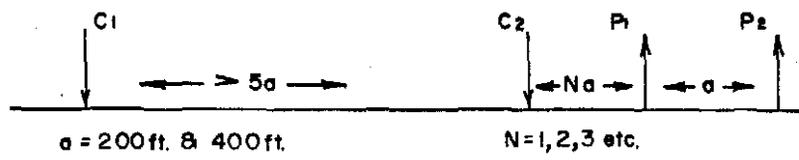
COMMONLY USED ELECTRODE ARRAYS

CLOSE - COUPLED ARRAYS

DIPOLE - DIPOLE



POLE - DIPOLE



GRADIENT ARRAY

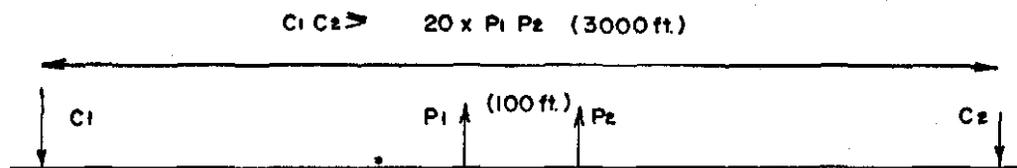


Fig. 2

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masking occurs using any of the close-coupled arrays, such as pole-dipole or dipole-dipole. An electrode spacing many times greater than the depth to freshrock must be used in order to obtain responses reasonably representative of the freshrock. With such large electrode spacings the physical properties are effectively averaged over so large a volume that we lose the ability to detect moderate sized bodies of polarizable material. However, under these conditions the gradient array is both feasible and desirable in that it minimises the effects of masking and at the same time has a high degree of resolution for small targets.

In the present areas of investigation, abnormal induced polarization responses may be expected to arise from the electronically conducting sulphide minerals such as pyrite, pyrrhotite, chalcopyrite and pentlandite, plus graphite and magnetite. The response from magnetite has been found to be quite variable and somewhat unpredictable, reflecting the great variation in the mode of electrical conduction in this material. It is not always possible to differentiate between these potential sources of high chargeability from the Induced Polarization and resistivity data alone. Complementary geophysical, geochemical and geological data enable a more complete interpretation to be made of the Induced Polarization data.

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REFERENCES

Seigel, 1962

"Induced Polarization and Its Role in Mineral Exploration" H.O. Seigel, Canadian Mining and Metallurgical Bulletin, April, 1962.

ed. Wait, 1959

"Overvoltage Research and Geophysical Applications" editor J.R. Wait, Pergamon Press, London, 1959.

SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.

GEOPHYSICAL CONSULTANTS AND CONTRACTORS

6 Tramore Place, Killarney Heights, N.S.W. 2087

Phone: 451.5367 452.2072

12th June, 1973

The Mount Lyell Mining & Railway Co. Ltd.,

QUEENSTOWN TAS. 7467.

TAS-016A

Attention: Mr. K. Reid, Mr. K. Wells

Dear Sirs,

Please find enclosed two (2) copies of my report on the electrical soundings carried out on Mt. Lyell. I look forward to discussing the results with you later this month.

I have forwarded one (1) copy of my report direct to Mr. R. Shakesby at New Consolidated Gold Fields here in Sydney.

Best personal regards,

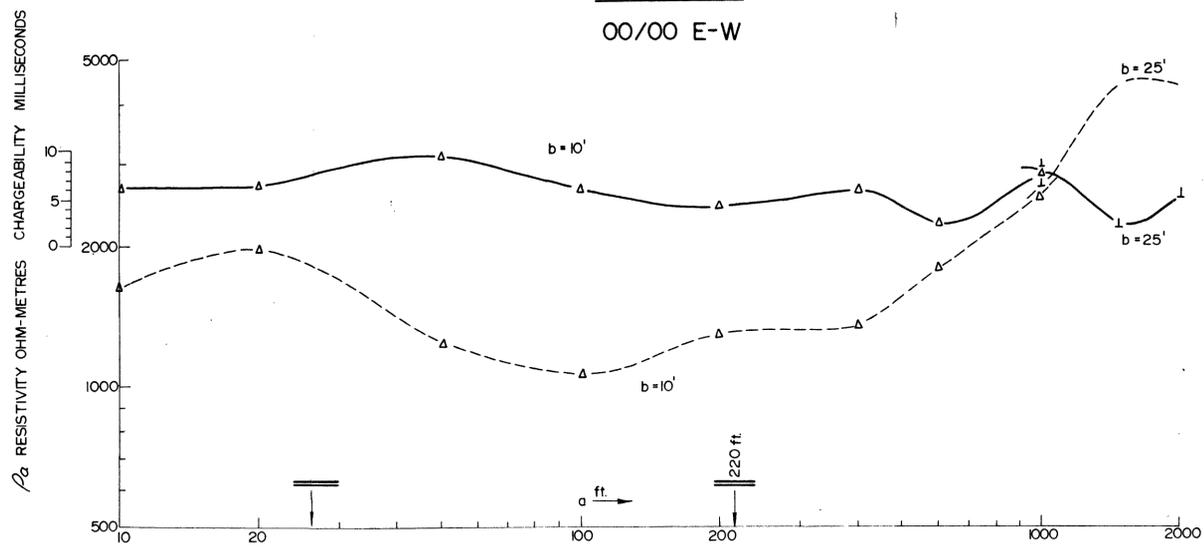
A.W. Howland-Rose
A.W. HOWLAND-ROSE
MANAGING DIRECTOR

AWHR:LK

c.c. R. Shakesby, New Cons. Gold., Sydney

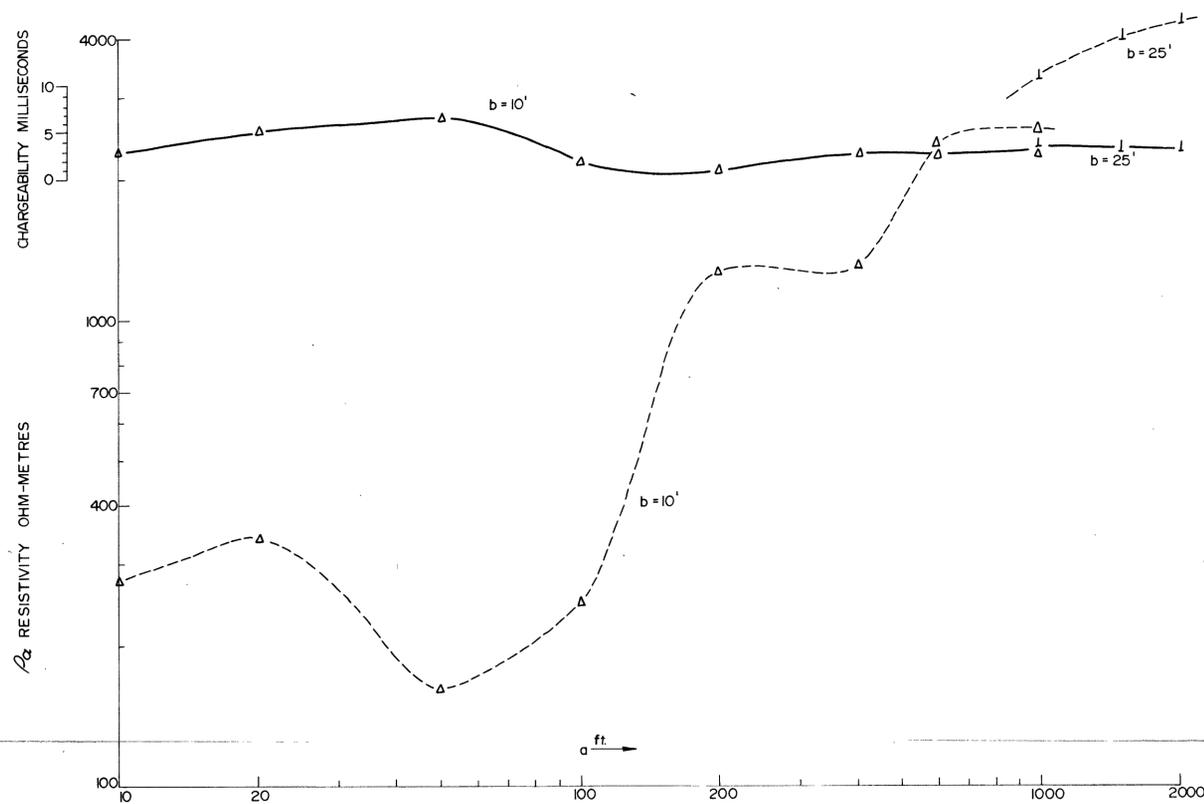
SOUNDING 1

00/00 E-W



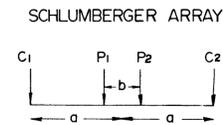
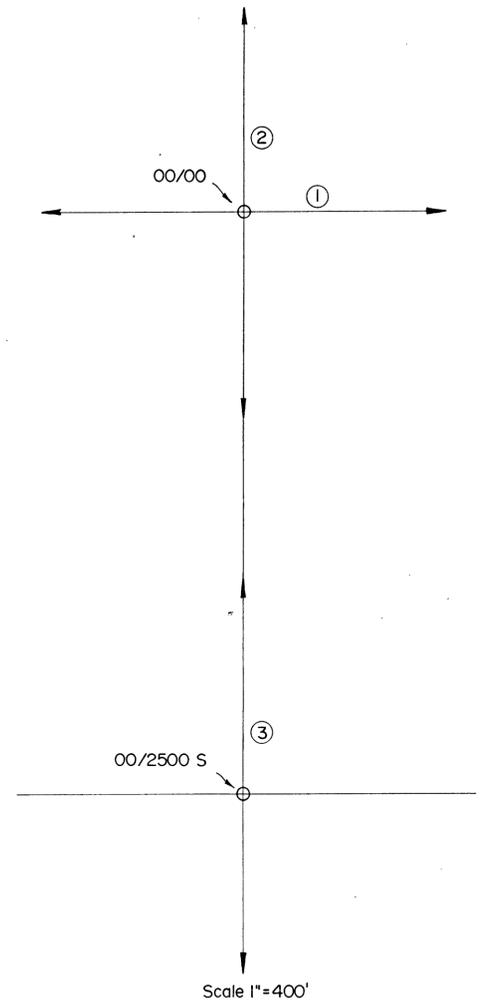
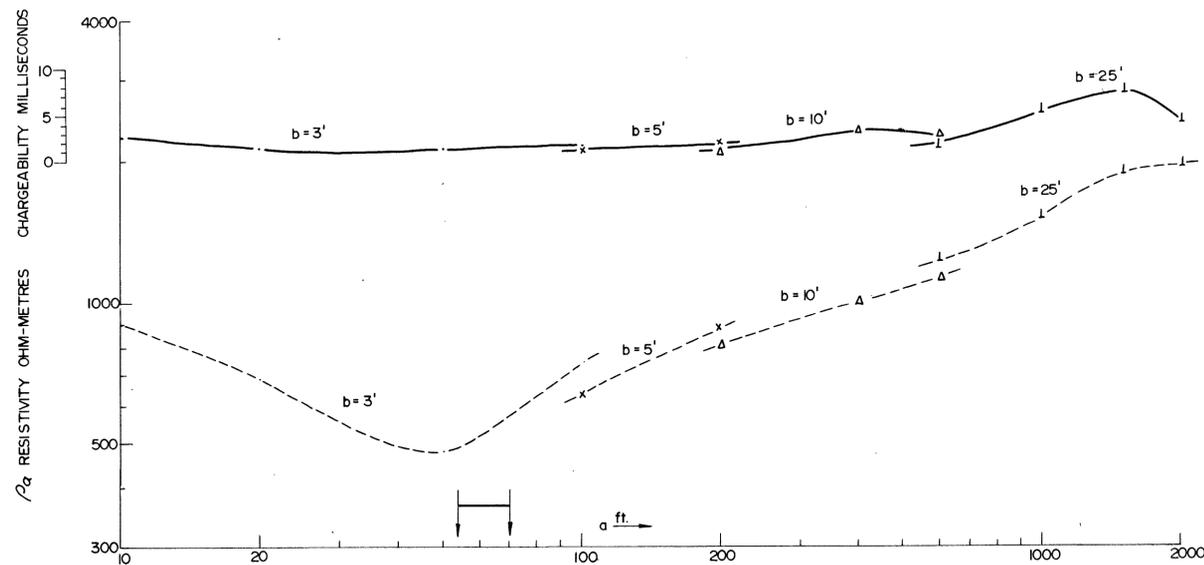
SOUNDING 2

00/00 N-S



SOUNDING 3

00/2500S N-S



THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

MT. LYELL GRID
N. W. TASMANIA

ELECTRICAL SOUNDINGS

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MARCH 1973



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