COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1964/32

QUART BOWL MAGNETIC SURVEY, TENNANT CREEK, N T 1963

by

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SUMMARY

In October 1963 a ground magnetic survey was made at the Quart Bowl area, Tennant Creek, to investigate a broad aeromagnetic anomaly. It was thought that this anomaly might comprise a number of narrow anomalies indicating several shallow bodies rather than one deep-seated body as suggested by the aeromagnetic anomaly. However, the ground magnetic results are essentially the same as the aeromagnetic results; there is no evidence for shallow bodies at the Quart Bowl area.

1. INTRODUCTION

During October 1963 a ground magnetic survey was made in the Quart Bowl area about 14 miles west of Tennant Creek (Plate 1). The purpose of the survey was to investigate a broad anomaly indicated by the aeromagnetic survey made by the Bureau of Mineral Resources, Geology and Geophysics in 1956. The Mines Branch, Northern Territory Administration, was considering a drilling programme to test the anomaly but before planning the programme, it required more-detailed information on the anomaly. It was thought that the anomaly might comprise a number of narrow anomalies, which would indicate several shallow bodies rather than one deep-seated body as suggested by the aeromagnetic results. If shallow bodies were detected they would be worth further investigation by diamond drilling.

2. OPERATIONS AND GEOPHYSICAL RESULTS

Twelve traverses with bearing magnetic north and up to 6000 ft in length were surveyed across the area and pegged at 100-ft intervals; the traverse spacing ranged from 200 to 800 ft. The approximate position of the survey grid is shown on Plate 1; at the time of writing (November, 1963) the grid had not been tied to the adjacent trig points.

All the traverses pegged were investigated with the vertical-force magnetometer and two traverses, viz. 00 and 16W, with the horizontal-force magnetometer. The vertical-force contours are shown in Plate 2 and the vertical and horizontal-force profiles for Traverses 00 and 16 W are shown in Plates 3 and 4.

The vertical-force contours show one main anomaly with its axis striking 130 degrees magnetic; this is essentially the same as for the aeromagnetic results. The only other anomaly detected is in the south-western corner of the area.

3. INTERPRETATION OF RESULTS AND CONCLUSIONS

The method of interpretation used is that described by Daly (1957), based on the assumption that the body causing the anomaly is spherical and polarised by induction in the present direction of the Earth's magnetic field. This method and its limitations have been fully described by Daly (op. cit.).

Using Daly's method, estimates has been made of the depth, position, and radius of the body causing the main Quart Bowl anomaly.

Traverse	Depth to centre (ft)	Position of centre	Radius (ft)
00	3010	2060S	750
16W	3010	1260	750

The estimates for the radius have been made assuming a magnetic susceptibility of 10^{-1} c.g.s. units for the body (see Daly, 1957).

Using these estimates the vertical-force and horizontal-force profiles have been calculated and compared with the observed profiles (Plates 3 and 4). The agreement between observed and calculated horizontal-force profiles is good, suggesting that the estimates of depth and position are reliable. For the vertical-force profiles the agreement is poorer but the maximum of the calculated and observed profiles are roughly in the same place and the estimates of depth and position are probably not greatly in error. The discrepancy between observed and calculated vertical-force profiles for Traverse 00 could be due to a regional effect with the magnetic intensity decreasing northwards. No explanation can be offered of the marked steepening of the observed vertical-force profiles at the northern end of Traverse 16W.

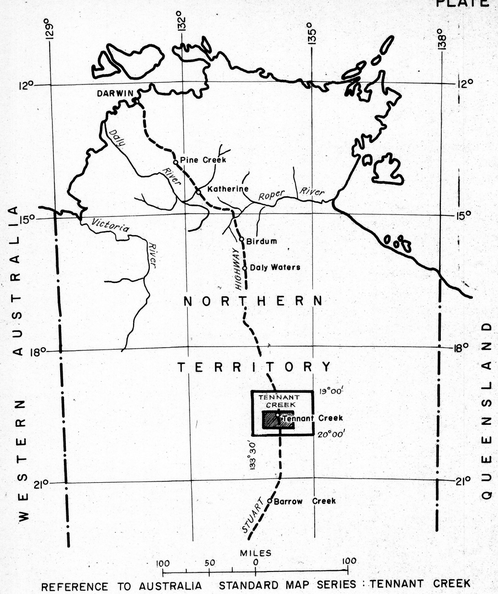
The anomaly in the south-western corner of the area was only outlined in part; therefore it is impossible to obtain an accurate estimate of the depth of the body causing it. However, as the anomaly is broad and the magnetic gradients are not steep, it is probable that this anomaly also is due to a body centred at a depth of about 3000 ft.

Thus there is no evidence for several shallow bodies at the Quart Bowl area. The ground survey results are essentially the same as the aeromagnetic results and indicate that the main anomaly is caused by a single deep-seated body.

4. REFERENCES

DALY, J. 1957 Magnetic prospecting at Tennant Creek, NT, 1935-37 Bur. Min. Resour. Aust. Bull. 44.

PLATE I



REFERENCE TO AUSTRALIA STANDARD MAP SERIES : TENNANT CREEK

QUART BOWL MAGNETIC SURVEY,
TENNANT CREEK, NT 1963

LOCALITY MAP
SHOWING
TOTAL MAGNETIC INTENSITY
MEASURED BY AIRBORNE MAGNETOMETER

MILES
2 0 2 4 6

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. E53/B7-14
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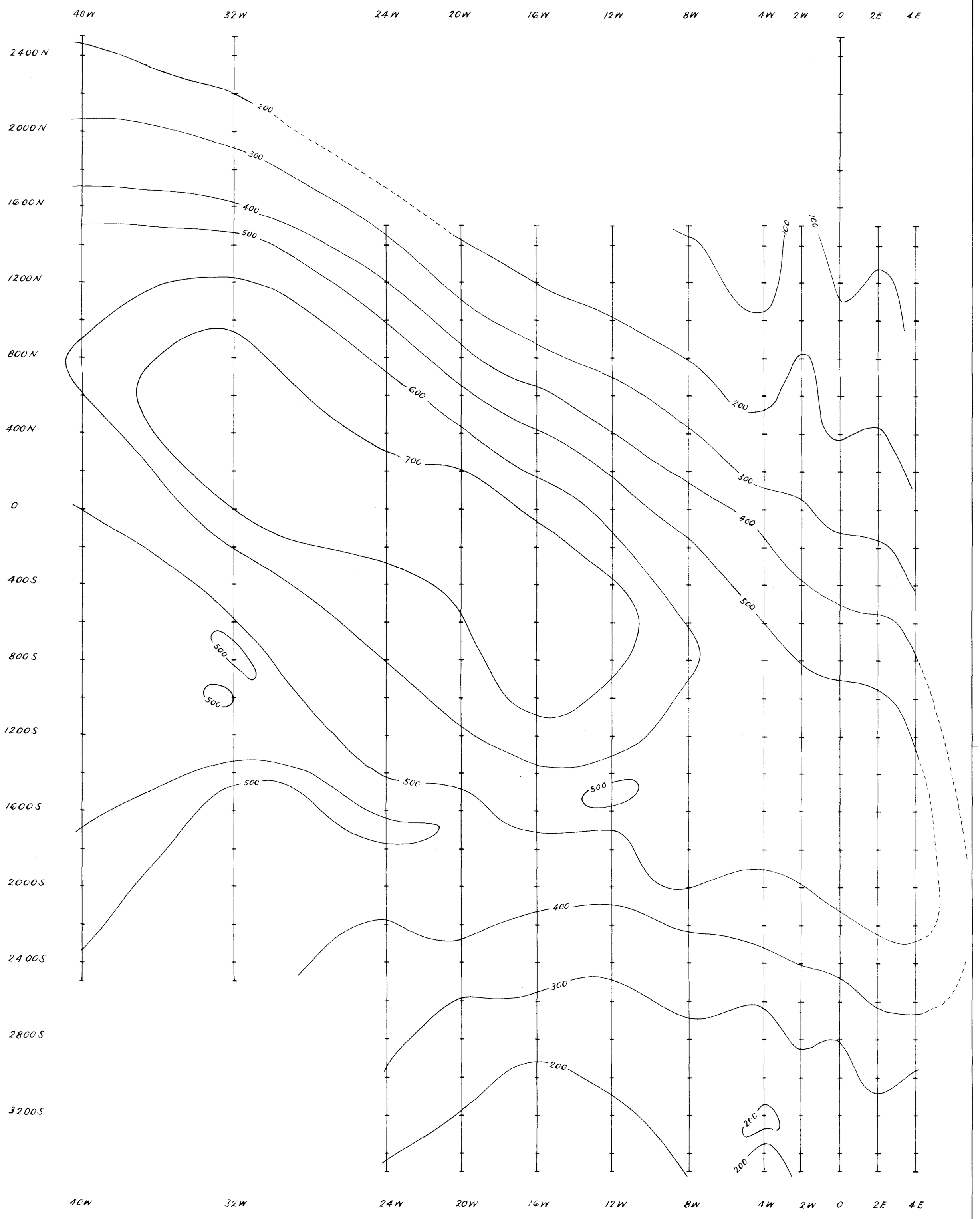

Magnetic North

QUART BOWL MAGNETIC SURVEY

VERTICAL MAGNETIC FORCE CONTOURS

Contour Interval: 100 gammas

Scale

400 0 400 800 1200 FT

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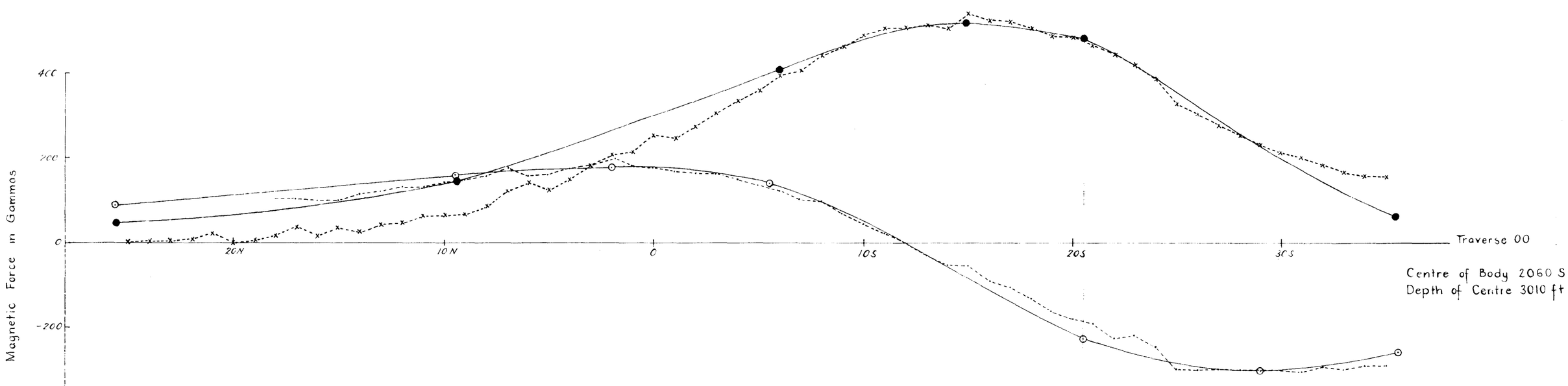
GP D91

PLATE 3



Reference

Observed horizontal-component variations

" vertical- " "

Calculated horizontal-component variations

" vertical- " "

QUART BOWL MAGNETIC SURVEY

COMPARISON OF OBSERVED AND CALCULATED PROFILES

Scale

400 0 400 800 1200 FT

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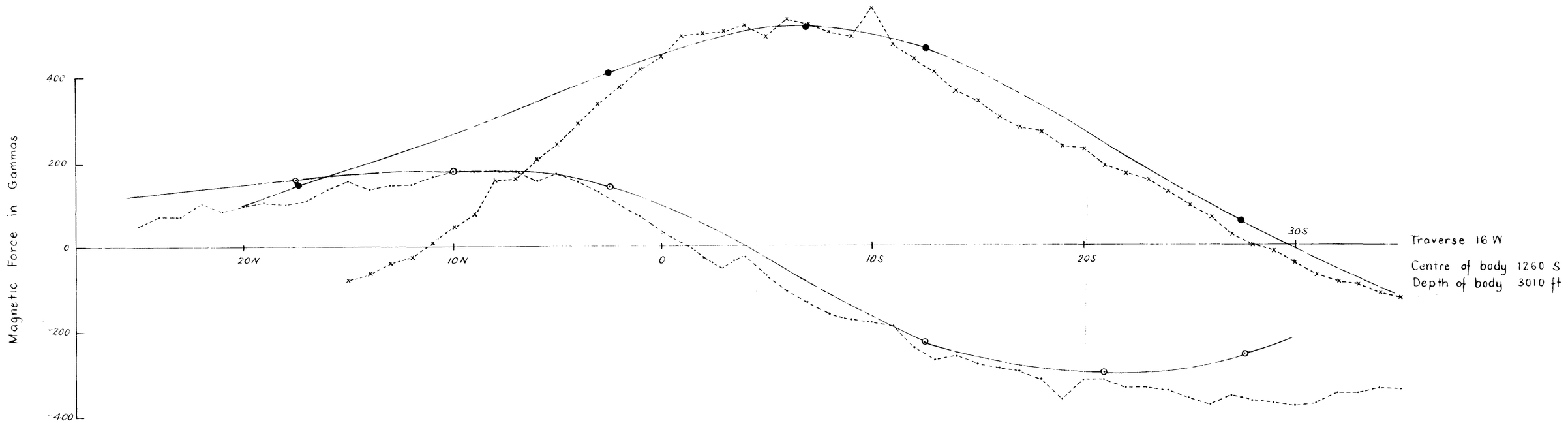
E53/B7-16

Gr. D92

PLATE 4



Reference

Observed horizontal-component profile
" vertical- " "
Calculated horizontal-component profile
" vertical- " "

QUART BOWL MAGNETIC SURVEY

COMPARISON OF OBSERVED AND CALCULATED PROFILES

Scale

400 0 400 800 1200 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. November 1963

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E53/B7-17

GP · D93