SCINTREX

A REPORT ON
EIP GRADIENT ARRAY
AND TOTAL MAGNETIC FIELD SURVEYS
OVER THE RED HILLS NORTH GRID (EL 9/66)
NEAR QUEENSTOWN, TASMANIA
ON BEHALF OF
THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

SCINTREX

PRIVATE AND CONFIDENTIAL

A REPORT ON ELECTRICAL INDUCED POLARIZATION GRADIENT ARRAY AND TOTAL MAGNETIC FIELD SURVEYS OVER THE RED HILLS NORTH GRID (EL 9/66) NEAR QUEENSTOWN, TASMANIA

ON BEHALF OF

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

BY

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GEOPHYSICIST

SYDNEY, N.S.W.

JUNE, 1978

TAS - 054A

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CONTENTS

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SCINTREX PTY. LTD.
GEOPHYSICAL CONSULTANTS AND CONTRACTORS

SUMMARY

A reconnaissance gradient array electrical induced polarization and total magnetic field survey over the Red Hills North grid, has shown the area to contain very few departures from the 7 ±1 milliseconds chargeability background. An analysis of the three physical properties has enabled a physical property plan to be constructed which represents the various underlying rock units.

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SCINTREX

A REPORT ON ELECTRICAL INDUCED POLARIZATION GRADIENT ARRAY AND TOTAL MAGNETIC FIELD SURVEYS OVER THE RED HILLS NORTH GRID (EL 9/66) NEAR QUEENSTOWN, TASMANIA ON BEHALF OF THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

INTRODUCTION

Scintrex Pty. Ltd. executed an electrical induced polarization gradient array reconnaissance and total magnetic field survey over the Red Hills North grid (EL 9/66), near Queenstown, Tasmania. These surveys were performed at the request of Mr. K. Reid, Chief Geologist for the Mount Lyell Mining & Railway Company Ltd., on some 13½ double and 2 single operator days between 18th and 21st December, 1977, and 4th and 16th January, 1978. The crew was under the immediate supervision of Scintrex operator Mr. R. Sims, and was under the geological direction of Mr. R. Meares, Senior Exploration Geologist for Mount Lyell Mining & Railway Company Ltd. The author provided such additional geophysical direction as was required.

The objective of these surveys was to (a) delineate zones of anomalous chargeability and, (b) to define physical property boundaries in order to assist geological mapping in the area.

EQUIPMENT

Energisation was effected using a Scintrex IPTA 3.0 kilowatt time domain induced polarization transmitter, while the resultant primary (resistivity) and secondary (induced polarization) fields were investigated using Scintrex IPR-8 and IPR-7 receivers. The data was normalised to the IPR-7 units of milliseconds (Ms) to conform with the units used on the Red Hill grid to the immediate south of the area under discussion herein.

The energising current dipoles employed were 5000 feet to 8000 feet, with the potential dipole being always 100 feet.

As the method is described in detail in previous reports, it is not repeated here.

The total magnetic field survey was carried out using a base station magnetometer read every two to three minutes with two units on line. The on-line readings were corrected for drift using the base station unit. The resultant corrected field data is considered to be accurate to ±3 gamma. The units used were Scintrex MP-2 and Geometrics 801 proton precession total field magnetometers.

DATA PRESENTATION

Profiles:- All profiles are displayed at the horizontal scale of 1 inch = 500 feet while vertical scales are as follows:

Chargeability   1 inch = 10 milliseconds

Resistivity   5 inches = 1 logarithmic cycle

and on separate sheets,

Total magnetic field 1 inch = 100 gamma

Contour Interpretations:- The three properties of apparent resistivity, chargeability and total magnetic field have been presented in contour form. The scales used were 1:6000 in all three cases.

A compilation of the major features of all three parameters is presented on Plate 4.

DISCUSSION OF RESULTS

CHARGEABILITY CONTOUR INTERPRETATION - PLATE 1

The bulk of the recorded chargeability data lies in the range 5 to 9 milliseconds. Higher chargeabilities were recorded to 16 milliseconds against backgrounds of the order of 6 milliseconds (e.g. at 3200W on line 56N, and the eastern extremity of line 14N), but these are few and far between. The chargeability, resistivity and total magnetic field data all show very similar trends. In the west, the strike is about grid N20°W, about grid north south along the 5000W co-ordinate, grid N20°E between line 26N/3500W-4500W and line 68N/2800W-3800W. In the extreme east and south-east, the strike veers progressively to grid N30°W towards the east.

A distinctive low chargeability zone about 800 feet wide was centred at about 3600W on line 68N (open to the north), and strikes about grid N20°E to cross line 44N centred at about 3900W. Within this zone chargeabilities approach zero, while resistivities reach over 20,000 ohm-metres, but remain above 10,000 ohm-metres for the most part. These conditions, together with the quiet magnetic field conditions suggest a highly acid, silicified volcanic (or sedimentary) source. The low chargeability and magnetic field infer an extremely low mafic mineral content.

The most significant chargeability response recorded (Zone 1) was defined parallel to and some 200 to 300 feet east of the pronounced acid volcanic unit, for over 2500 feet of strike length. Both the "low" and the "high" referred to above, terminates between lines 44N and 38N.

General increases in chargeability were noted on the extreme ends of lines 68N and 62N, lines 44N and 38N, line 26N and line 14N. As these sections also show increased magnetic activity it is considered that a change in rock type is responsible for the observed chargeability increase.

APPARENT RESISTIVITY CONTOUR INTERPRETATION - PLATE 2

The majority of the stations read recorded resistivities between 2000 and 20,000 ohm-metres. The strike of these features conform to that observed for chargeability and total magnetic field also.

Overall, the western 20% of the area showed the highest resistivities of between 10,000 to 20,000 ohm-metres. As this area also shows low 5 to 8 milliseconds chargeability, the general rock type is considered to be acid perhaps silicified, and low in mafic mineral content. A series of sympathetically striking increases in magnetic field of 200 to 300 gamma were noted, however, no corresponding increase in chargeability was recorded.

An elongate wedge of high resistivities of 10,000 to 20,000 ohm-metres rocks was noted on 50N at 2550W ±100 feet, on 44N at 2550W ±250 feet, line 38N at 2800W ±400 feet, and on line 32N at 2500W ±250 feet. The chargeability level over the bulk of the unit is about 7 ±1 milliseconds, except in the western margin where it rises to 12 milliseconds on line 44N at 2800W. The magnetic field within this unit remains "quiet" but the eastern and western margins are marked by a series of 200 gamma rises in magnetic field.

A series of lower than average resistivities were recorded at, and east of 5000W on line 68N to 44N, which averages some 700 feet in width. Over this zone chargeabilities are very slightly higher than average being from 8 to 9 milliseconds, while the magnetic field is about 100 gamma higher than to the immediate east, and more active, particularly in the south. The underlying rocks, while still resistive at 2000 to 5000 ohm-metres plus, are less so than average. The source is still considered to be acid volcanics probably with tuffs, but less silicified and with a higher mafic mineral content than in the higher (10,000 to 20,000 ohm-metres) areas.

TOTAL MAGNETIC FIELD CONTOUR INTERPRETATION - PLATE 3

The magnetic data was acquired using a base station and any station is accurate to within ±3 gamma to any other station. The contour map, however, by virtue of the 1:6000 scale has been contoured at 100 gamma intervals only. Should greater detail be required it could be contoured to 20 gamma but a scale of 1:2500 (±) should be used.

Two relatively "quiet" zones are readily apparent. The most easterly has an arcuate trend being north in the north, to N30°W in the south. On line 68N it extends from about 1400W to 2400W and on line 20N from 200E to about 1200W. A complimentary "mirror image" zone trending grid north in the north to grid N20°E was noted between 2600W and 4300W on line 62N and between about 3000W and 4100W on line 32N. To the south the zone is dextrally displaced to the west of about 3700W on lines 26N, 20N and 14N.

To the west of the western "quiet zone" referred to above, the magnetic field is "noisy" and rises some 200 to 300 gamma above the 62,500 (±100 gamma) background over elongate narrow features whose strike direction conforms to that observed on the resistivity and chargeability. The magnetic highs themselves bear no general relationship to the resistivity and occur as often as not in relative "highs" and relative "lows". As there is no significant change in the chargeability level either, the source is considered to be disseminated magnetite.

PHYSICAL PROPERTY INTERPRETATION PLAN - PLATE 4

The major features of each of the physical properties are summarised on Plate 4. Each of the physical property units displayed will represent a unique geological unit. In the case of the Red Hills North area, the strike as ascertained from all three parameters is very similar and therefore the trends of each of the physical property units represents the strike of the underlying strata.

The area as a whole is a resistive one, with only about 5% of the rocks being less than 3000 ohm-metres. This, together with the low background chargeability of 7 ±1 milliseconds infers an acid, silicified rock sequence. Generally, the lower the chargeability and the higher the resistivity, the more acid and less mafic the underlying sequence is. (This is true for both volcanic and sedimentary rock suites).

There is very little evidence of sedimentary shales anywhere in the area surveyed, except in the vicinity of 5000W on lines 44N to 62N.

A general increase in resistivity, with major variations, is noticeable from east to west, inferring an increase in silicification in that direction.

An area of some geological interest was recorded striking about grid N20°E about the 3500W(±) co-ordinate on lines 68N to 44N. Within this zone, chargeabilities approach zero and are accompanied by high 10,000 ohm-metres. This unit is considered the most acid and mafic mineral poor unit in the area.

After examination of the three physical properties, a series of "dislocations" at a shallow angle to the traverse lines are proposed to explain sharp changes in physical properties between lines which are not considered to be due to the positions of the gradient block boundaries.

SIGNIFICANT INDUCED POLARIZATION ANOMALIES

As remarked on above, the area is characterised by extremely low chargeability background of 7 ±1 milliseconds with 90% of the readings being within 7 ±2 milliseconds. Each of the above-background responses is discussed in detail below.

ZONE 1 ..... This zone was noted on lines 50N, 56N, 62N and 68N centred at 3250W, 3150W, 3050W and 3000W, where above background responses of 8, 10, 8 and 6 milliseconds respectively were recorded. On all four lines the response is coincident with relatively high resistivities of 6000 to 10,000 ohm-metres, but occurs some 150 feet to 200 feet east of a relatively low resistivity zone (although still high in absolute terms).

The source is interpreted as being disseminated sulphides within a resistive host. The maximum depth to the source is considered to be 150 to 200 feet in all cases.

The anomaly is considered of secondary interest.

ZONE 2 ..... This zone was defined on lines 38N and 44N at 2950W and 2750W where above background responses of 5 milliseconds and 6 milliseconds respectively were recorded. In both cases the apparent resistivity is a high 10,000 ohm-metres, indicating a disseminated source. The profile form suggests a maximum depth of about 150 feet on line 38N and 100 feet on line 44N. Local increases in magnetic field of 60 gamma and 200 gamma in close proximity to these chargeability maxima, infer the source to contain magnetite and/or pyrrhotite. The former, however, could not be expected to be the sole source of the anomalism recorded.

This response is of tertiary interest only.

ZONE 3 ..... A broad chargeability response of 5 to 9 milliseconds above the 10 milliseconds background was noted between 450E and 900E on line 14N. The maximum was defined at 550E. A second single station 10 milliseconds above background response was recorded at 1150E. The apparent resistivity is in excess of 10,000 ohm-metres at 450E and 1150E, but between 550E and 1050E falls to less than 2000 ohm-metres.

A strong increase in the total magnetic field of 150 to 400 gamma was noted over this resistivity low. The interpretation of this zone is that of a *relatively* "conductive" unit of 1500 to 2000 ohm-metres having a higher chargeability background, and a significant magnetite content. The chargeability maxima of 9 milliseconds at 550E lies on the *contact* of this and the enclosing rocks, and is disseminated or electrically discontinuous in nature.

The anomaly is of secondary significance at best.

All other recorded chargeability responses are considered to be of little significance, or due to array end effects and thus require additional detail.

CONCLUSIONS

1 - The gradient array reconnaissance chargeability and resistivity data, together with the total magnetic field data, have enabled an excellent delineation of physical properties to be made, which will undoubtedly assist in the delineation of geologic units and boundaries.

2 - The resistivity, chargeability and particularly the total magnetic field data are capable of further detailed refinement. However, should this be required, a larger scale such as 1:2500 (±500) must be employed. The lack of significant chargeability responses, however, probably renders this redundant.

3 - The induced polarization data shows only minor variations from the 7 ±1 milliseconds background. The three anomalies worthy of detailed description, designated Zones 1, 2 and 3, are considered of secondary, tertiary and secondary interest at best.

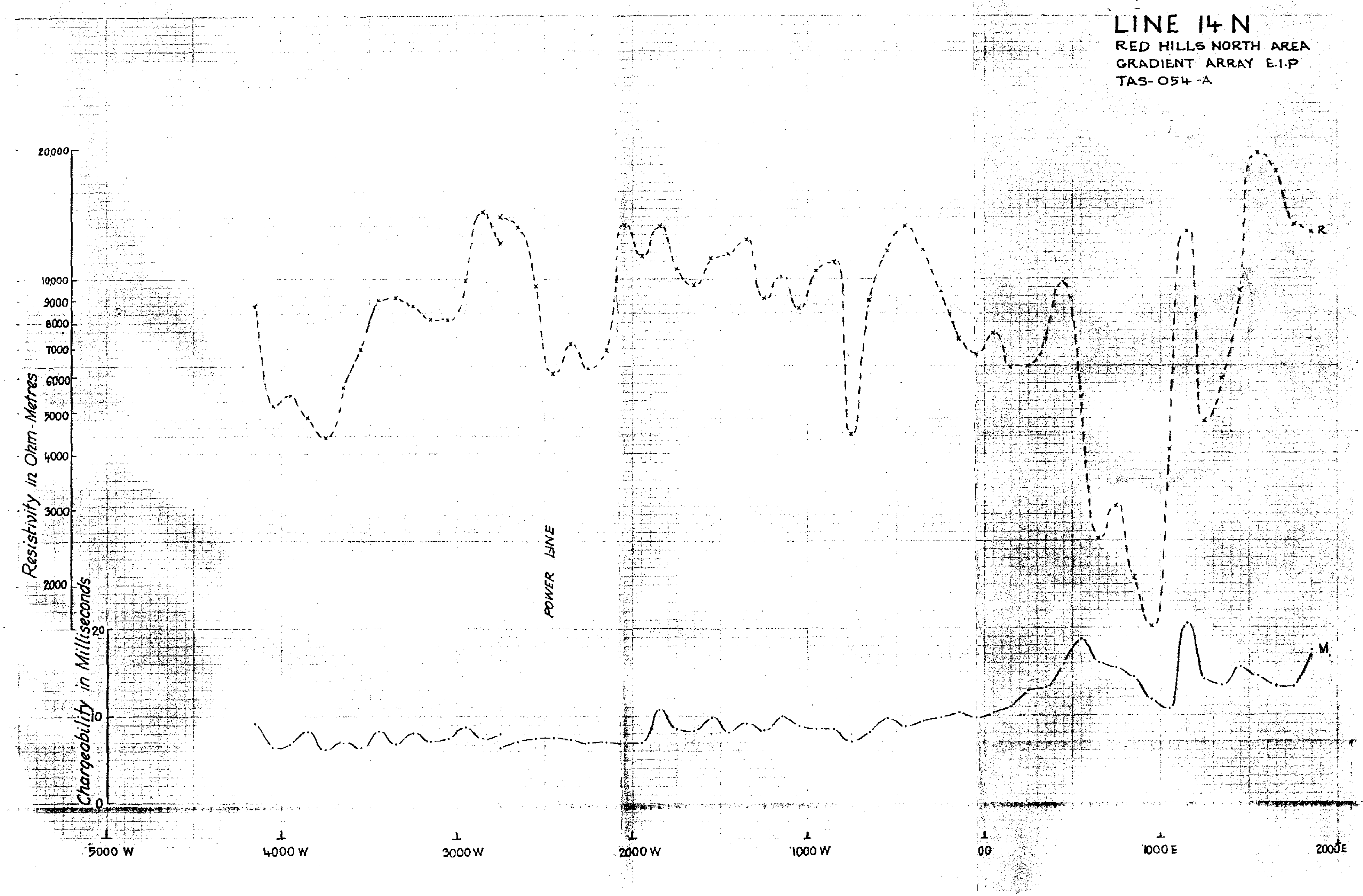
Respectfully submitted on behalf of:

SCINTREX PTY. LTD.

A.W. HOWLAND-ROSE,MSc,DIC,AMAusIMM,FGS.

GEOPHYSICIST

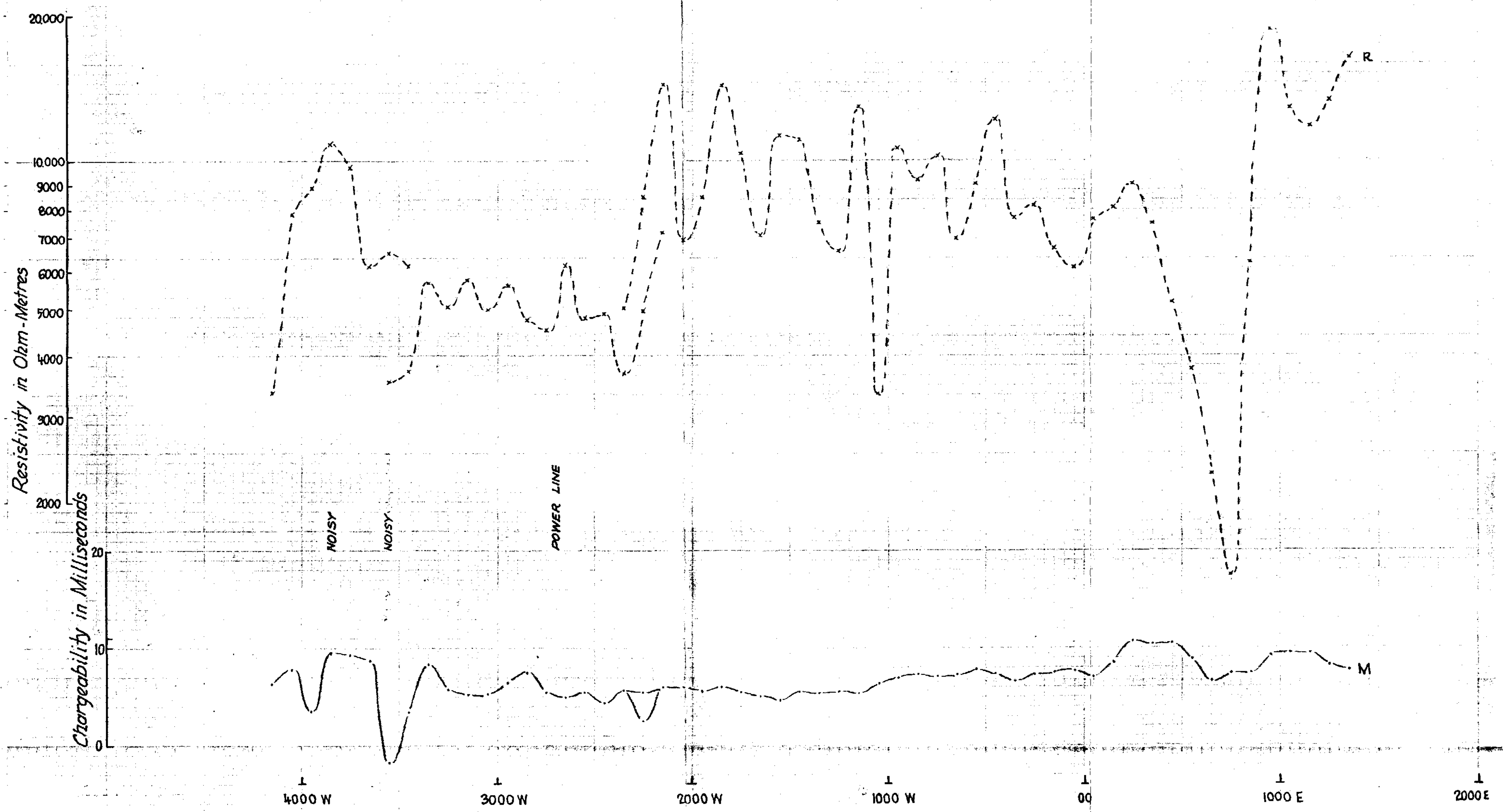
320016


LINE 14 N
RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P
TAS-054-A
Resistivity in Ohm-Metres
20,000
10,000
9000
8000
7000
6000
5000
4000
3000
2000
Chargeability in Milliseconds
20
10
0
R
M
POWER LINE
5000 W
4000 W
3000 W
2000 W
1000 W
00
1000 E
2000 E

320017

LINE 20N

RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P.
TAS-054-A



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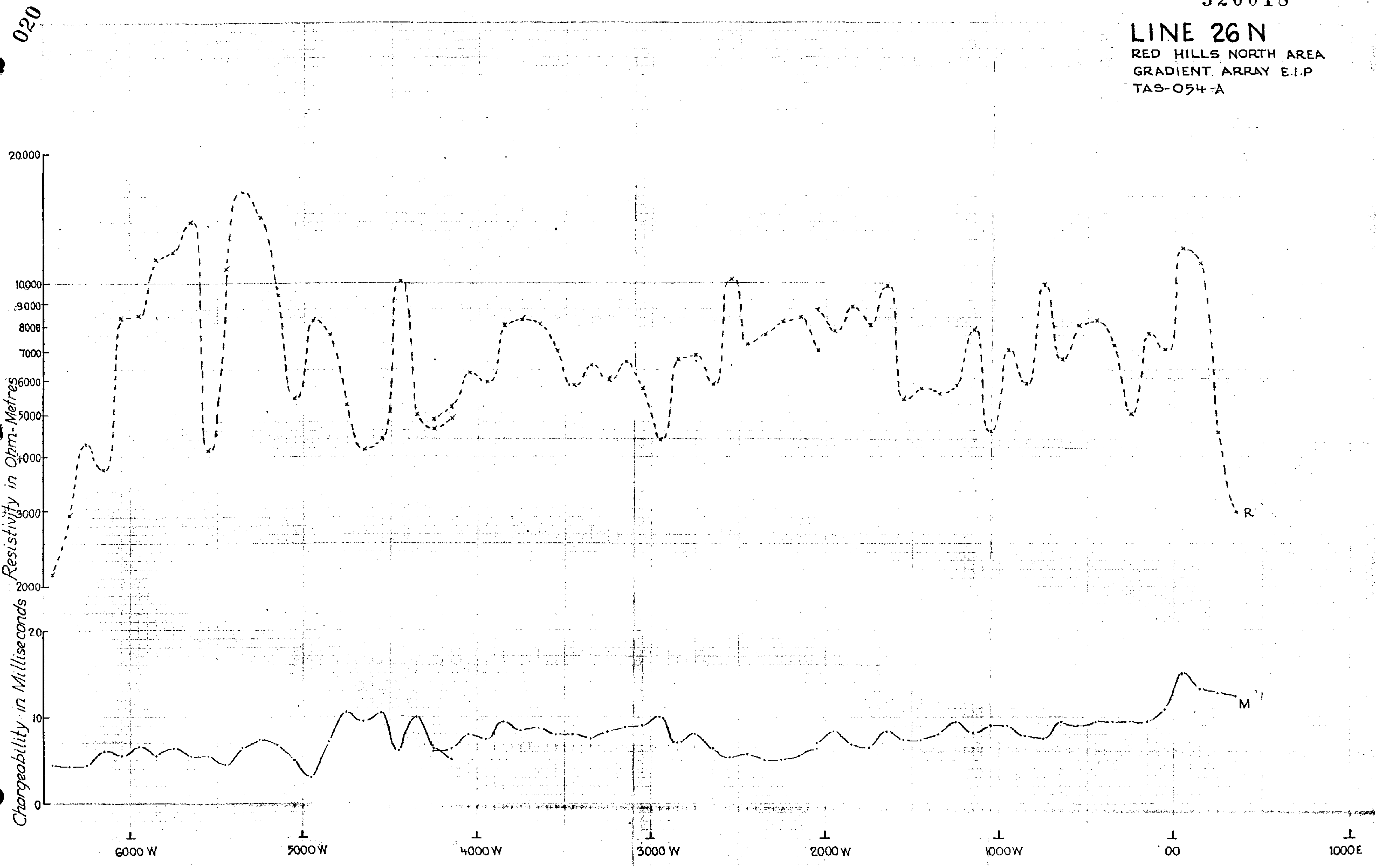

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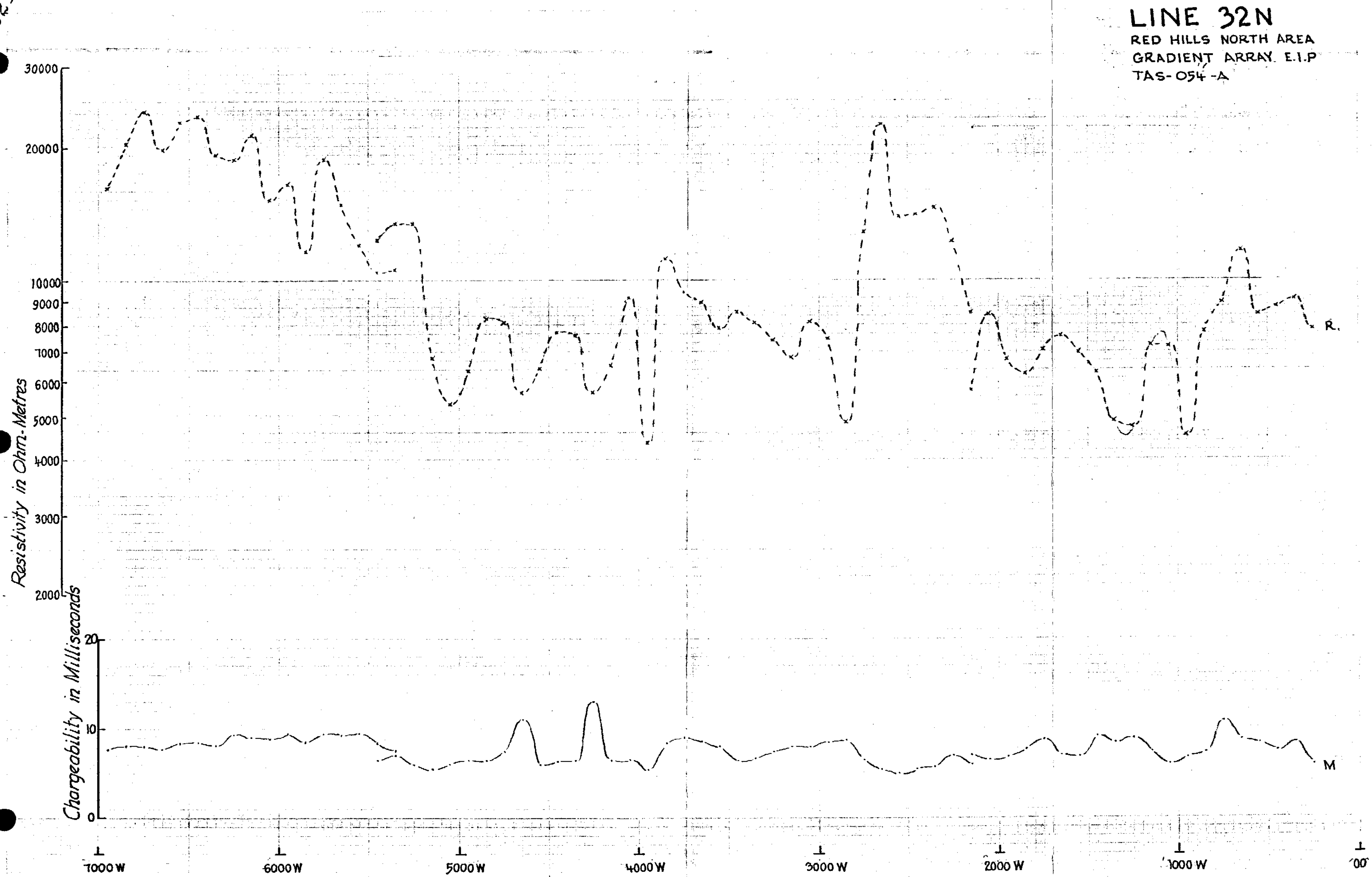
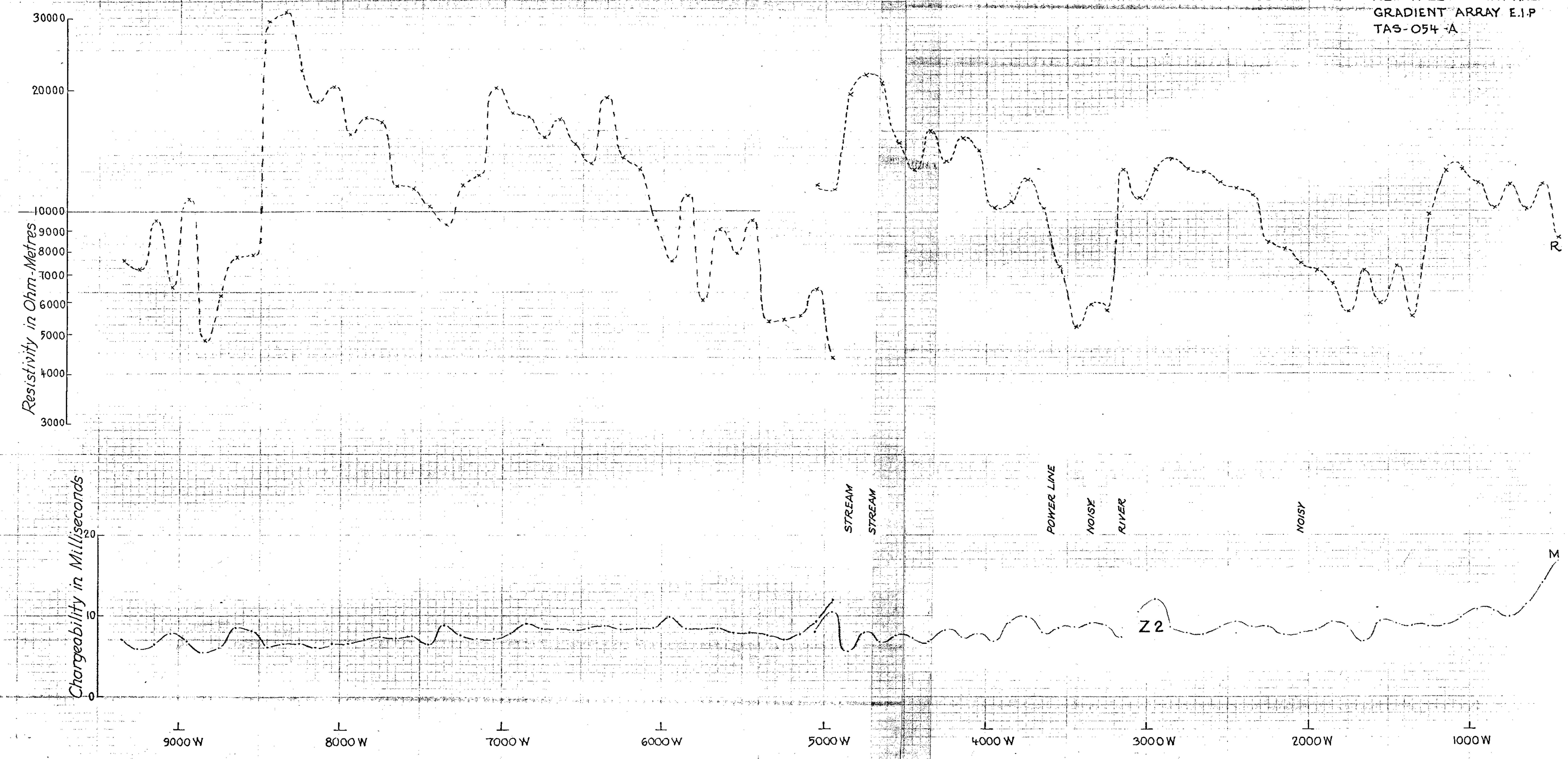

LINE 32N
RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P
TAS-054-A
Resistivity in Ohm-Metres
30000
20000
10000
9000
8000
7000
6000
5000
4000
3000
2000
R.
Chargeability in Milliseconds
20
10
0
M
7000 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W
00

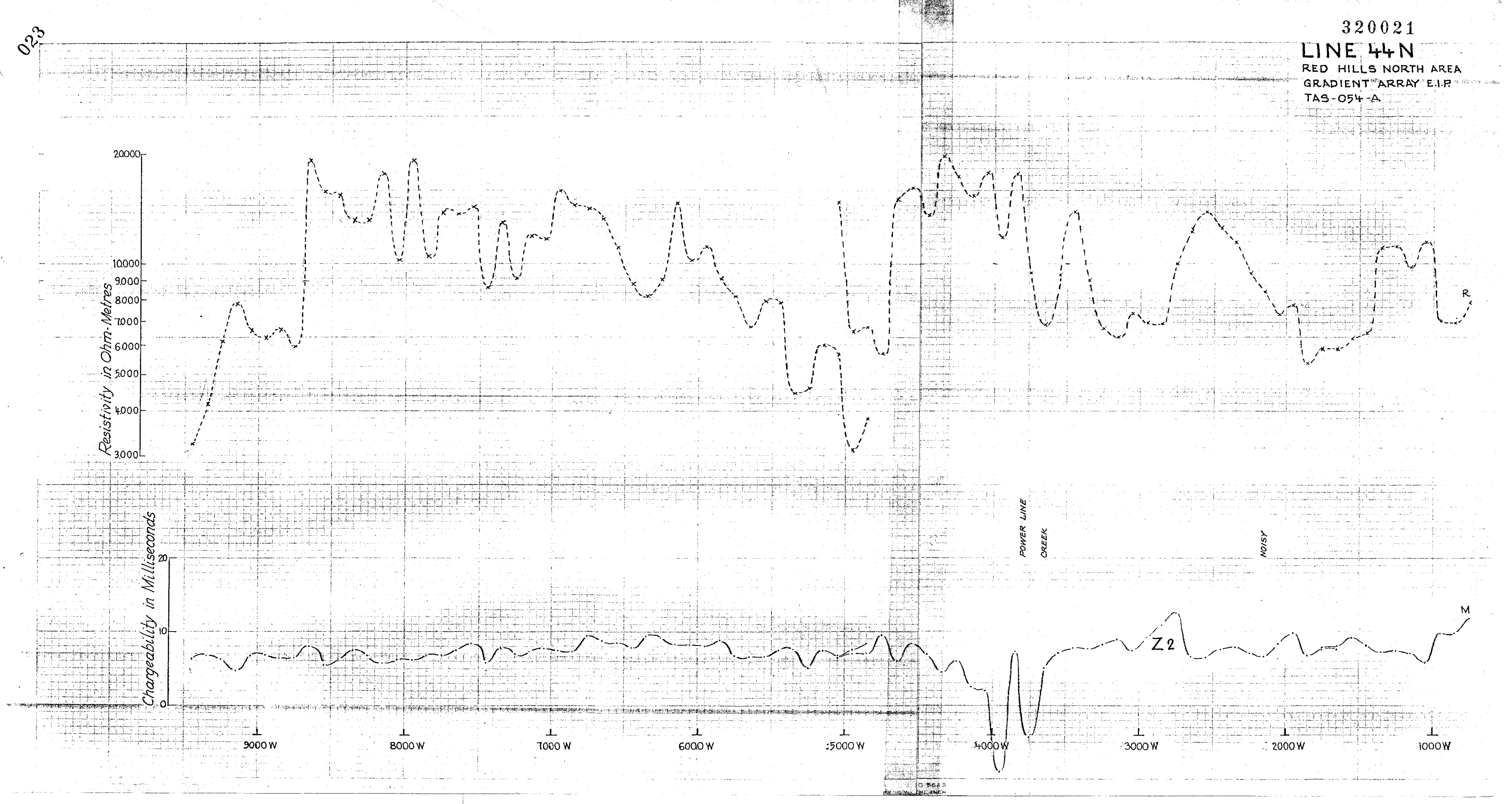
022

320020

LINE 38 N

RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P
TAS-054-A

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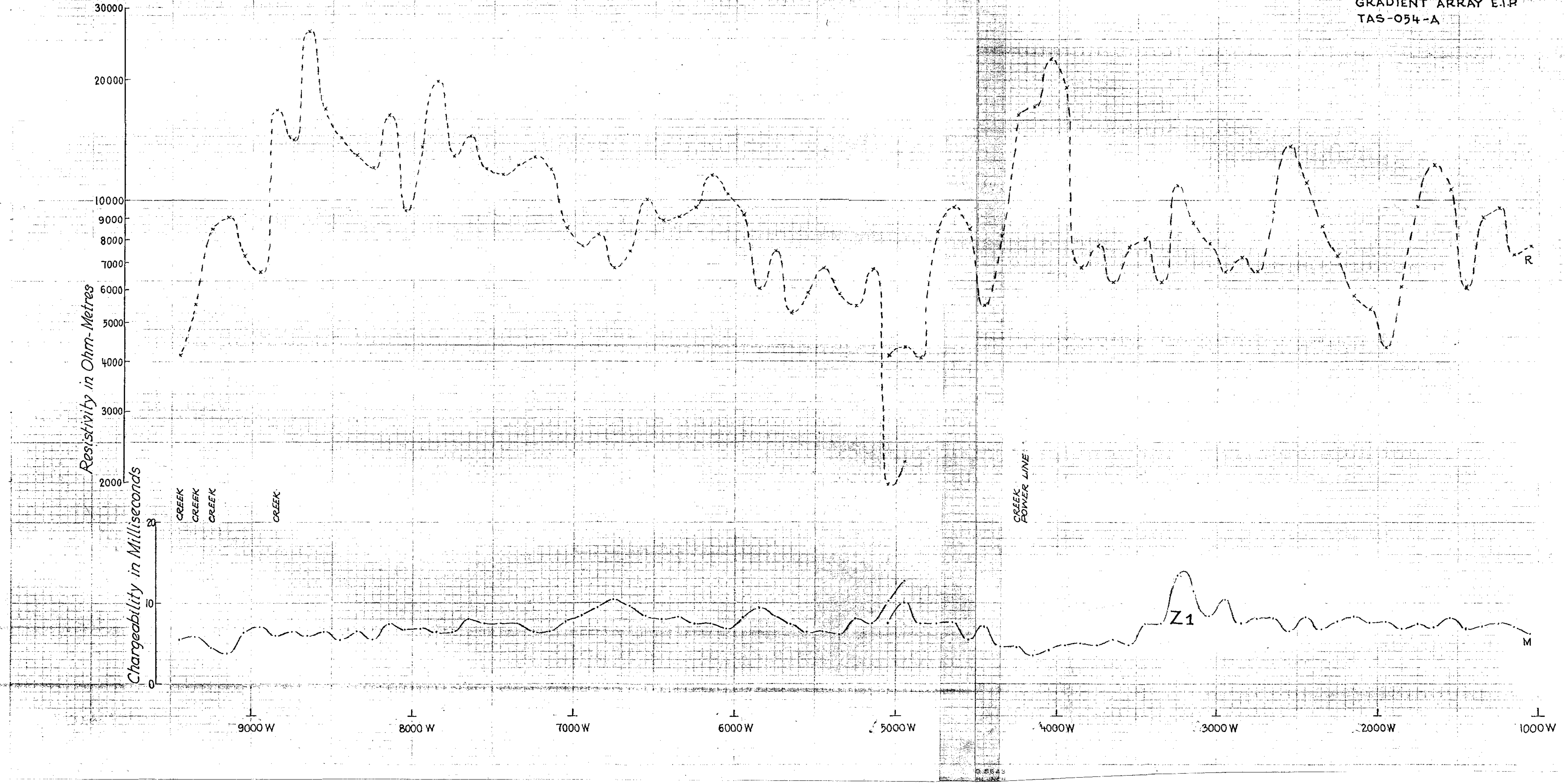
RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P.
TAS-054-A
Resistivity in Ohm-Metres
20000
10000
9000
8000
7000
6000
5000
4000
3000
R
Chargeability in Milliseconds
20
10
0
M
Z2
POWER LINE
CREEK
NOISY
9000W
8000W
7000W
6000W
5000W
4000W
3000W
2000W
1000W

320022

LINE 50 N

RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P.
TAS-054-A



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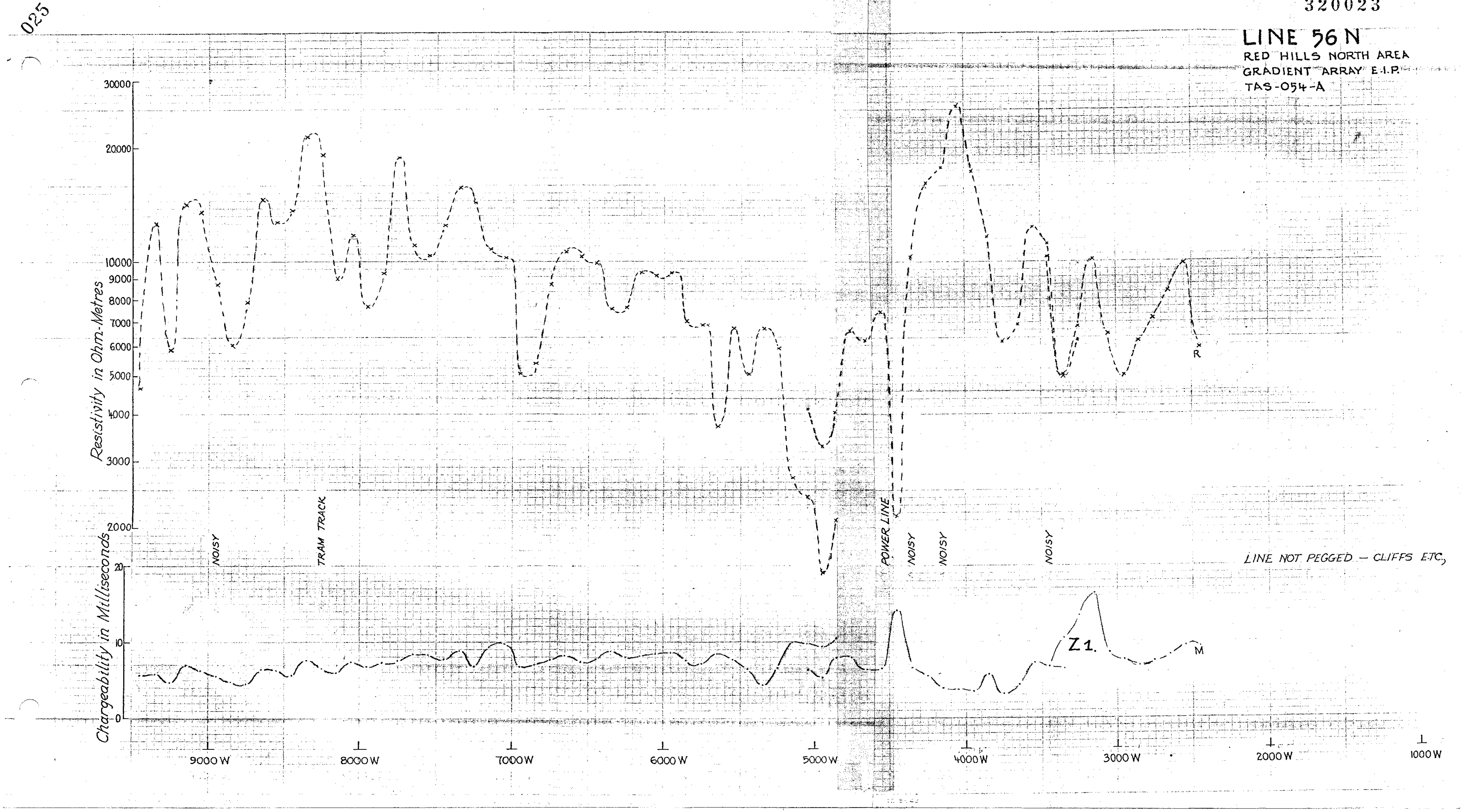
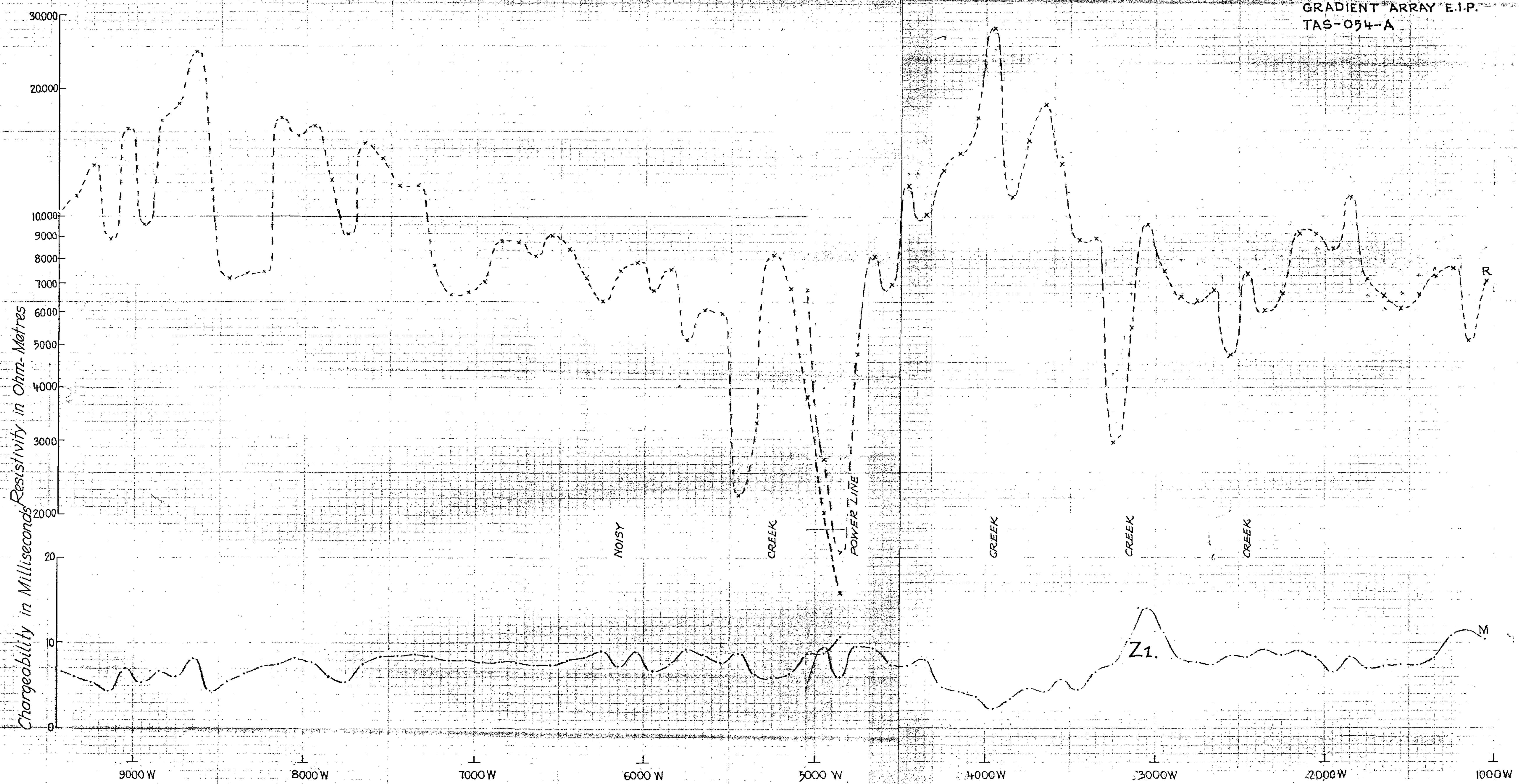

025
LINE 56 N
RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P.
TAS-054-A
Resistivity in Ohm-Metres
30000
20000
10000
9000
8000
7000
6000
5000
4000
3000
2000
Chargeability in Milliseconds
20
10
0
NOISY
TRAM TRACK
POWER LINE
NOISY
NOISY
NOISY
LINE NOT PEGGED – CLIFFS ETC,
R
Z1.
M
9000 W
8000 W
7000 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W

320024

LINE 62 N

RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P.
TAS-054-A



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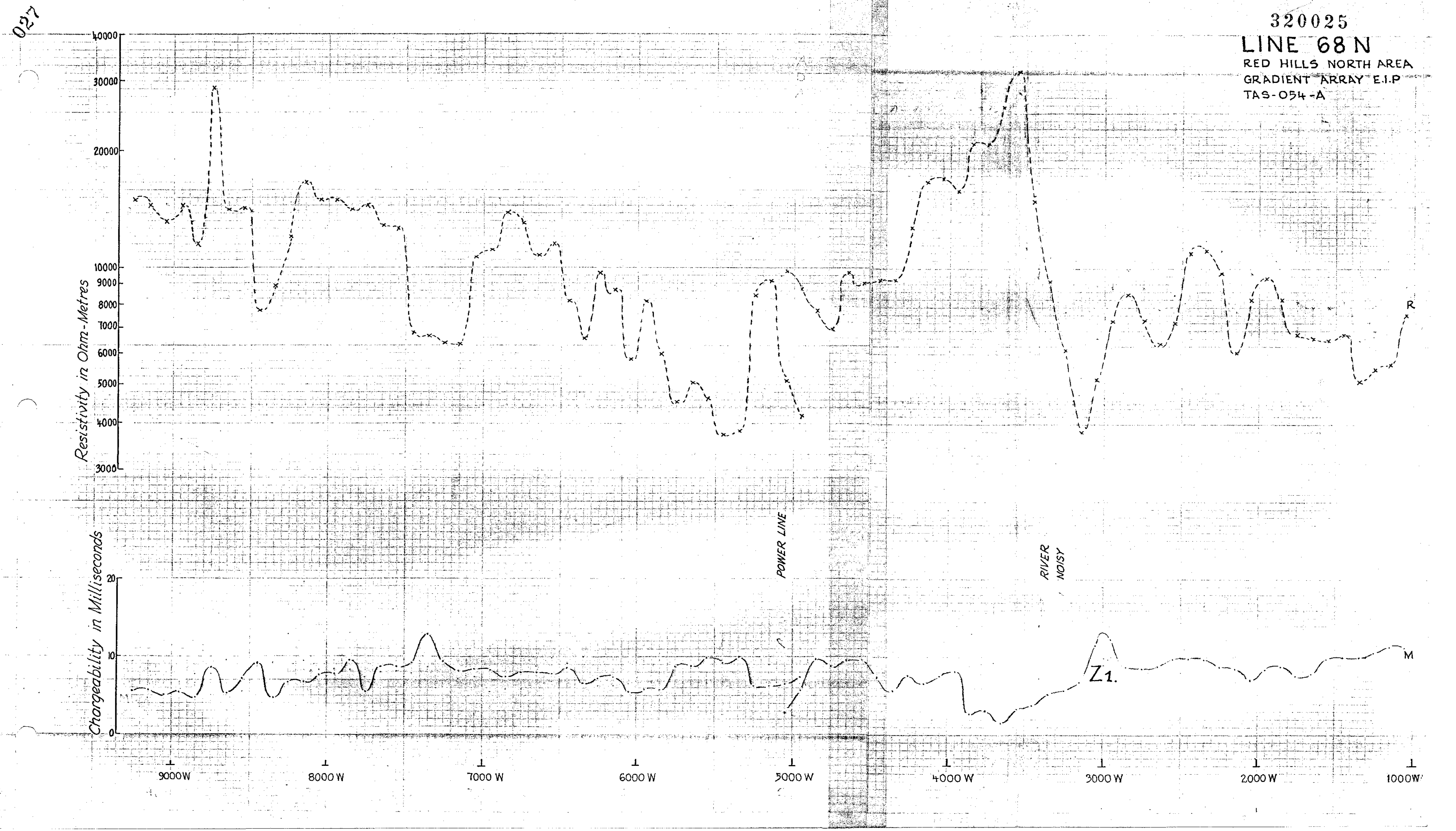

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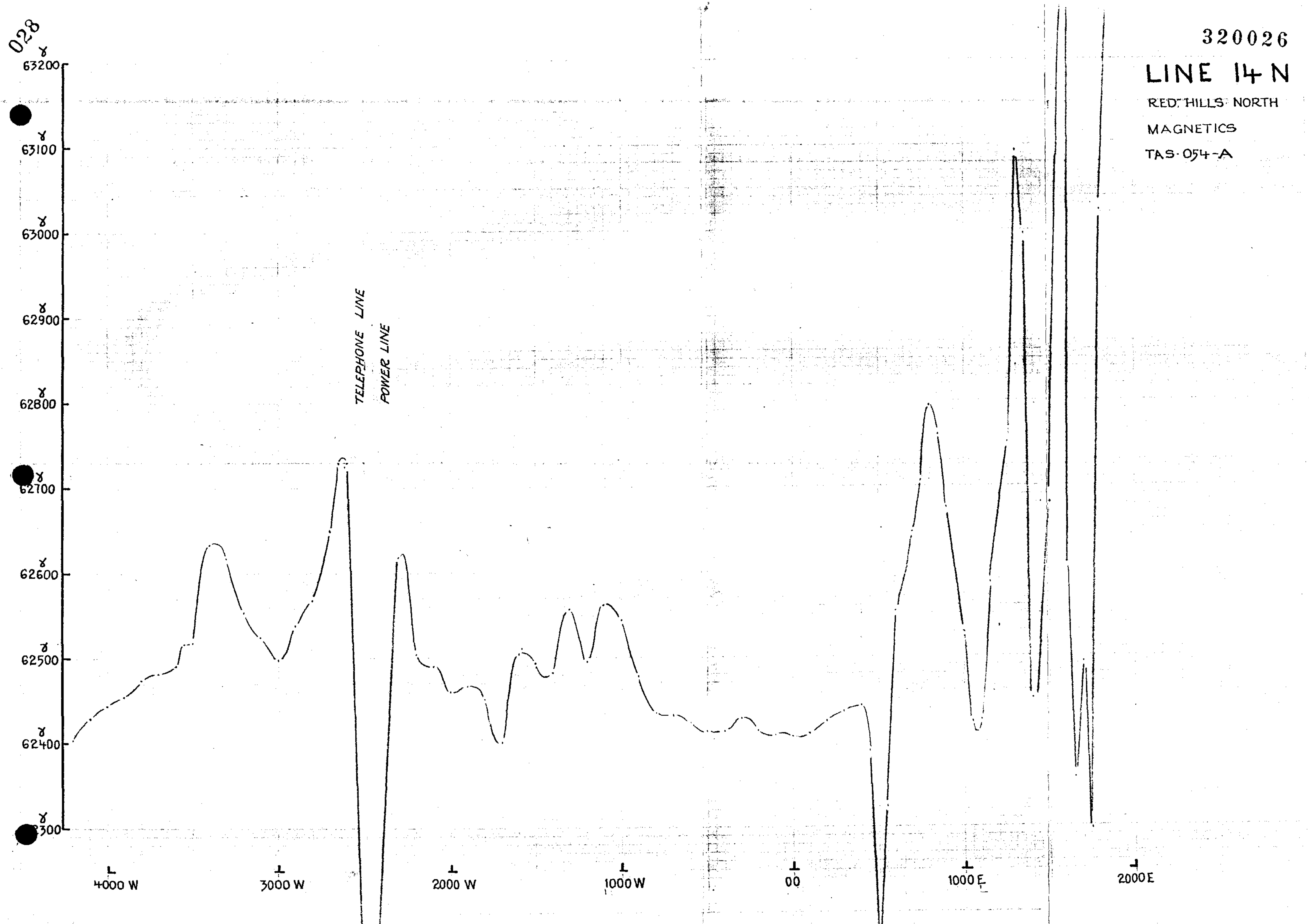
LINE 68 N
RED HILLS NORTH AREA
GRADIENT ARRAY E.I.P
TAS-054-A
Resistivity in Ohm-Metres
40000
30000
20000
10000
9000
8000
7000
6000
5000
4000
3000
R
Chargeability in Milliseconds
20
10
0
M
Z1.
POWER LINE
RIVER
NOISY
9000 W
8000 W
7000 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W



028
320026
LINE 14 N
RED HILLS NORTH
MAGNETICS
TAS-054-A
63200 γ
63100 γ
63000 γ
62900 γ
62800 γ
62700 γ
62600 γ
62500 γ
62400 γ
62300 γ
TELEPHONE LINE
POWER LINE
4000 W
3000 W
2000 W
1000 W
00
1000 E
2000 E

029

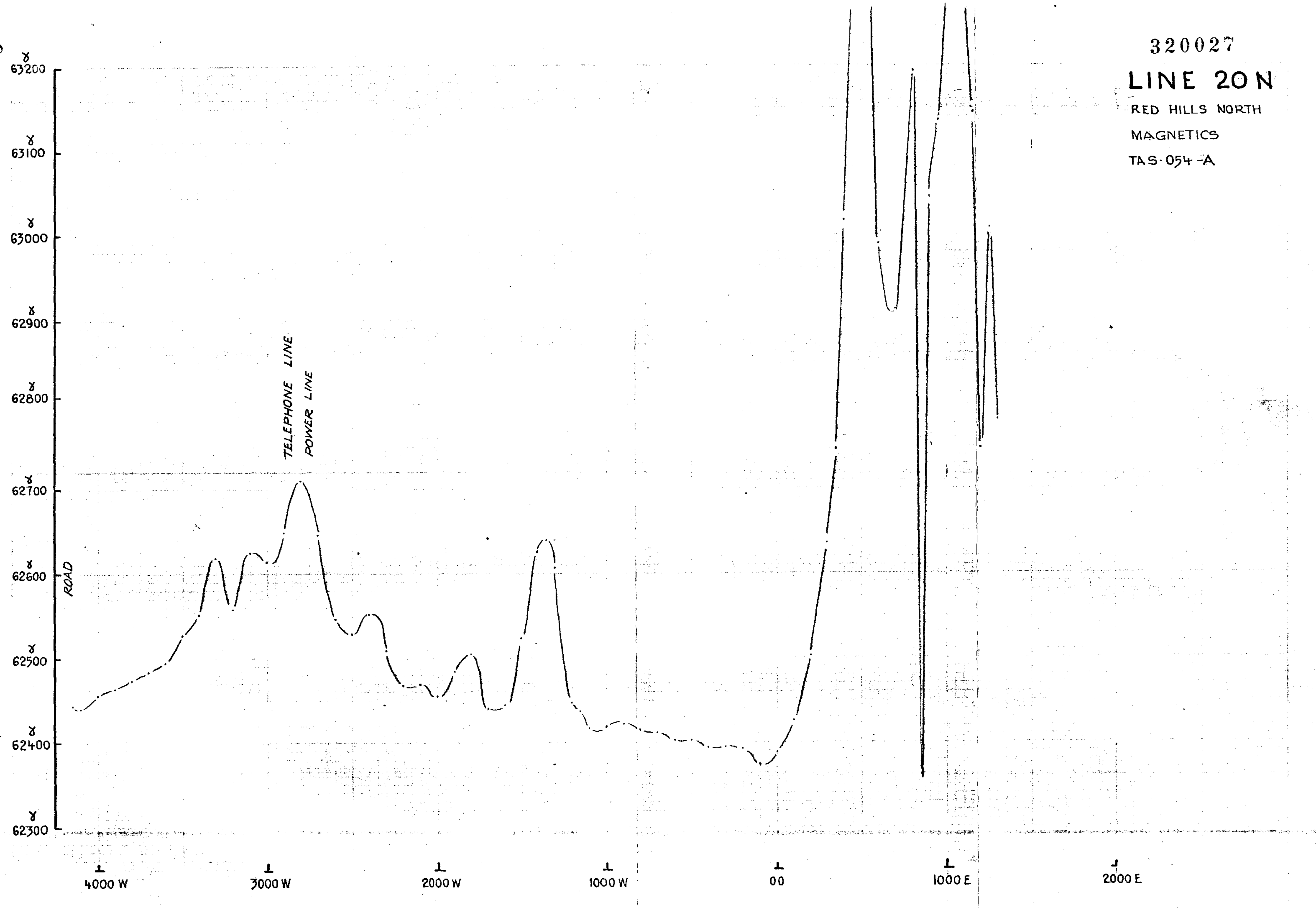
320027

LINE 20N

RED HILLS NORTH

MAGNETICS

TAS-054-A



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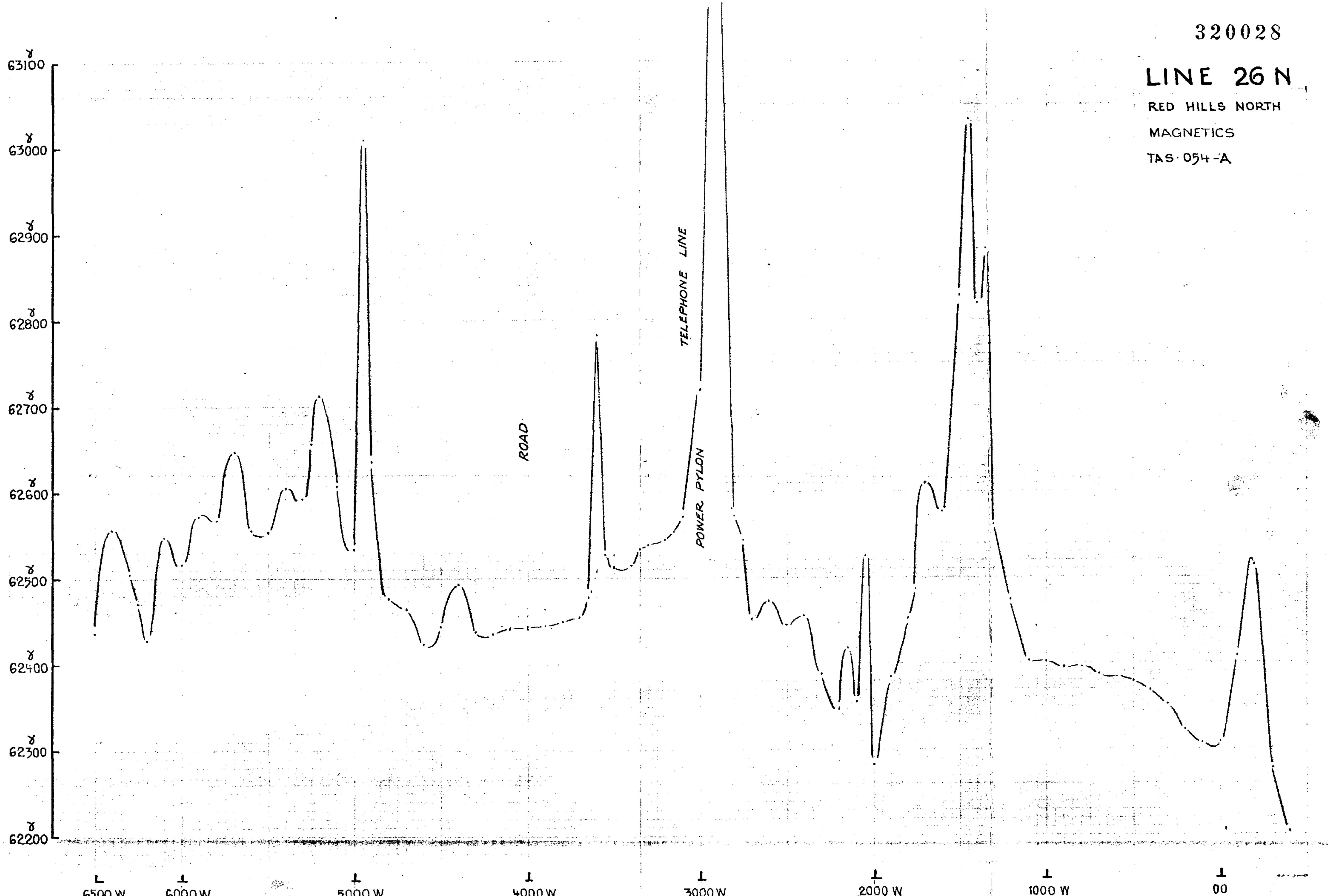
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RED HILLS NORTH
MAGNETICS
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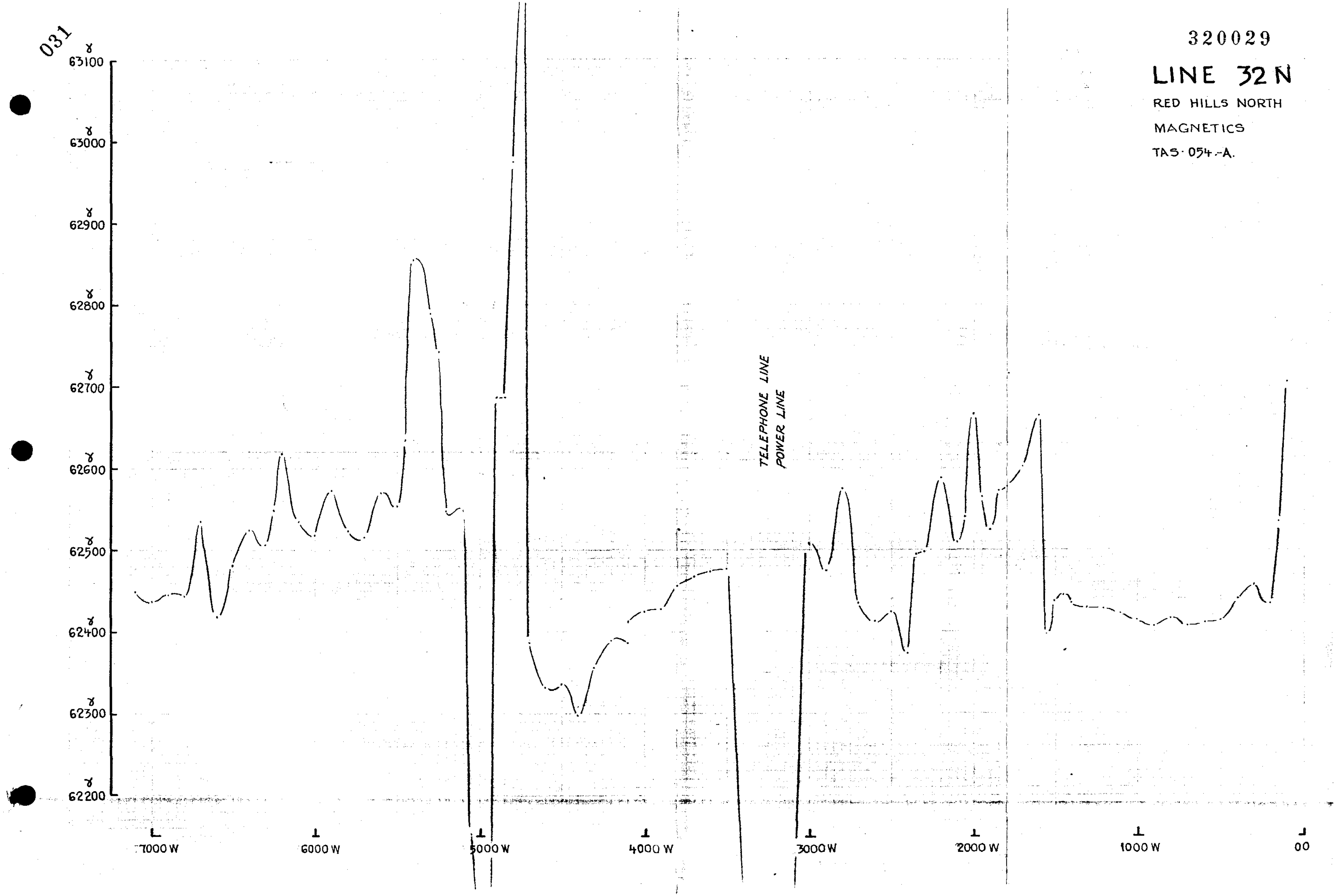
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
γ 62200
ROAD
TELEPHONE LINE
POWER PYLON
6500 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W
00



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LINE 32 N
RED HILLS NORTH
MAGNETICS
TAS·054.-A.
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
γ 62200
TELEPHONE LINE
POWER LINE
7000 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W
00

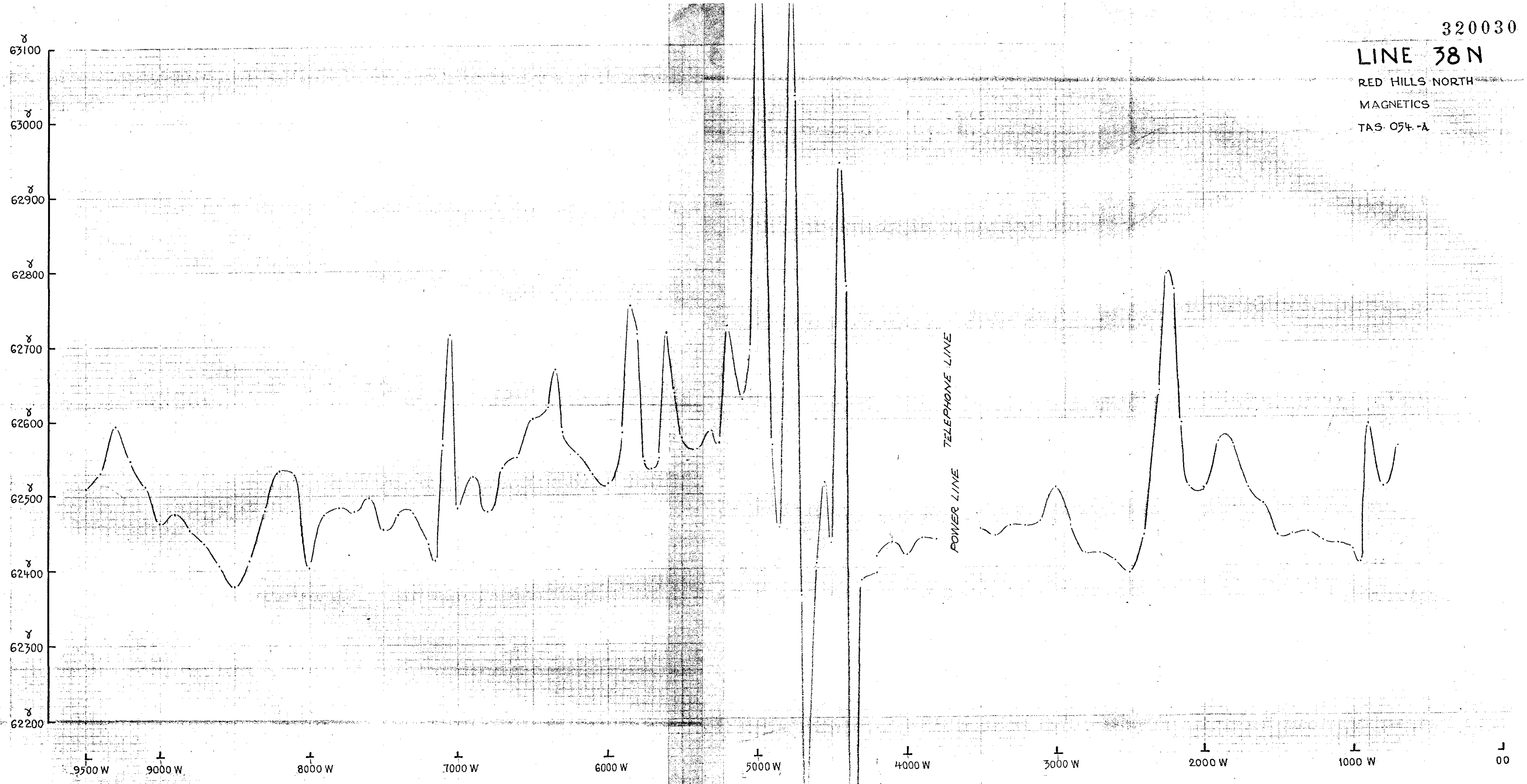
320030

LINE 38N

RED HILLS NORTH

MAGNETICS

TAS. 054.-A



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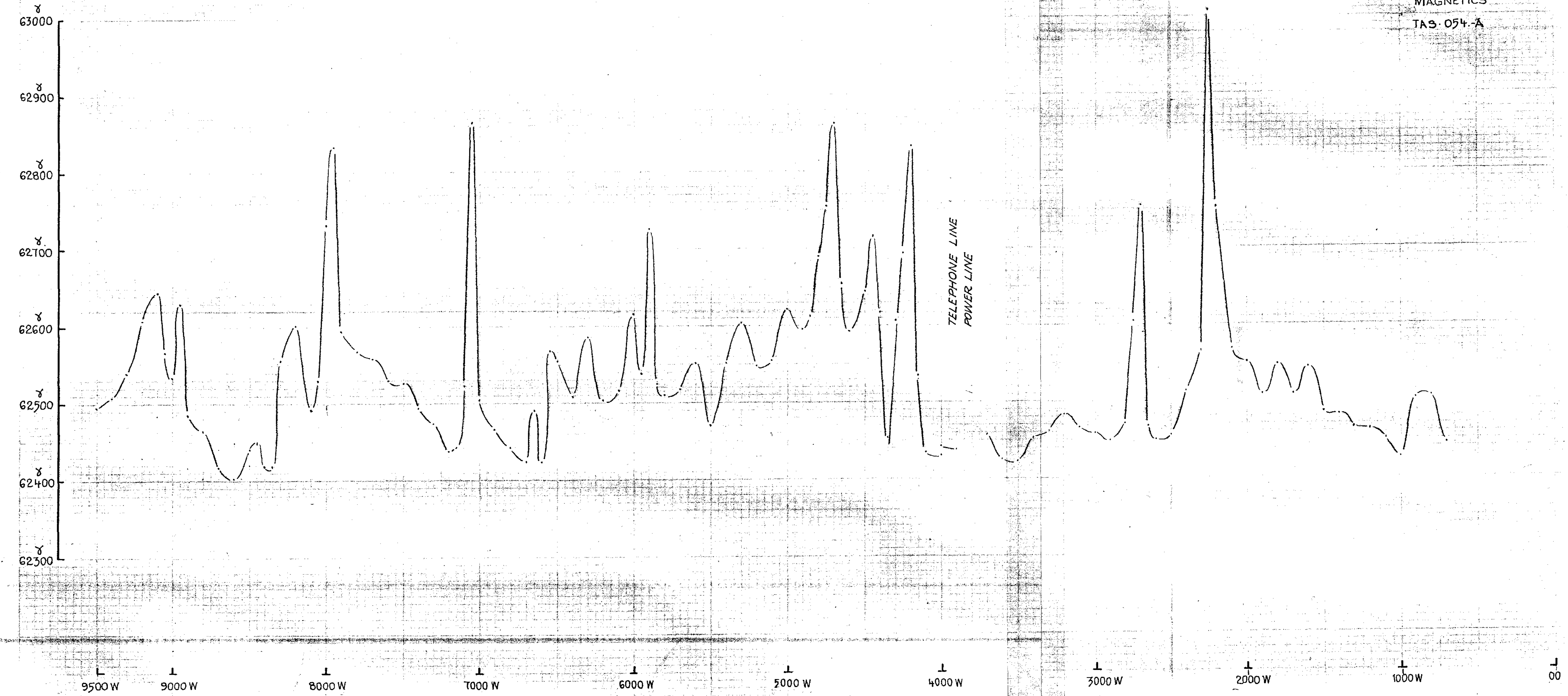
320031

LINE 44 N

RED HILLS NORTH

MAGNETICS

TAS·054-A



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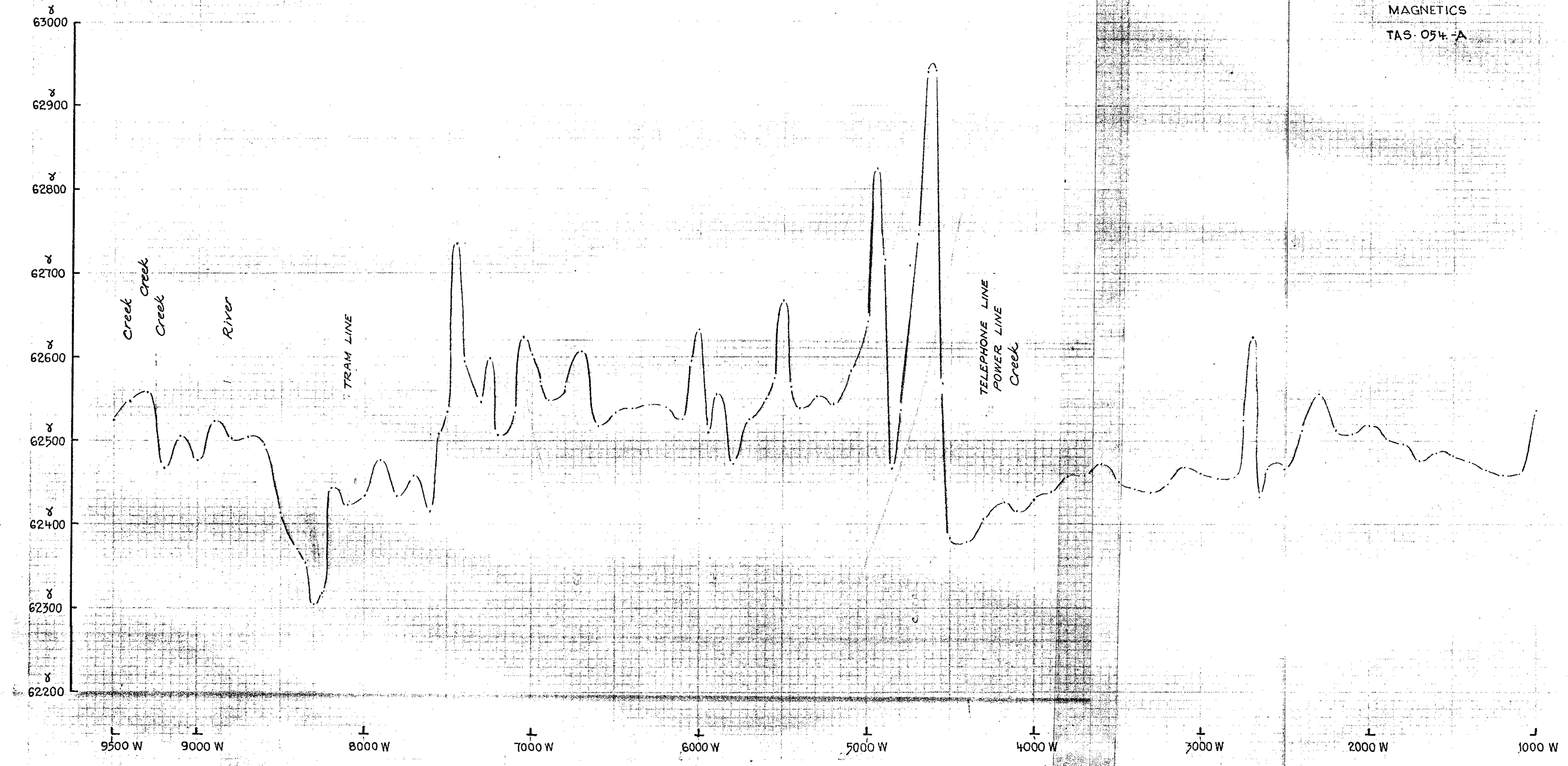
LINE 50N
RED HILLS NORTH
MAGNETICS
TAS 054-A
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
γ 62200
Creek
Creek
Creek
River
TRAM LINE
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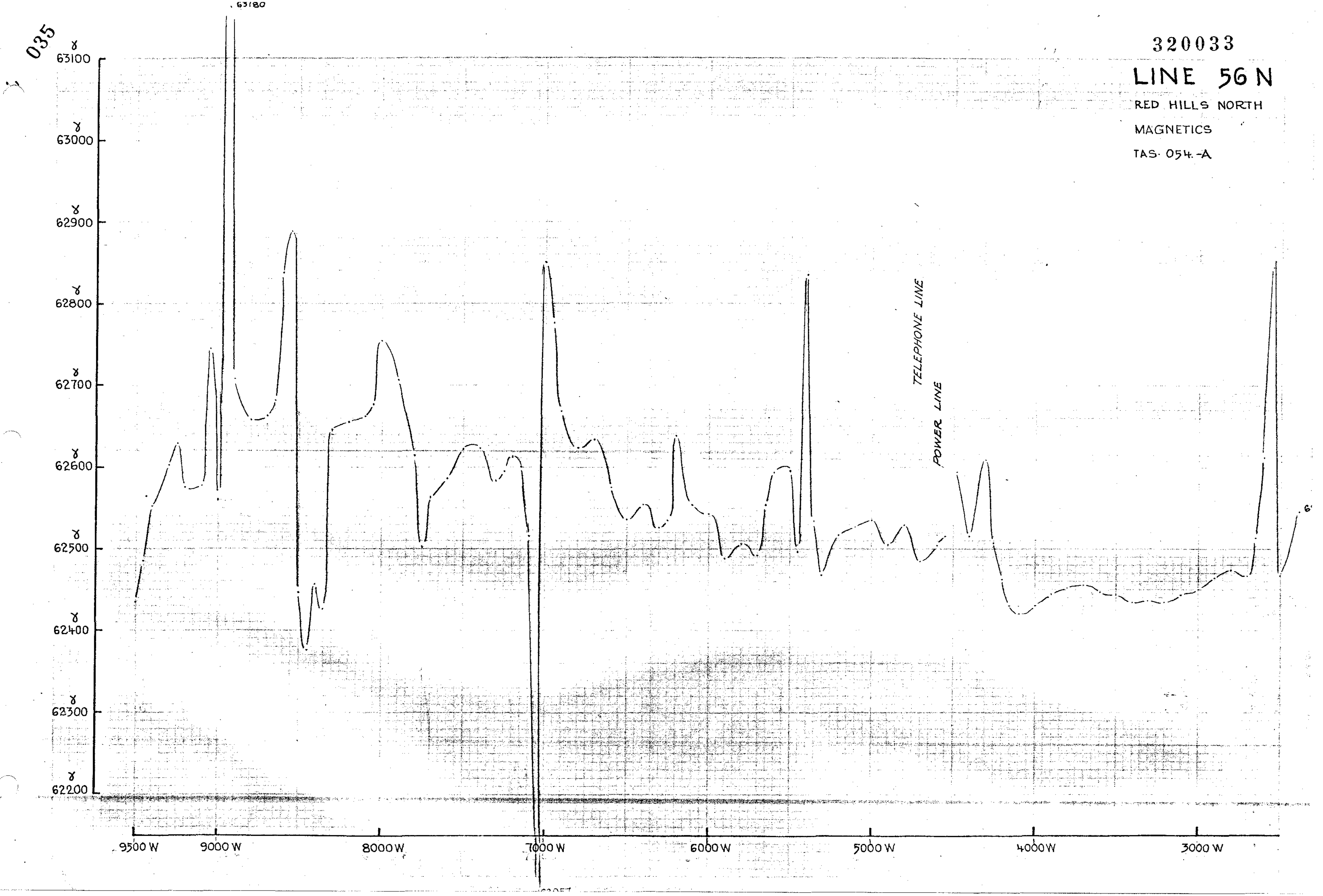
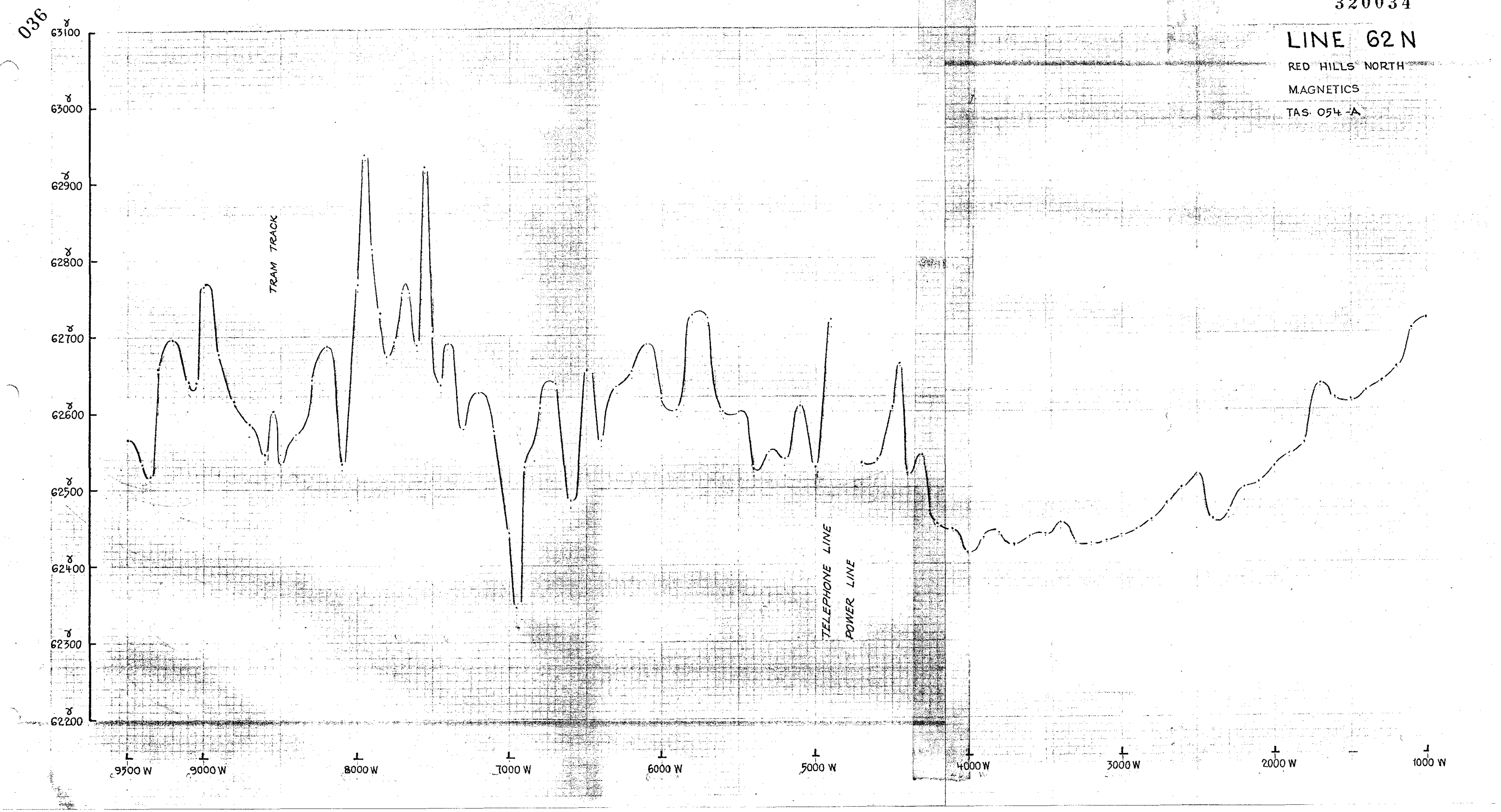
4000 W
3000 W
2000 W
1000 W

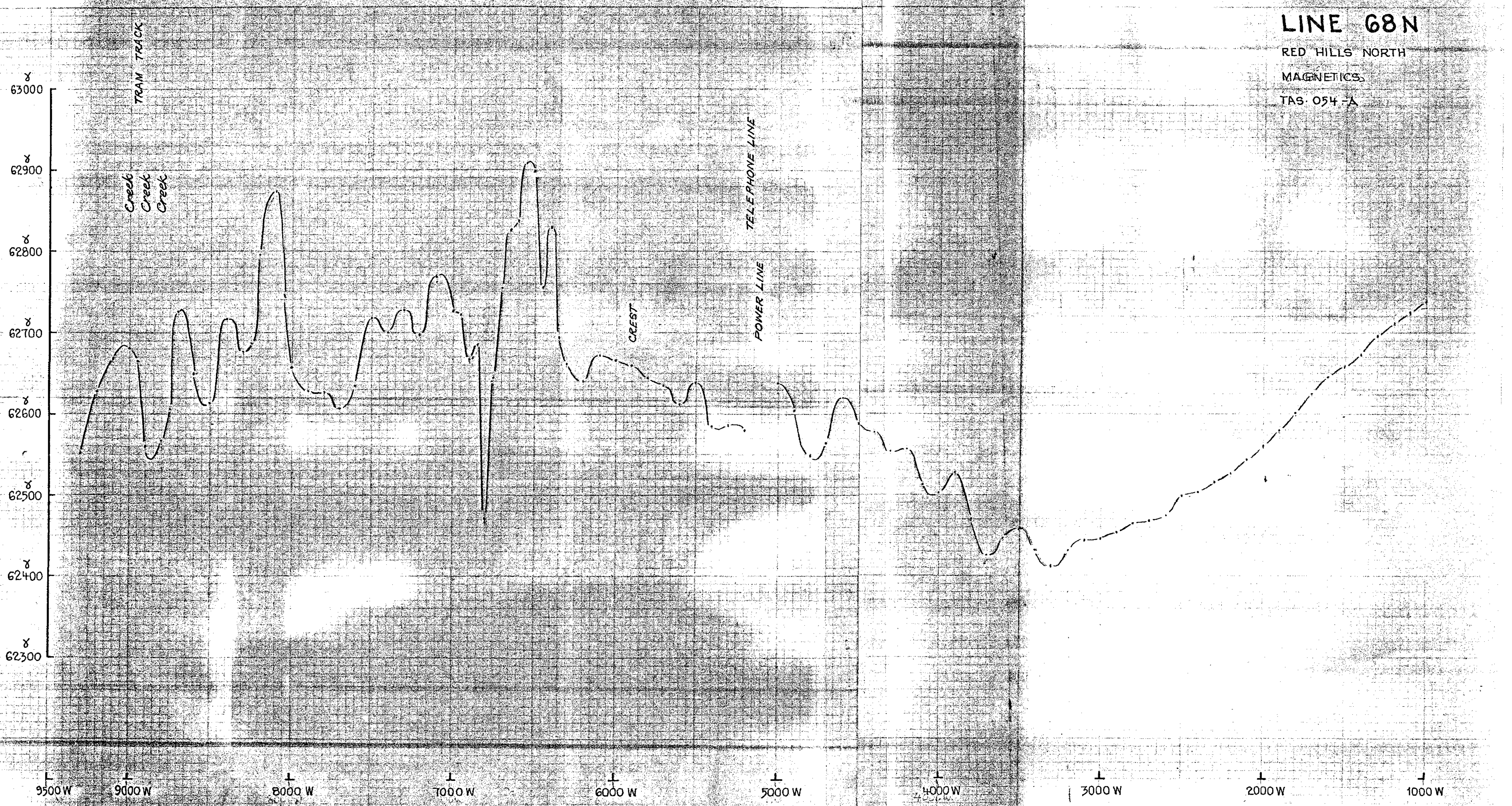


035
320033
LINE 56 N
RED HILLS NORTH
MAGNETICS
TAS. 054.-A
63180
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
γ 62200
TELEPHONE LINE
POWER LINE
9500 W
9000 W
8000 W
7000 W
6000 W
5000 W
4000 W
3000 W

320034



036
LINE 62N
RED HILLS NORTH
MAGNETICS
TAS 054 -A
63100 γ
63000 γ
62900 γ
62800 γ
62700 γ
62600 γ
62500 γ
62400 γ
62300 γ
62200 γ
TRAM TRACK
TELEPHONE LINE
POWER LINE
9500 W
9000 W
8000 W
7000 W
6000 W
5000 W
4000 W
3000 W
2000 W
1000 W


LINE 68N
RED HILLS NORTH
MAGNETICS
TAS. 054 - A
TRAM TRACK
Creek
Creek
Creek
TELEPHONE LINE
POWER LINE
CREST
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
9500 W
9000 W
8000 W
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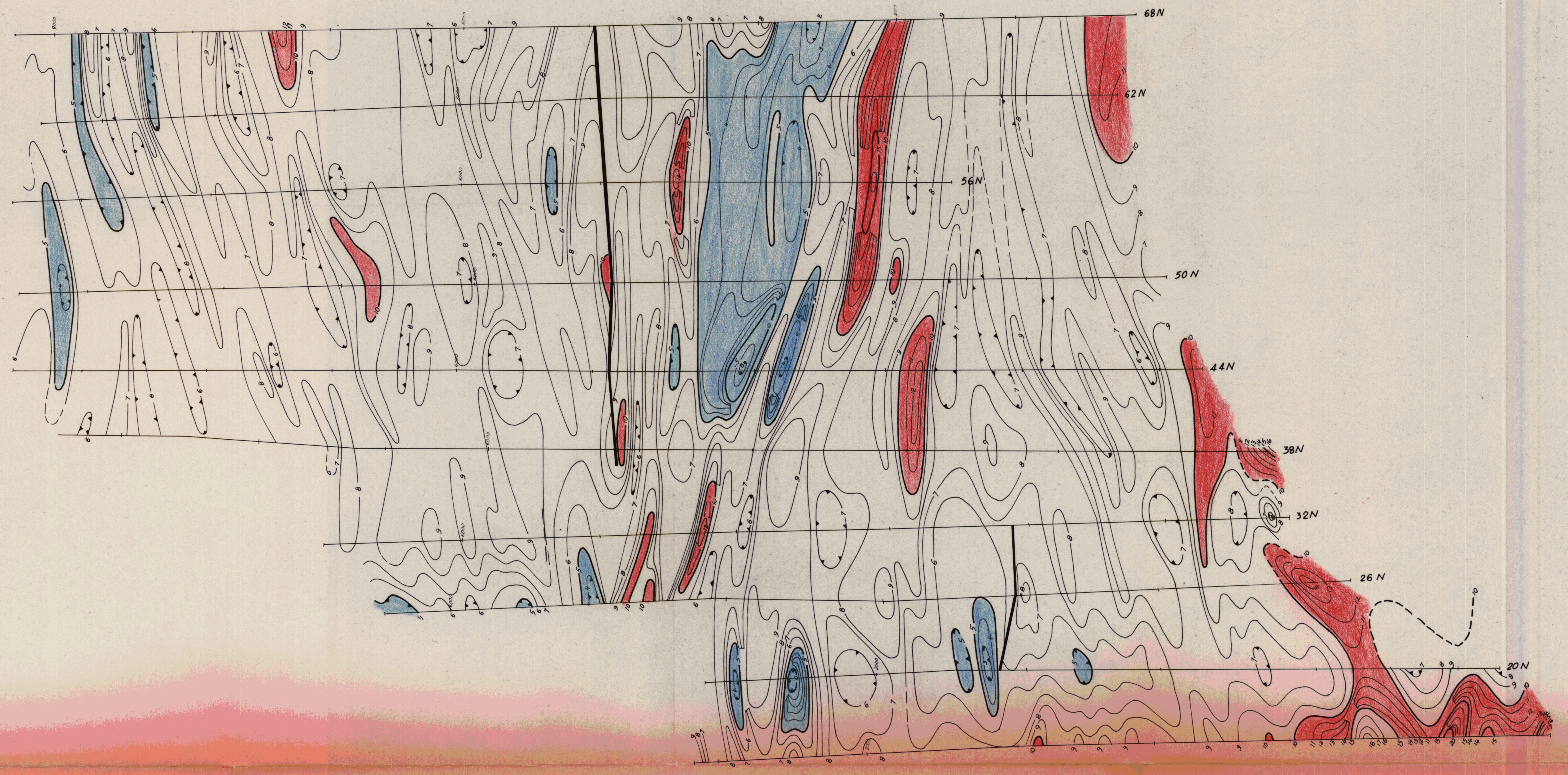
4000 W
3000 W
2000 W
1000 W



Gradient block boudary

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

RED HILLS NORTH

NEAR QUEENSTOWN - TASMANIA

GRADIENT ARRAY
ELECTRICAL INDUCED POLARIZATION

5 cm

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX

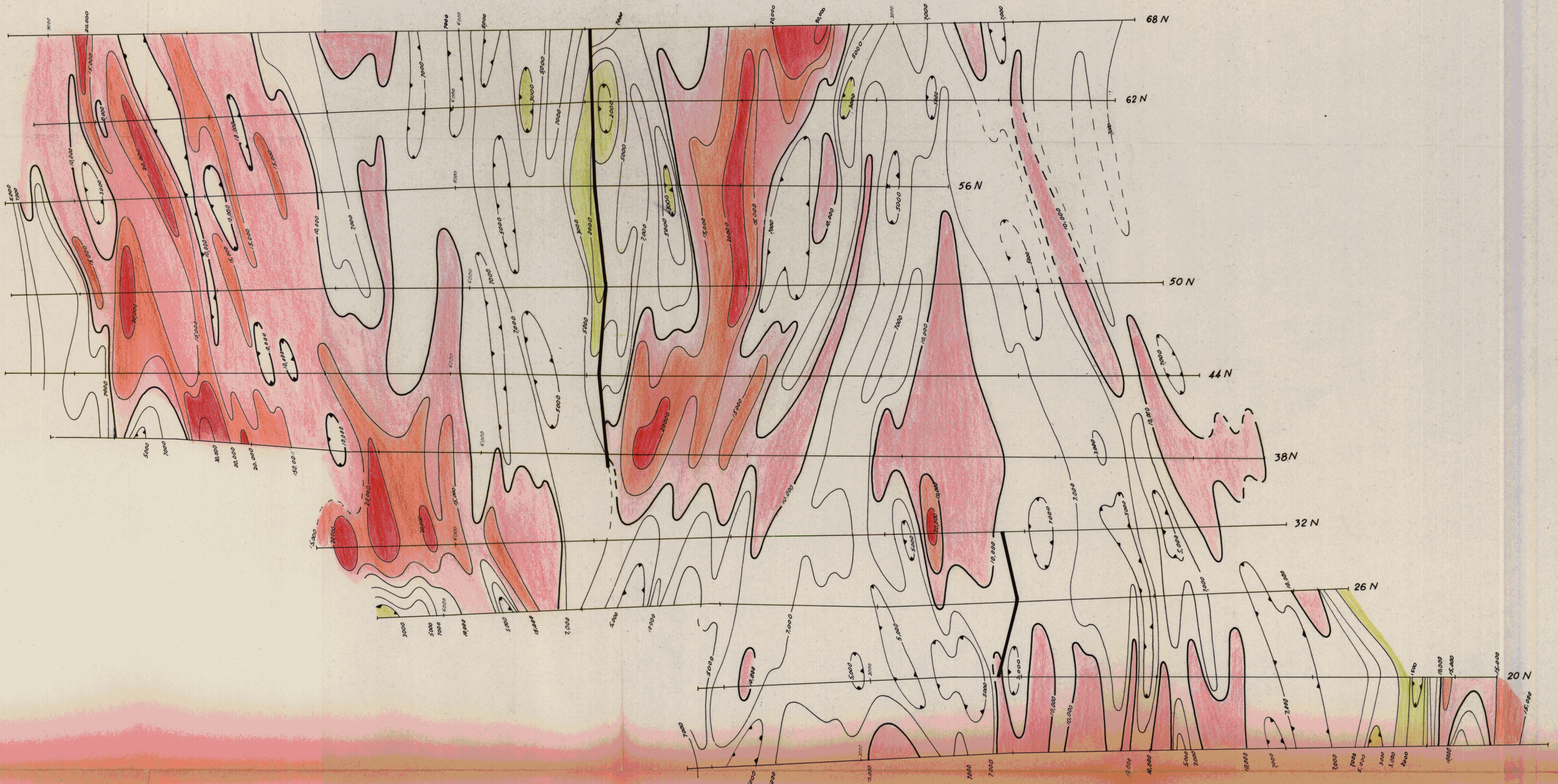
DECEMBER - JANUARY 1978

SCALE - 1:6000

014

84-2240

Job N° TAS-054-A   Sheet 1 of 1   PLATE 1.



Gradient block boundary

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

RED HILLS NORTH

NEAR QUEENSTOWN TASMANIA

GRADIENT ARRAY
ELECTRICAL INDUCED POLARIZATION

320037

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX

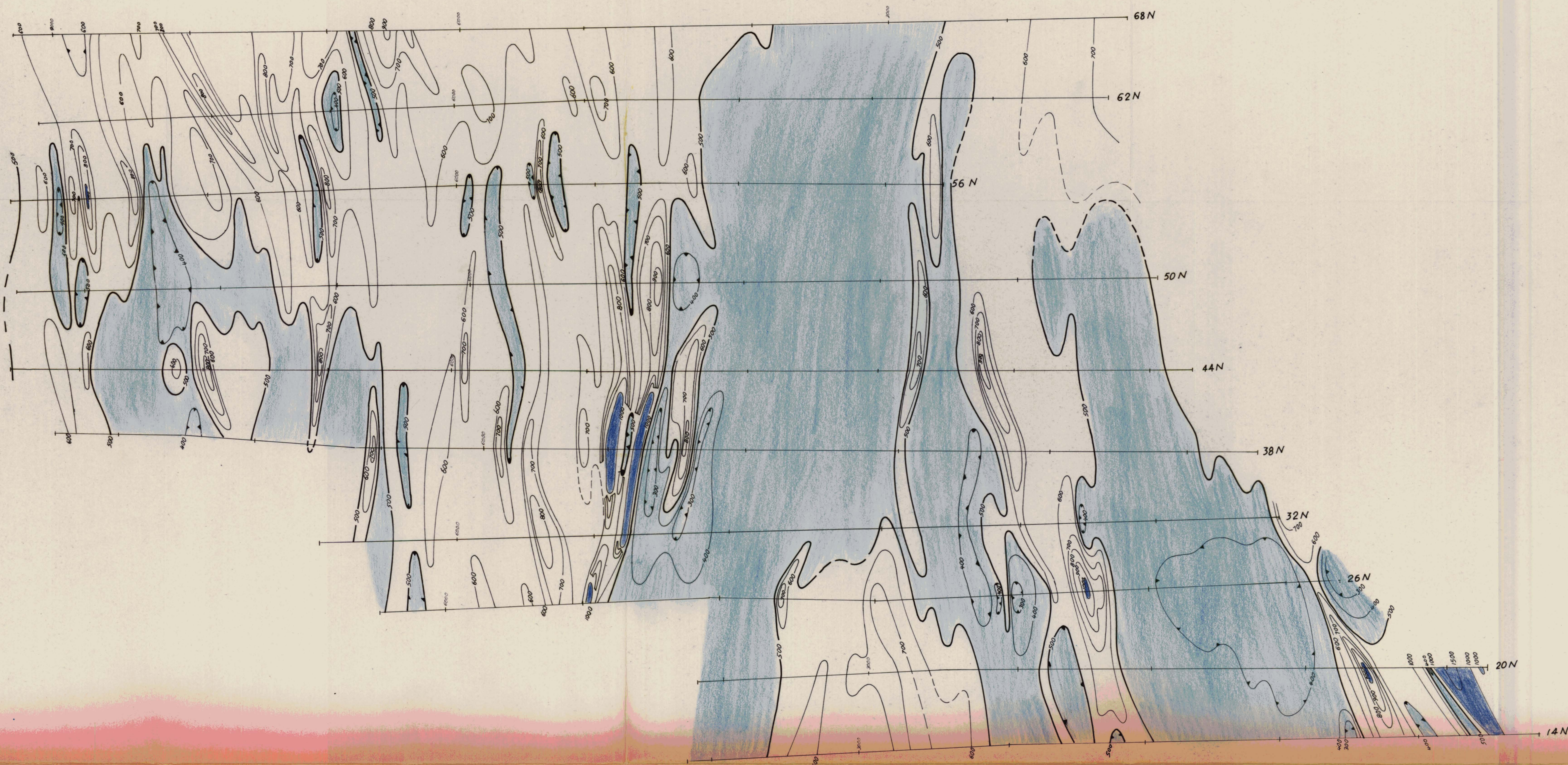
DECEMBER - JANUARY 1978

5 cm

SCALE - 1 : 6000

Job. N°. TAS-054-A Sheet 1 of 1 PLATE 2.

84-2240.



NOTE: Add 62,000γ to all values

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

RED HILLS NORTH

NEAR QUEENSTOWN TASMANIA

TOTAL MAGNETIC FIELD SURVEY

CONTOUR PLAN

320038

SURVEYED & COMPILED BY
SCINTREX

DECEMBER - JANUARY 1978

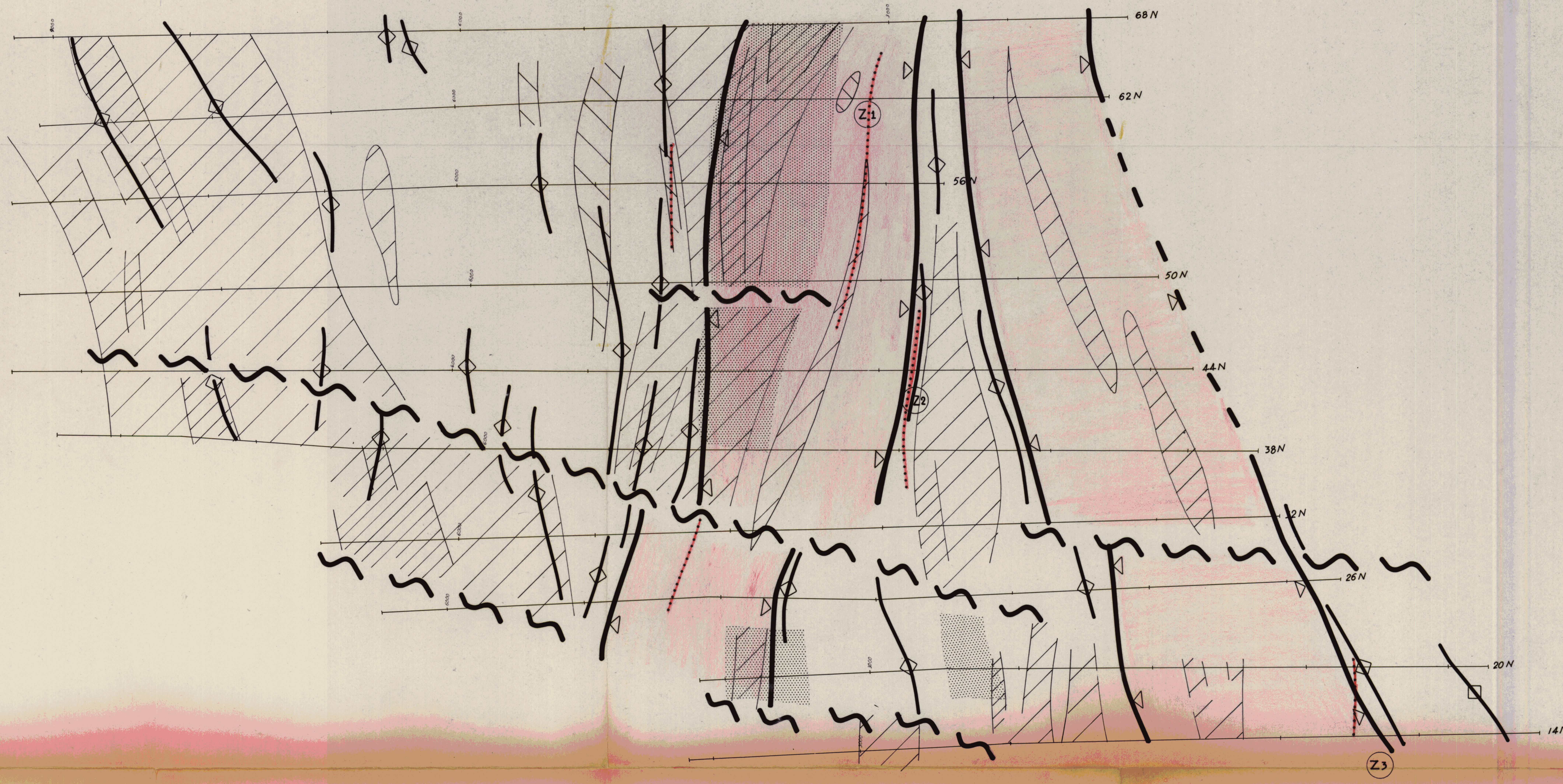
5 cm

SCALE - 1:6000

84-2240.

016

Job Nº TAS-054-A Sheet 1 of 1 PLATE 3.



MOUNT LYELL MINING & RAILWAY COMPANY LTD.

RED HILLS NORTH

NEAR QUEENSTOWN TASMANIA

GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION & TOTAL MAGNETIC FIELD SURVEY

INTERPRETATION PLAN

SURVEYED & COMPILED BY
SCINTREX

DECEMBER - JANUARY 1978

320039

5 cm

SCALE - 1 : 6000

Legend

- Resistive units (mod., high, low)
- Low chargeability units
- Chargeability highs
- Individual narrow magnetic units
- 'Quiet' magnetic units
- Dislocations

Job. No. TAS-054-A

Sheet 1 of 1

PLATE 4

84-2240.

017