RB 41/75

DEPARTMENT OF MINES

SOUTH AUSTRALIA

GEOPHYSICAL SECTION

G.S. 366

Geophysical Report No. 11/55

MAGNETIC AND GRAVITY INVESTIGATIONS AT CURRAMULKA

by

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ASSOCIATED PLANS : 55-307
55-306
55-304

D.M. 667/55

Report Book No. 41/75.

no further action recommended
14/10/11

MAGNETIC AND GRAVITY INVESTIGATIONS AT CURRAMULKA

SUMMARY

Magnetic and gravity investigations have clarified the form of the magnetic anomaly near Curramulka. Considerations of depth, anomalies over other iron-bearing rocks on Yorke Peninsula and other factors suggest that further work is not warranted.

INTRODUCTION

The aerial magnetometer survey of Yorke Peninsula, flown for the Department by Adastra-Hunting Geophysics Ltd., in February, 1955, disclosed a magnetic anomaly a few miles north of Curramulka. (Aeromagnetic Map of Total Intensity - Curramulka). The area has been investigated by detailed vertical magnetic force measurement and some reconnaissance gravity traverses.

GEOLOGY

The area lies in the undulating country of central Yorke Peninsula and is extensively cultivated for mixed farming.

Sheet or nodular travertine limestone is found close to the surface throughout the area and on the elevated country five miles north of the township of Curramulka, ancient NW - SE trending dunes of white sand are found. Through lack of outcrops little is known of the subsurface geology but a hard dense limestone of Cambrian age is present at Curramulka and to the south and west, but apparently absent a few miles north of Curramulka. Most of the information available comes from local boring contractors.

METHODS USED

After a reconnaissance survey a representative portion of the area of high magnetic intensity shown in plan 55-165 was covered with a grid laid out from a north-south baseline 20 feet west of the boundary fence between Sections 107 and 108, Hd. of Curramulka. Vertical intensity was measured with a Watt's magnetometer and the values have been contoured and shown on plan 55-304. Several paddocks in the area were under crop at the time of the survey and no readings were obtained over them.

Gravity traverses were run along a number of roads crossing the area using a Worden Gravity Meter. Stations were levelled optically and in the reduction a combined free air and Bouguer correction factor of 0.62 gravity units per foot was used.

RESULTS AND CONCLUSIONS

Within the general zone of high readings there are many individual maxima around which the magnetic intensity falls off more or less equally in all directions. This indicates a patchy distribution of magnetic material within the rocks of the strongly magnetic zone. The separate centres are however so close together that it is impossible completely to isolate their magnetic expressions and thus to estimate dip or depth extent. However, consideration of magnetic profiles (plan 55-307) suggests varying pole depths, but of the order of at least 300 feet. (For a structure which can be represented by a single pole, the pole depth is equal to four-thirds of the distance between the point of maximum vertical intensity and the point at which the vertical intensity has fallen to one-half its maximum value. For a structure representable by a "magnetized line," (2 dimensional bodies) the pole depth is equal to this "half-value distance").

From information verbally received from Mr. A. Hickman, a boring contractor of Port Vincent, it appears that the Cambrian limestone, known locally as "blue rock," and present in

thickness of from 200 feet to 600 feet to the south and west of Curramulka is not present 4 miles north of the town where bores penetrate clayey and sandy material before bottoming on granite or gneiss. About 4 miles north-west of Curramulka a bore passed through 325 feet of "cream limestone" before entering granite. It was hoped that some gravity values might show up structural lines controlling the disposition of these rock types.

No samples of the granitic rocks or the "cream limestone" were available for density determination but the specific gravity of the Cambrian limestone was found to be 2.55. This is very little below the normal figure for granites so the gravity difference over the two rocks was expected to be small, if present at all.

The results (plan 55-306) do show an unexpectedly large range of gravity variation of 9 milligals but the gradients are gentle and no definite lines of gravity change can be seen. No positive gravity effect can be seen over the belt in which magnetic values are high which may indicate that iron is present throughout the area but for some reason, e.g. differential weathering or metamorphism, is in a more magnetic form in the belt over which magnetic values are high. Alternatively the iron may be in too small a quantity significantly to affect the density of the host rocks but in a highly magnetic form.

Because of the vague knowledge of the rocks concerned and the unavailability of samples for determination of densities, magnetic susceptibilities and remanent magnetism, the range of possible hypothetical structures which could give rise to the anomalies is extremely large.

The moderate order of the magnetic anomalies, lower than those recorded over rocks proved to be low in iron content in other parts of Yorke Peninsula (at Kadina & Balgowan), the

greater apparent depth and the difficulty of testing by geochemical methods, (A.A. Gibson's report, G.S. 332) suggest that further investigation is not justified at this stage.

(K.R. SEEDSMAN)
GEOPHYSICIST

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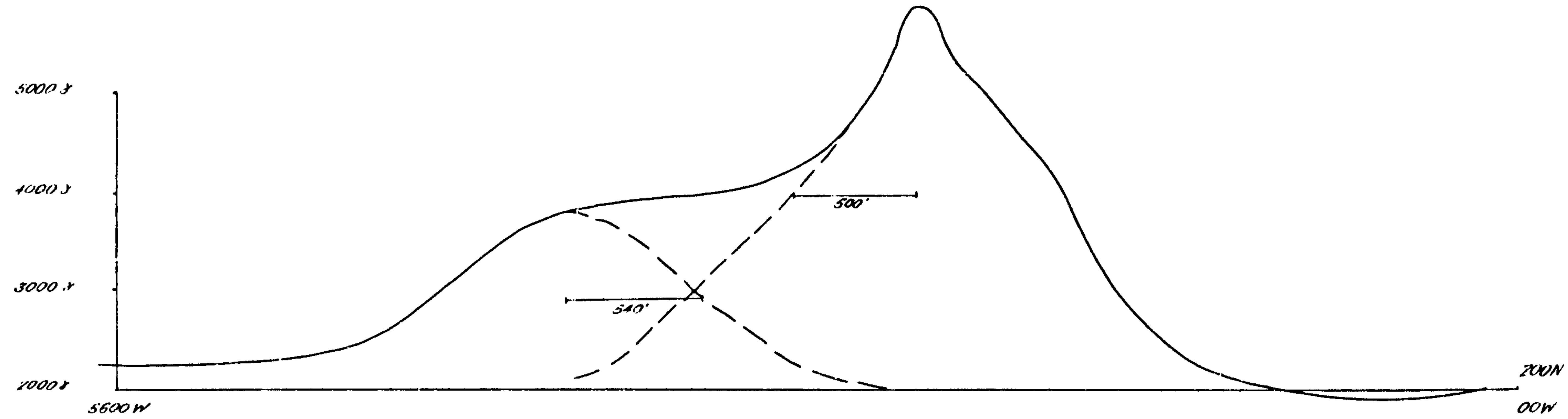
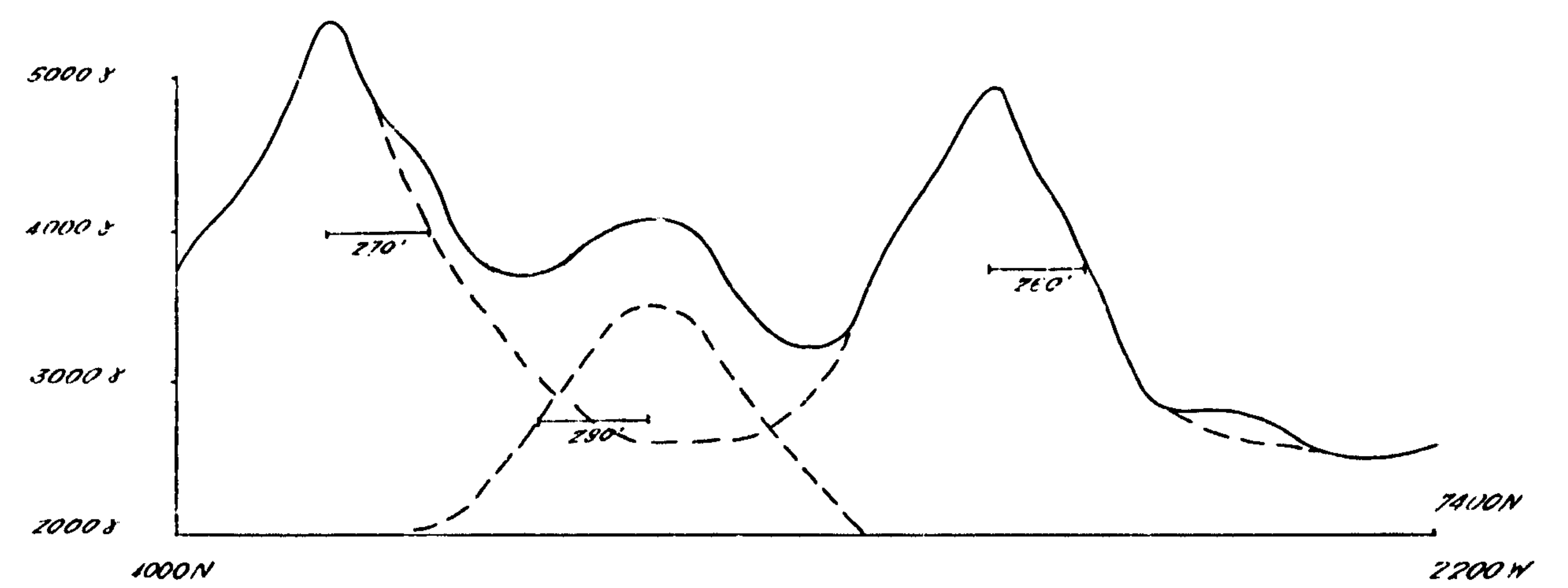
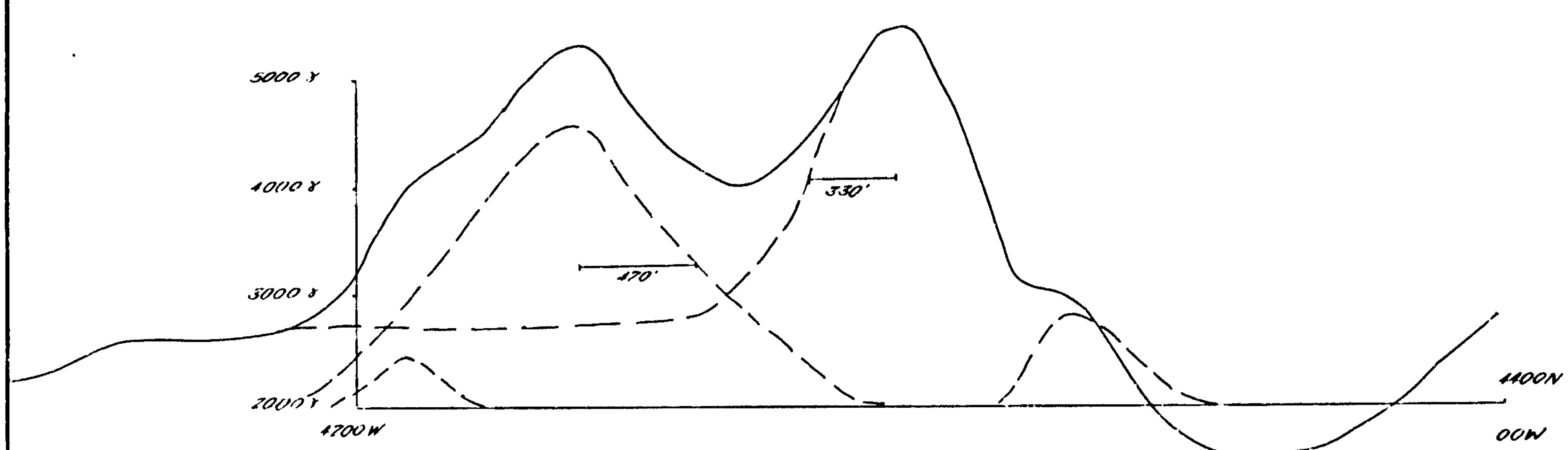
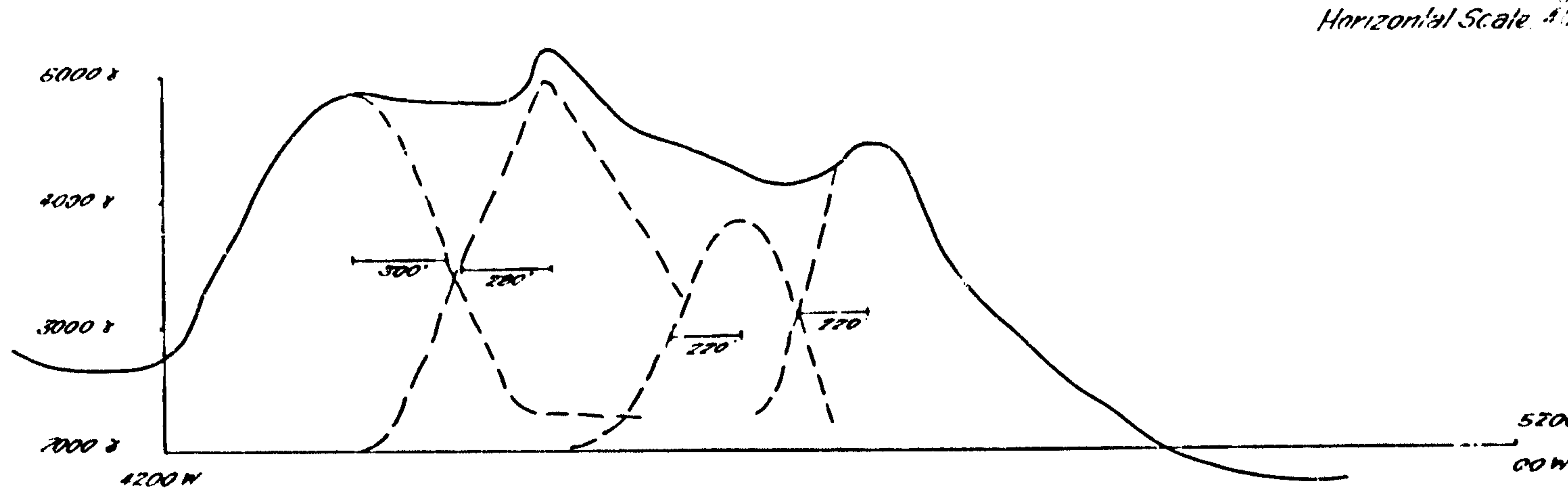






Observed Profile
Possible Components
Half value distance ... 500'
Vertical Scale 1000 gammas to 1 inch
Horizontal Scale 400 feet to 1 inch



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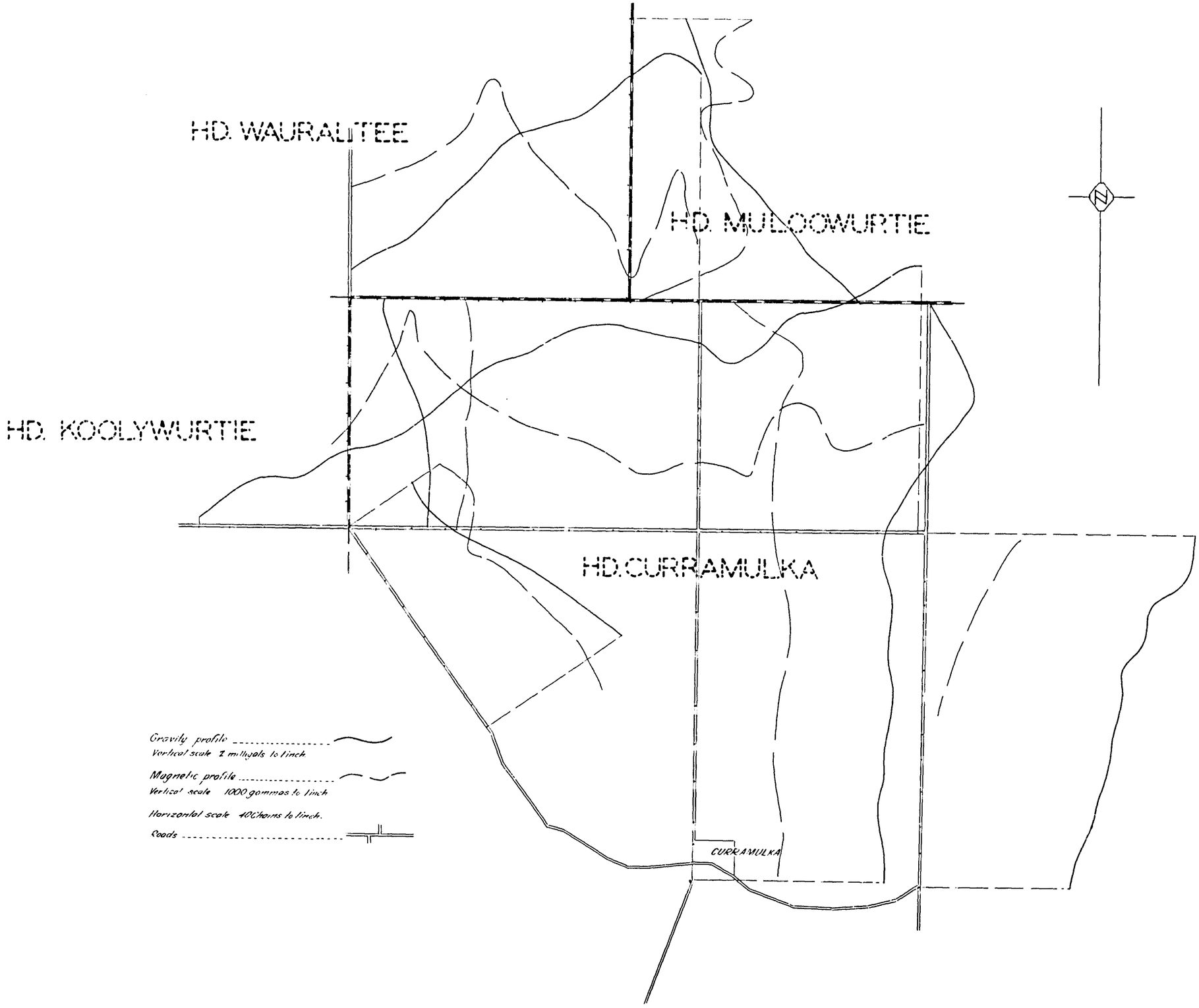
CURRAMULKA AREA

MAGNETIC PROFILES

55-307

G47

To accompany report by K Seedsman



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CURRAMULKA AREA

RECONNAISSANCE GRAVITY AND MAGNETIC TRAVERSES

Approved Passed

Director of Mines

Drn.
Tcd. R.J.B.
Ckd.
Exd.

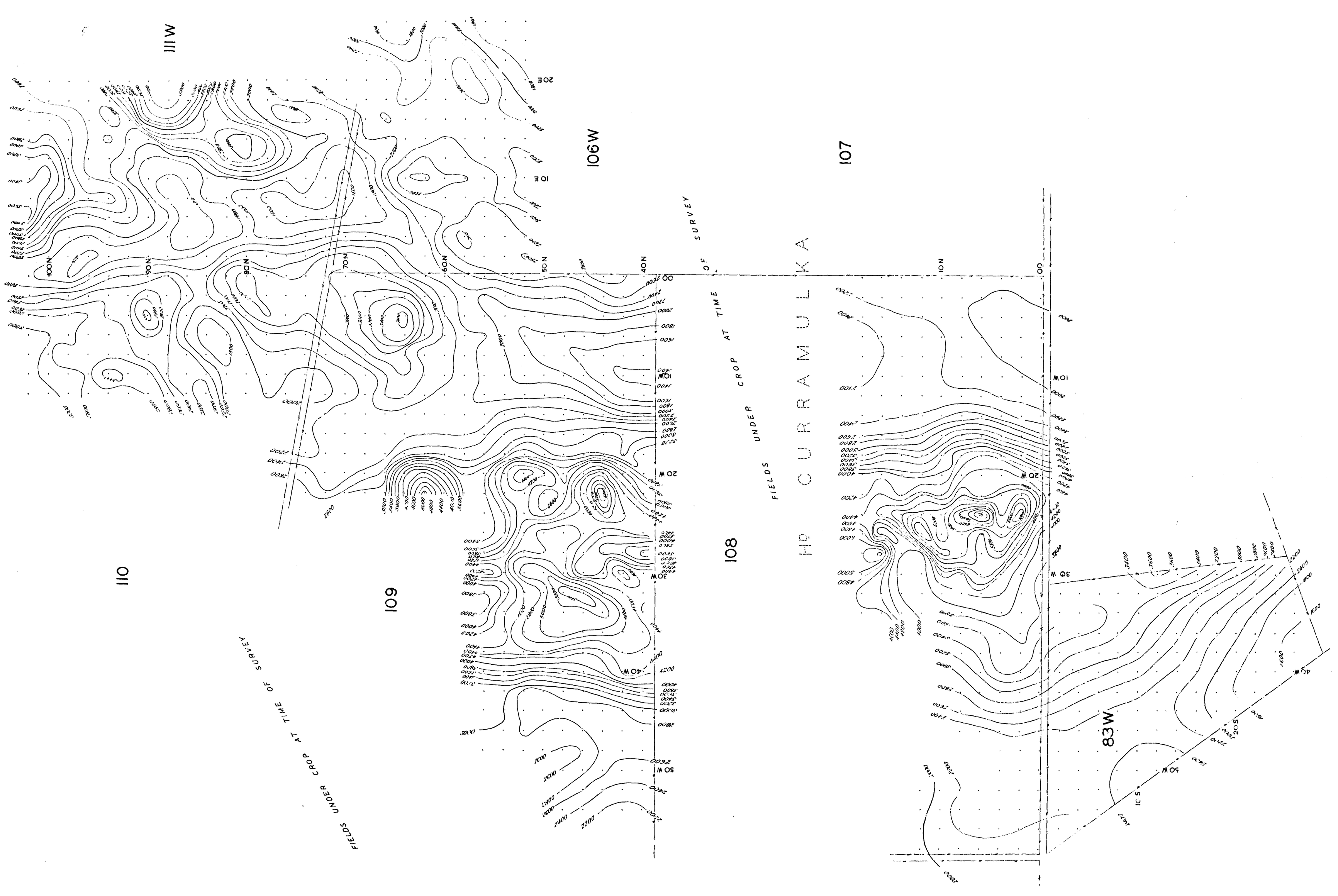
Scale: 40 Chains to 1 inch.

55 • 306
Gh. 7

Date 16.9.55

Associated Drawing No.

No. Amendment Exd. Date



Contour Interval 200 gammas.

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CURRAMULKA AREA

CONTOURS OF VERTICAL MAGNETIC INTENSITY

Scale 400 Feet to Inch.

55-304

G47