COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS

1958 NO. 109

RECONNAISSANCE GROUND MAGNETIC SURVEY OVER OLIVE WOOD AREA, TENNANT CREEK (1958).

by

M.J. O'CONNOR and J. DALY.

RECORDS 1958 NO.109

RECONNAISSANCE GROUND MAGNETIC SURVEY OVER OLIVE WOOD AREA, TENNANT CREEK (1958).

by

M.J. O'CONNOR and J. DALY.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
TECHNICAL MATTERS	1
RESULTS AND DISCUSSION	1
RECOMMENDATIONS	2

LIST OF ILLUSTRATIONS

Plate 1. Locality Plan

Plate 2. Contours of Vertical Magnetic Intensity.

Plate 3. Anomaly No.1. Comparison of observed and calculated profiles.

Plate 4. Anomaly No.2. Comparison of observed and calculated profiles.

ABSTRACT.

At the request of Peko Mines N.L., a reconnaissance magnetic survey was conducted over an area surrounding the Olive Wood Mine, Tennant Creek. Three major anomalies were located, and evidence of the presence of several smaller ones was obtained. Two of the anomalies were inspected in detail, and predictions made of the position and dimensions of the bodies causing them. Drilling targets for these bodies are recommended.

INTRODUCTION

During the progress of the Tennant Creek Magnetic Survey, Peko Mines N.L. requested the assistance of the Bureau in investigating a Prospecting Area held by the Company, surrounding the Olive Wood Mine. For this purpose, the Bureau Geophysical Party performed a reconnaissance survey over an area approximately two miles by 1½ miles, centred roughly on the Olive Wood lease. The survey was carried out during September, 1958.

The area in question is about 2 miles south of the site of No.1 Government Battery, and about 18 miles north-west of Tennant Creek township (see Plate 1). Mines in this area have not been large producers. The Olive Wood and Havelock leases, which lie on or close to the surveyed area, have been mentioned briefly by Ivanac (1954). Recently, testing at the Orlando Mine, about 1 mile to the west, has given encouraging results, and the area is now the subject of some interest.

TECHNICAL MATTERS.

Pegging of traverses was begun by the staff of Peko Mines N.L., and completed by Department of Interior Surveyors attached to the Bureau Party. The area was covered at reconnaissance scale, traverses being 400 feet apart, and stations 200 feet apart. In areas showing major anomalies, traverses were pegged 100 feet apart with stations at 100 foot intervals. Details of the traverses are shown on Plate 2.

Vertical component readings were taken at all stations, and horizontal component readings on traverses 0 and 2400E only. The following instruments were used.

Variometer	Scale Value
Watts No.61939 (Vertical)	36.5 gammas per division.
Askania No.541479 (Vertical)	30.6 " " "
Askania No.521633 (Horizontal)	16.6 " " "

RESULTS AND DISCUSSION

The results are shown as contours of vertical component on Plate 2. Several anomalies are present in the surveyed area.

The basis for classifying magnetic anomalies on the Tennant Creek field has been discussed by Daly (1957). Using this classification, the results of the survey show three major type anomalies, which will be referred to as Nos.1, 2 and 3, beginning at the western boundary of the surveyed area.

The method of the interpretation used at Tennant Creek has been described in detail by Daly (1957). Briefly, the process involves matching observed profiles as closely as possible with the profiles calculated for a spherical body polarised by induction. It is concluded that the calculated position of the centre of such a sphere will be close to the centre of the actual body causing the anomaly. The size of the theoretical sphere is calculated, using a reasonable figure for magnetic susceptibility, and it is considered that this size will give a minimum figure for the extension of the body in depth, although at Tennant Creek the horizontal dimension will in general be very much less than the calculated value.

Anomalies 1 and 2 lie on a long magnetically high zone, which strikes north-west across the surveyed area. Anomaly No.1 consists of a central maximum, with an extension to the north-west, which may be due to a protuberance of the body, but is more likely to reflect the presence of a separate ironstone body, at moderate depth. The main part of the anomaly appears to be due to a body of very large size, at great depth. Plate 3 shows vertical and horizontal component profiles along traverse 00 E, compared with profiles calculated for a spherical body, centred at 300N, at a depth of 2500 feet. The fit is not as good as should be obtained from a body at such a depth, which indicates that there must be considerable irregularities in the shape of the body. Some time was spent in endeavouring to fit the curves by adding effects due to several separate bodies, but no great improvement could be achieved. As the assumption of only two separate bodies involves fitting curves depending on four unknowns by trial and error, it will be realised that the process can become very laborious. It is considered that the assumption shown gives a reasonable figure for maximum depth. Some improvement might possibly be obtained by placing the main body at a slightly shallower depth (perhaps 2,000 feet) and adding effects due to one or more bodies very much smaller, at much shallower depth.

It is desirable to stress the very large size of the body causing this anomaly. Using the value of susceptibility found to give a reasonable average for ironstone bodies at Tennant Creek (0.1. c.g.s. Units), the radius of the body is calculated as 650 feet, which is much larger than the dimensions needed to account for any other anomaly on the field.

On the interpretation adopted, the body would extend from 1850 feet to 3150 feet vertical depth.

Anomaly No.2 is due to a smaller and shallower body of ironstone. Preliminary trials showed that there was no possibility of explaining this anomaly by a single body. Plate 4 shows horizontal and vertical component profiles along traverse 2400E, compared with profiles calculated for two bodies, one centred at 780S at a depth of 1165 feet, the other centred at 400S, at a depth of 535 feet. The fit is close enough to suggest that this interpretation could be used as a basis for drilling. Using the abovementioned value for susceptibility, the radius of the shallower body is calculated as 110 feet, and the deeper one 290 feet.

The magnetic high which includes these anomalies contains a number of other highs, which could be resolved into discrete anomalies by sufficiently detailed work.

Anomaly 3 has not been investigated in detail, as it is due to a body of rather small dimensions at considerable depth, and is remote from the area of present geological interest.

RECOMMENDATIONS.

(1) If it is considered desirable to test the anomalies, the following targets are recommended.

(a) Anomaly 1.

200E/300N, depth 2250 feet.

The depth has been put rather less than the calculated depth to the centre, to allow for the possibility that a more accurate interpretation might reduce the depth to the centre.

(b) Anomaly No.2

2450E/780S, depth 1165 feet

2450E/400S, depth 535 feet.

In the absence of information on the dip of the beds, it is not possible to choose the most favourable direction for drilling. Collar sites should be chosen on geological evidence.

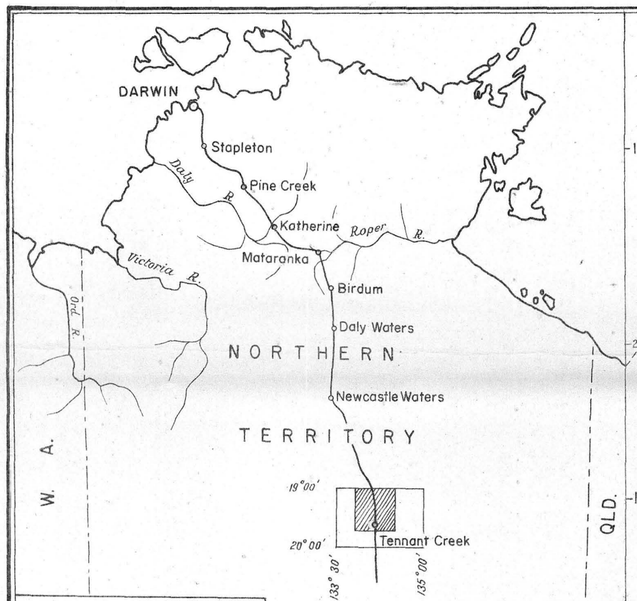
(2) If, as a result of testing, mining operations in this area are contemplated, the whole of the magnetically high area should be covered by a detailed magnetic survey, before any such operations are begun. Such a survey would almost certainly reveal the location of other ironstone bodies of smaller size. It is not certain that such bodies will be of economic interest, but it must be remembered that if this information is required at a later date, it may be impossible to obtain it after mine buildings have been erected.

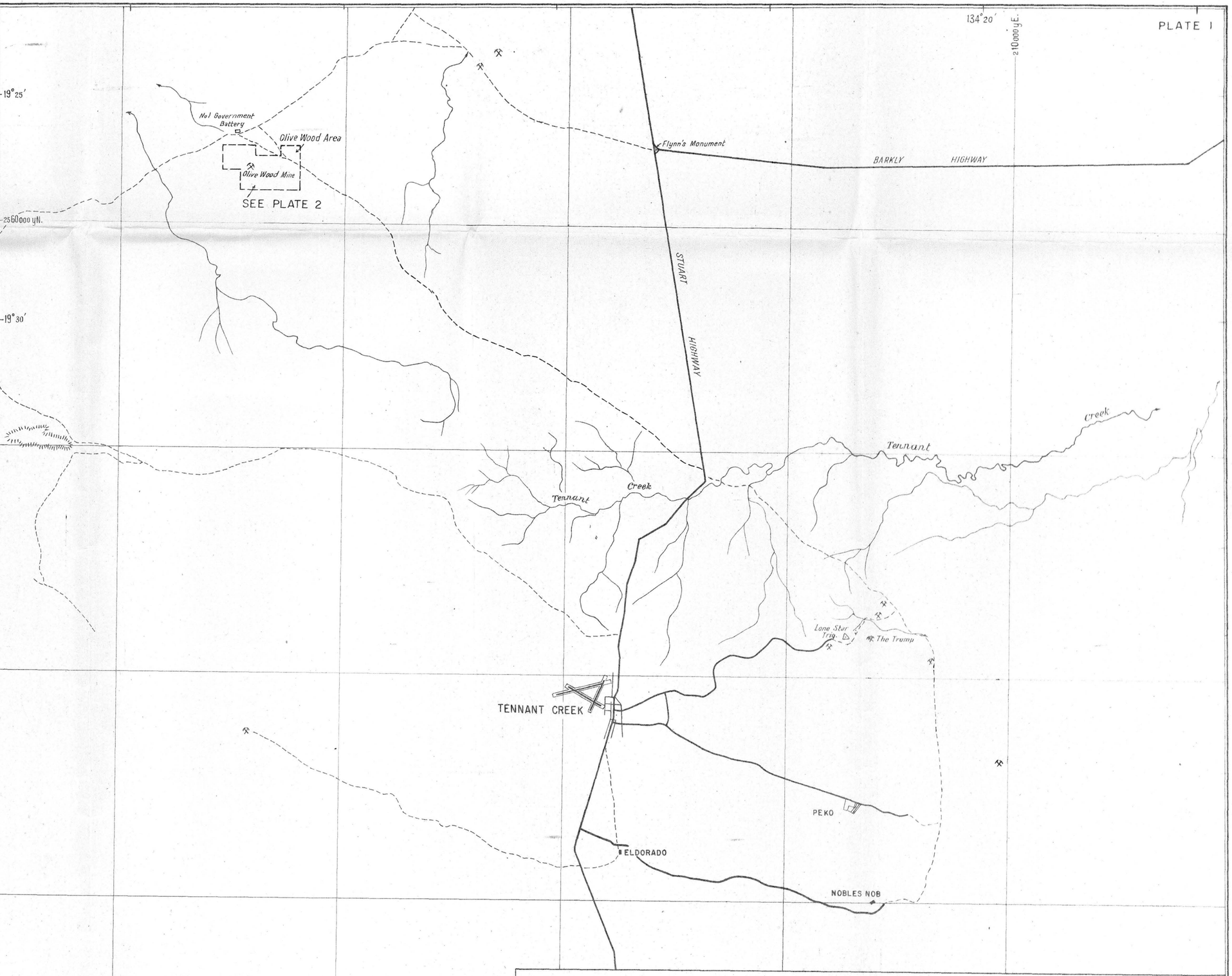
REFERENCES

Daly, J. (1957) - Magnetic Prospecting at Tennant Creek, 1935-37. B.M.R.G.G.Bulletin 44.

Ivanac, J.F. (1954) - The Geology and Mineral Resources of the Tennant Creek Gold Field. B.M.R.G.G. Bulletin 22.

PLATE I





GROUND MAGNETIC SURVEY, OLIVE WOOD AREA, TENNANT CREEK, N.T. (1958)

LOCALITY MAP

(PORTION OF THE TENNANT CREEK (SPECIAL) MAP. G110-30)

SCALE IN MILES

2 0 2 4 6

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics. G 110-47

PLATE 2

ANOMALY 1

ANOMALY 2

ANOMALY 3

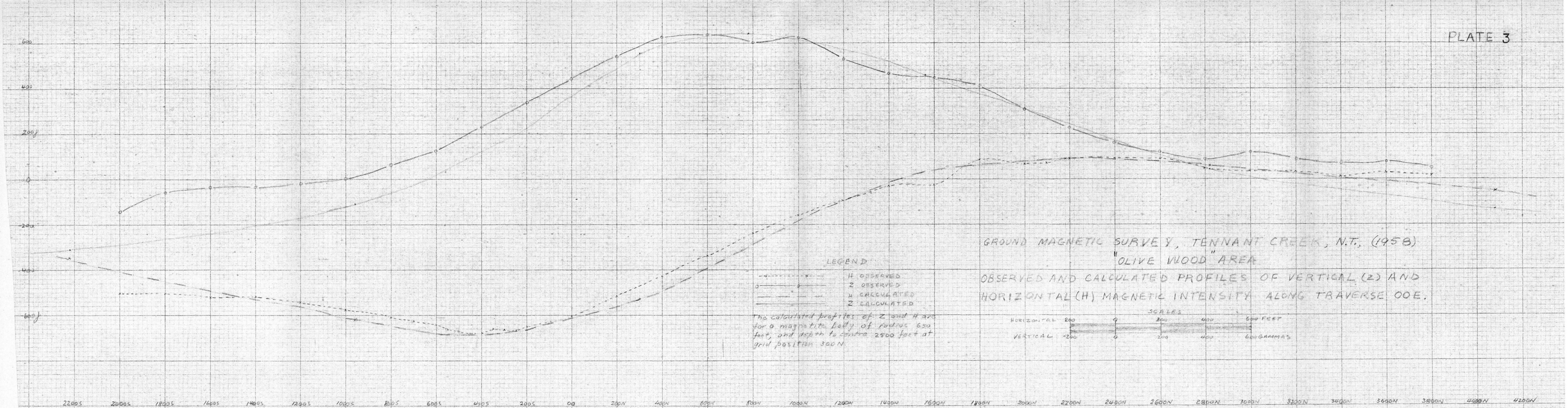
GROUND MAGNETIC SURVEY, TENNANT CREEK, N.T.
"OLIVE WOOD" AREA
CONTOUR PLAN OF
THE VERTICAL MAGNETIC FORCE
(CONTOUR INTERVAL 50 GAMMAS)

SCALE IN FEET
200 0 400 800 1200

LEGEND
100 VERTICAL MAGNETIC FORCE CONTOUR
MAGNETIC LOW
MAGNETOMETER STATION

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics G110-46

PLATE 3



LEGEND

H OBSERVED
Z OBSERVED
H CALCULATED
Z CALCULATED

The calculated profiles of Z and H are for a magnetite body of radius 650 feet, and depth to centre 2500 feet at grid position 300 N.

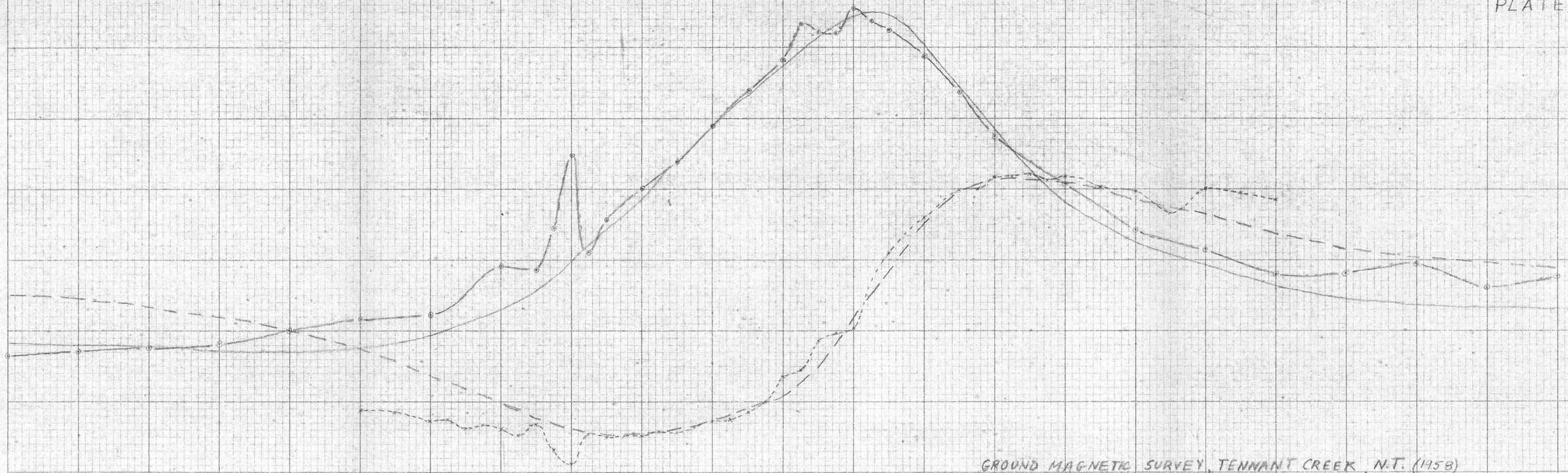
GROUND MAGNETIC SURVEY, TENNANT CREEK, N.T., (1958)
"OLIVE WOOD" AREA
OBSERVED AND CALCULATED PROFILES OF VERTICAL (Z) AND HORIZONTAL (H) MAGNETIC INTENSITY ALONG TRAVERSE 00E.

SCALES

HORIZONTAL 200 0 200 400 600 FEET
VERTICAL -200 0 200 400 600 GAMMAS

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.
G110-48

PLATE 4



LEGEND.

o——o	Z OBSERVED
x- - - -x	H OBSERVED
———	Z CALCULATED
— — —	H CALCULATED

The calculated profiles of Z and H are for two separate spherical magnetite bodies as tabulated below

Grid position	780S	400S
Depth to centre	1168 feet	535 feet
Radius	290 feet	110 feet

GROUND MAGNETIC SURVEY, TENNANT CREEK, N.T. (1958)

"OLIVE WOOD" AREA.

OBSERVED AND CALCULATED PROFILES OF VERTICAL (Z) AND HORIZONTAL (H) MAGNETIC INTENSITY ALONG TRAVERSE 2400E

SCALES

HORIZONTAL — 200 0 200 400 600 FEET

VERTICAL -200 0 200 400 600 GAMMAS

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics. G 110-49

2800S 2600S 2400S 2200S 2000S 1800S 1600S 1400S 1200S 1000S 800S 600S 400S 200S 0 200N 400N 600N 800N 1000N 1200N 1400N 1600N