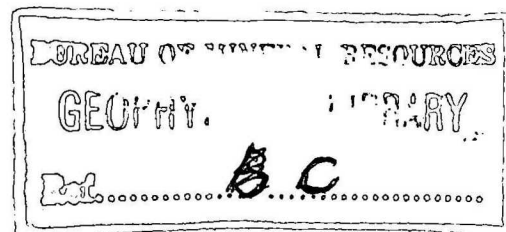


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COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1959, N^o. 45



RECOMMENDATIONS
FOR
DIAMOND DRILLING
AT TENNANT CREEK, N.T.

by
J. DALY

1959/45

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AT TENNANT CREEK, N.T.

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ABSTRACT

During 1957-58, the Bureau performed ground magnetic surveys at Tennant Creek. The work included surveys over two areas (Areas No.1 and No.3) temporarily reserved from the provisions of the Mining Ordinance, which revealed a number of anomalies indicating the presence of concealed ironstone bodies. The present report gives:-

- (1) specifications for drill holes to test all anomalies recorded.
- (2) recommendations for drilling within the limits envisaged in the Bureau's program for 1959.

1. INTRODUCTION

During the Bureau's magnetic survey at Tennant Creek in 1957-58, surveys were made over two areas reserved from the provisions of the Mining Ordinance for the purpose of the survey. Anomalies indicating the presence of concealed ironstone bodies were discovered on each area. As the areas have not previously been tested by mining activities, and as they are largely soil covered, so that surface prospecting is impracticable, it is recommended that the economic significance of the results be tested by diamond drilling.

2. CONSIDERATIONS GOVERNING THE SELECTION OF DRILL SITES

The minerals of economic value associated with ironstone bodies on the Tennant Creek field are gold and copper. The mode of occurrence has been discussed in previous reports. Briefly, the gold occurs typically in small rich shoots, controlled by complicated geological factors. The richest gold must be expected to occur in the oxidised zone. The copper occurs disseminated through the ironstone bodies. It is rarely seen in outcrop, but all bodies tested at depth have contained some copper mineralisation, generally of non-economic grade. The Peko No.1 anomaly body is the only one so far found to contain copper in economic quantities. However, the fact that some copper mineralisation appears to be almost invariably associated with the ironstone at depth indicates that any anomaly is worthy of testing for copper. Gold in general is only discovered by chance.

By analogy with known bodies, it appears that the typical ironstone body at Tennant Creek has an easterly strike and a steep dip. Its strike length may be of the order of some hundreds of feet, but its thickness in north south section may be quite small. Any hole intersecting such a body near its centre will be suitable as a test for copper. In order to give the best chance of discovering a gold shoot if one exists, the hole should intersect the body in the oxidised zone. The combination of these factors suggests that a vertical hole aimed at the centre of the body is the most economical method of testing. However, it is known that drill holes deviate at Tennant Creek, and the direction of deviation of a vertical hole would be quite unpredictable. As the bodies may be expected to be narrow, and to dip steeply, it would be quite possible for a vertical hole of any considerable depth to miss its target. This would mean that the body would not be tested for copper, although the hole would intersect the area most favourable for the occurrence of gold. It is considered that testing for copper should have first priority. For this reason, angle holes are preferred, although the depression should be as steep as possible, to give some chance of testing the areas favourable for gold. It is considered that an angle of depression of 65° is the best compromise. There is usually no sound basis for choosing to drill from one side rather than the other. In the areas in question, there is no geological evidence as to dips, nor do the magnetic anomalies usually provide any reliable indication as to the dips of the bodies producing them. However, as long as it is safe to assume that dips are steep, and that holes will tend to flatten, the direction of drilling is not of great significance.

3. RESULTS & RECOMMENDED DRILLING TARGETS

The following plans are attached:-

Area No.1

Eastern Portion.	Plan showing vertical force contours				
Western Portion.	Plan showing vertical force contours				
Anomaly 1A	"	"	"	"	"
Anomaly 1B	"	"	"	"	"
Anomaly 1C	"	"	"	"	"

Area No.3

Plan showing vertical force contours.

Anomaly No.1	Plan showing vertical force contours				
Anomaly No.2	"	"	"	"	"
Anomaly No.4	"	"	"	"	"
Anomaly No.9	"	"	"	"	"
Anomaly No.10	"	"	"	"	"
Anomaly No.13	"	"	"	"	"

Sections through recommended drill holes.

Area No.1 shows a small number of anomalies due to relatively small bodies. On area No.3, a larger number of anomalies was found, some of which are caused by bodies of considerable size. Drill targets on a number of these bodies have been selected by fitting the anomalies by curves calculated for spherical bodies, as described by Daly (1957). The centre of the theoretical sphere has been chosen as the target position. Comments on the individual anomalies are given below and sections along the recommended drill holes are appended.

The sites for the drill holes will have to be located from existing pegs. Area No.1 is readily accessible, and sites can be easily located from permanent markers. The position of Area No.3 cannot be located by readily visible marks. It is reached by following a track which proceeds due west from Cabbage Gum bore for 16 miles. At this point, a lagoon and stockyard are reached. The track to Area No.3 skirts the lagoon on the northern side, and proceeds north west for 6 miles. At this point, it intersects the base line at the zero peg. A track then follows the base line.

To minimise the amount of surveying required, all drill sites are on existing traverses, and bear along the traverses. In general, the drill sites have been taken to the north of the body, as there is some slight evidence from the magnetic results that most of the bodies dip steeply to the north. In one case, mentioned below, other considerations have led to the conclusion that a hole drilled from the south is preferable.

Area No.1 (Eastern Section)

Two anomalies are recommended for testing, shown as areas 1A and 1B respectively on the drawing. Anomaly 1A should be tested by a hole aimed at 2500E/2950S at a depth of 700 feet. Anomaly 1B is due to two small bodies, which should be tested by drill holes aimed at the following targets.

12300E/4240S depth 390 feet

12300E/4660S depth 500 feet

A number of other small bodies is present near anomaly 1B, which could be tested if encouraging results are obtained in the holes recommended.

Although outcrop is scarce in this area, the soil cover does not appear to be deep, and the drilling might well be preceded by geochemical testing.

Area No.1 (Western Section).

One anomaly is recommended for testing by a drill hole aimed at 24200W/5900S, at a depth of 340 feet. A number of other anomalies appears in the western portion, which may be due to small ironstone bodies, but testing is not recommended at the present stage. Two anomalies appearing in the south eastern corner of the plan are associated with outcropping ironstone, which should be tested in the first instance by geochemical methods.

Area No.3.

The anomalies in this area represent a major discovery of ironstone bodies in an area completely devoid of outcrop, and should be tested to some extent, irrespective of what results may be obtained by geochemical work. Anomalies have been numbered 1 to 14, as shown on the plan. Comments on individual anomalies are given below.

Anomaly No.1. This should be tested by a drill-hole aimed at 20500W/4600N, at a depth of 535 feet.

Anomaly No.2. This is due to a small body. If testing is considered desirable, the hole should be aimed at 19600W/4525N, at a depth of 435 feet.

Anomalies No.3 & 4. These require special consideration. The form of anomaly No.3 as shown on the plan is deceptive. Detailed work shows that it is very complicated in shape, and is certainly due to a complex distribution of ironstone, very close to the surface.

Anomaly No.4 is due to a deeper body, but the fit of observed and calculated profiles is very poor. It may be noted that this is the only part of the reservation which is not completely soil covered. A fair area is covered by lateritic pebbles, which may be an indication that soil cover is very thin. These facts, together with the fact that the strike of Anomaly No.3 is at an acute angle to the general strike of the magnetic formation, indicate that some geological complication is present here, which may be favourable for the occurrence of ore, but which makes the magnetic results difficult to interpret. It is recommended that the testing program should be as follows:-

- (1) Geochemical testing over Anomaly No.3.
- (2) Test Anomaly No.4 by a drill-hole aimed at 16200W/4545N, at a depth of 340 feet.
- (3) If favourable results are obtained from (1) or (2) above, test Anomaly No.3 by pattern wagon drilling to a depth of 100 feet.

In view of the doubt as to the shape and aspect of the body causing Anomaly No.4, and the fact that the presence of Anomaly No.3 indicates possible geological complications to the south, it appears that there may be some advantages in drilling Anomaly No.4 from the south, and the collar site has been selected on this basis.

Anomalies Nos. 5 & 6. These are due to smaller bodies, and testing is not recommended at present.

Anomaly No.7. It is doubtful whether this is a major type anomaly at all. No testing is recommended.

Anomaly No.8. This has not been covered in detail, and a drill target has not been selected at present.

Anomaly No.9. This is due to two bodies, which should be tested by drill holes aimed at 9200W/1340N, at a depth of 680 feet, and 9200W/1700N, at a depth of 270 feet.

Anomaly No.10. This should be tested by a drill-hole aimed at 8600W/3175N, at a depth of 435 feet.

Anomalies Nos.11 and 12. It appears very likely that the bodies causing these anomalies have been affected by faulting, with a strong southerly component. Detailed surveys over the whole of this area would be required before drill targets could be selected.

Anomalies Nos.13 and 14. Anomaly No.13 is due to a large body. It should be tested by a drill-hole aimed at 5300W/3225S, at a depth of 800 feet. As it was necessary to take account of the effect of Anomaly No.14 when calculating the theoretical profile along 5300W, the centre of the body causing Anomaly No.14 has been shown as at a depth of 650 feet below 5300W/1270S. However, if it is desired to test Anomaly No.14, the first target should be 4200W/1400S, at a depth of 580 feet. If encouraging results are obtained from this hole, it would be of interest to investigate the anomaly at 5300W/1270S.

The general character of magnetic results in this area suggests that many of the bodies causing the anomalies dip steeply to the north.

4. SPECIFICATIONS OF DRILL-HOLES & PRIORITIES OF DRILLING.

The drill-holes recommended are listed below:-

Area	Drill Hole No.	Anomaly	Collar	Bearing	Depression	Length
No.1	{ DDH1	1A	2500E/2640S	180°(mag)	65°	920 ft.
	{ 2	1B	12300E/4040S	180°(mag)	65°	600 ft.
	{ 3	1B	12300E/4430S	180°(mag)	65°	700 ft.
	{ 4	1C	24200W/5740S	180°(mag)	65°	470 ft.
No.3	{ 5	1	20500W/4835N	180°(mag)	65°	800 ft.
	{ 6	2	19600W/4720N	180°(mag)	65°	600 ft.
	{ 7	4	16200W/4390N	0°(mag)	65°	500 ft.
	{ 8	9	9200W/1670N	180°(mag)	65°	930 ft.
	{ 8A	9	9200W/1820N	180°(mag)	65°	370 ft.
	{ 9	10	8600W/3370N	180°(mag)	65°	620 ft.
	{ 10	13	5300W/2855S	180°(mag)	65°	1200 ft.
	{ 11	14	4200W/1120S	180°(mag)	65°	800 ft.
	{ 11A	14	5300W/960S	180°(mag)	65°	875 ft.

5.

The figure for length is the maximum length which should be drilled if no intersection of ironstone is obtained. If ironstone is intersected, the length of hole should be governed by the results of drilling. The hole should be stopped when it is reasonably certain that the intersection of ironstone is complete, but not until then. The holes must be surveyed during drilling, at least to the extent of checking that they are in fact flattening. A hole which is found to be steepening should be stopped at once, and another site selected.

As the bodies in Area 3 are larger and more remote from the possibility of surface prospecting, testing of Area 3 should have priority. It is recommended that the holes be drilled in the following order.

AREA 3.

DDH 10, 5, 9, 7, 8, 11, 6.

Holes 8A and 11A should be drilled only if encouraging results are obtained in holes 8 and 11.

AREA 1.

DDH 1, 3, 2, 4.

5. RECOMMENDATIONS FOR DRILLING BY THE BUREAU.

The total length of the holes specified above is 9,385 feet. The Bureau's program for 1959 includes provision for drilling to a total extent of 4,000 feet at Tennant Creek. In order to reduce the amount of drilling to this figure, it is recommended that -

- (1) Testing be confined to Area No.3, in view of the larger dimensions of the ironstone bodies indicated.
- (2) The following holes be drilled in the order shown:-

No.10
No. 5
No. 9
No. 7
No. 8

This involves 5 holes, of a total length of 4,050 feet.

6. REFERENCE

DALY, J. (1957)

- Magnetic Prospecting at Tennant Creek 1935-37. BMR Bulletin No.44.

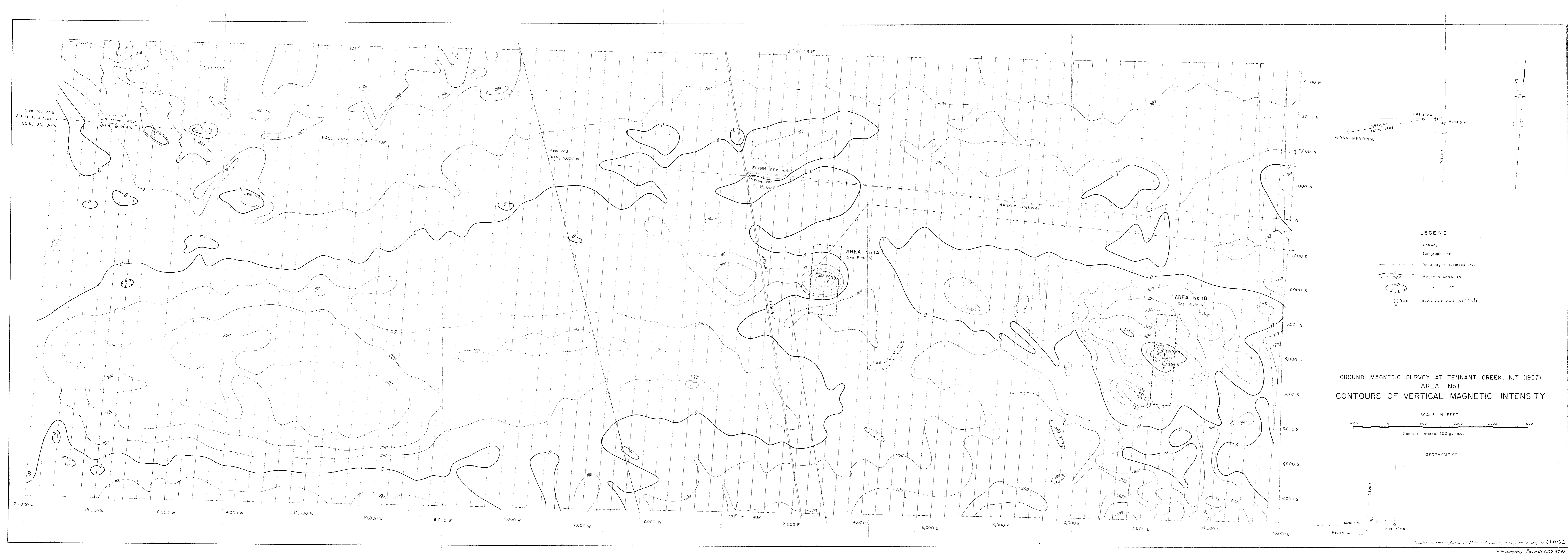
APPENDIX

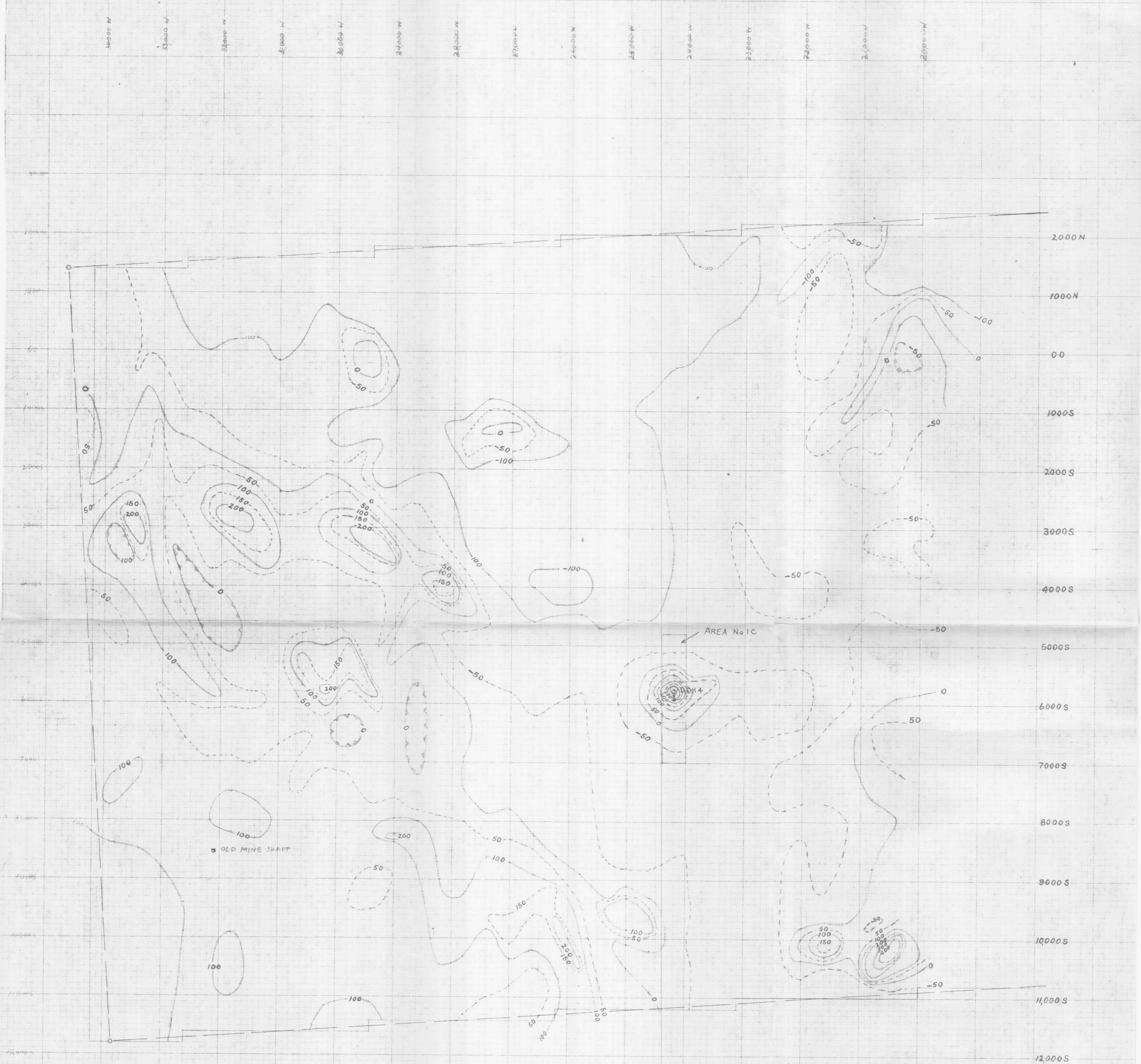
As the wooden pegs used as station marks are liable to be destroyed by various agencies, the recommended drill sites have been marked as follows:-

- (1) each recommended collar site has been marked by a wooden stake painted white.
- (2) the nearest traverse point to each collar site has been marked with a star dropper (steel fence post). On the five sites recommended for immediate drilling (Area 3, drill holes 5,7,8,9,10) the steel post has been painted white, except for a band midway between the ground surface and the top of the post which has been left unpainted. At other sites, the whole post has been painted white.
- (3) a tag showing the appropriate drill hole number has been wired to each post.

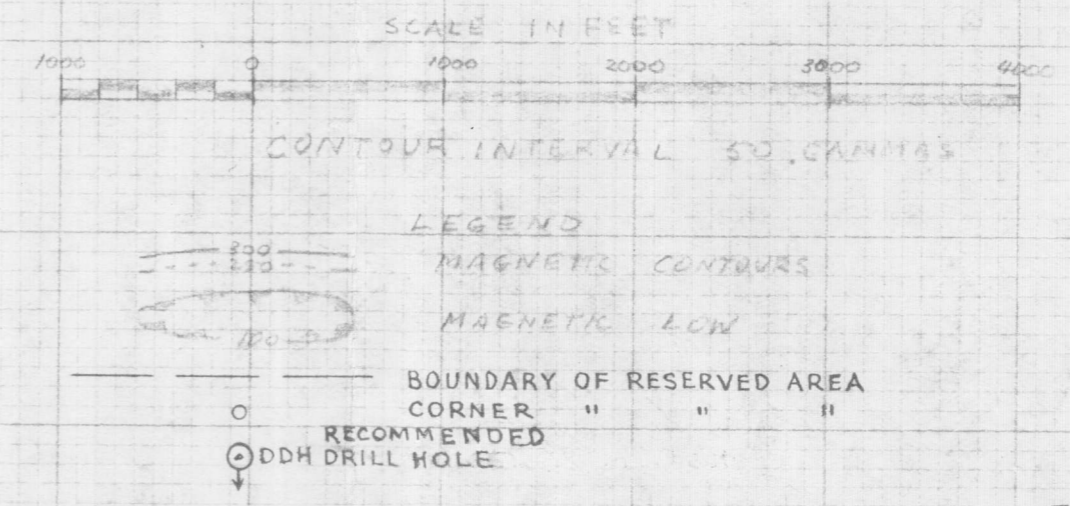
The positions of the various markers are shown below:-

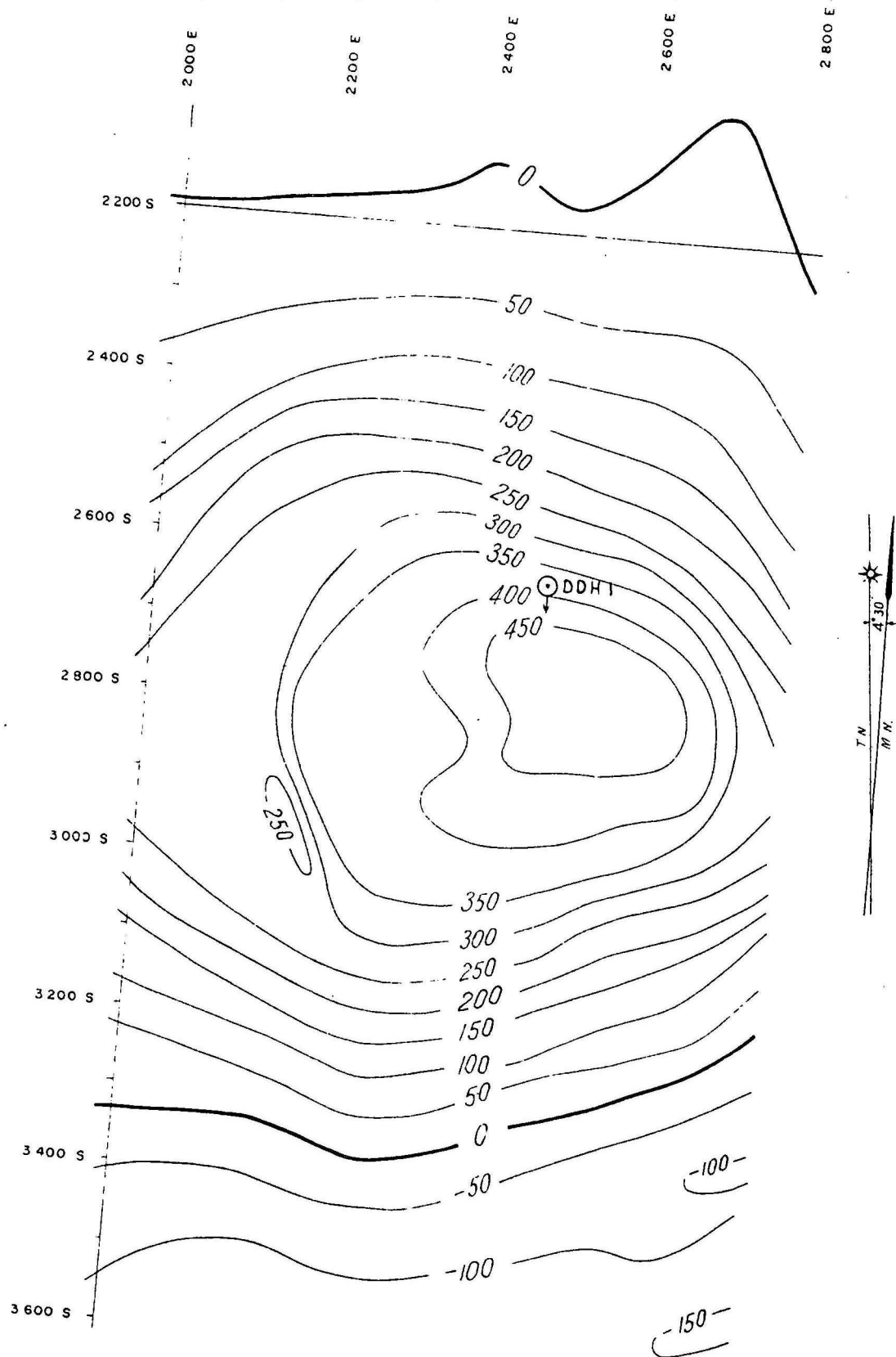
Area	Drill Hole No.	Wooden Stake at Collar Site	Steel Post
1	1	2500E/2640S	2500E/2600S
	2	12300E/4040S	12300E/4000S
	3	12300E/4430S	12300E/4400S
	4	24200W/5740S	24200E/5700S
3	5	20500W/4835N	20500W/4800N
	6	19600W/4720N	19600W/4700N
	7	16200W/4390N	16200W/4400N
	8	9200W/1670N	9200W/1700N
	8A	9200W/1820N	9200W/1800N
	9	8600W/3370N	8600W/3400N
	10	5300W/2855S	5300W/2800S
	11	4200W/1120S	4200W/1000S
	11A	5300W/ 960S	5300W/1000S



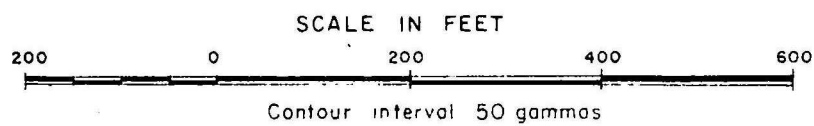


GROUND MAGNETIC SURVEY AT TENNANT CREEK, N.T. (1958)
 AREA No. 1 (WESTERN EXTENSION)
 CONTOURS OF VERTICAL MAGNETIC INTENSITY.

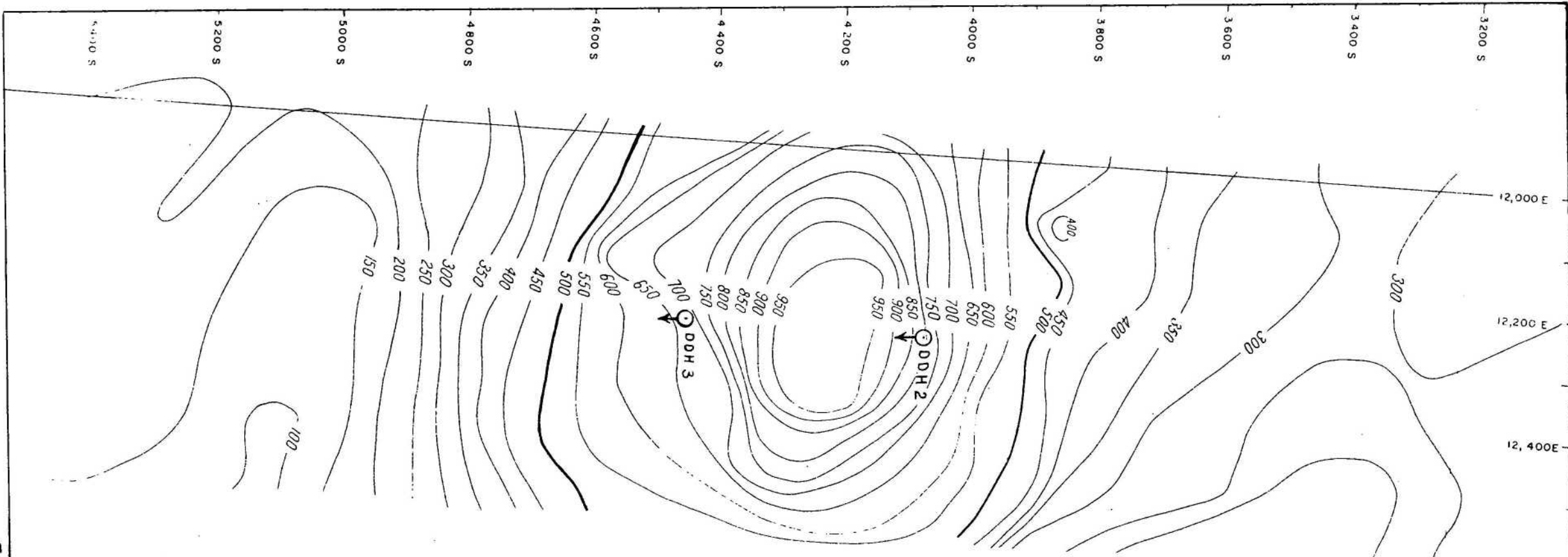




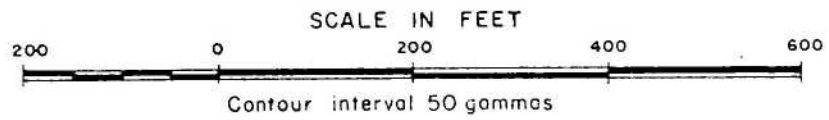
GROUND MAGNETIC SURVEY AT TENNANT CREEK, N.T. (1957)
 CONTOURS OF VERTICAL MAGNETIC INTENSITY
 AREA No 1A



GEOPHYSICIST



GROUND MAGNETIC SURVEY AT TENNANT CREEK, N.T. (1957)
 CONTOURS OF VERTICAL MAGNETIC INTENSITY
 AREA No 1B



McLennan

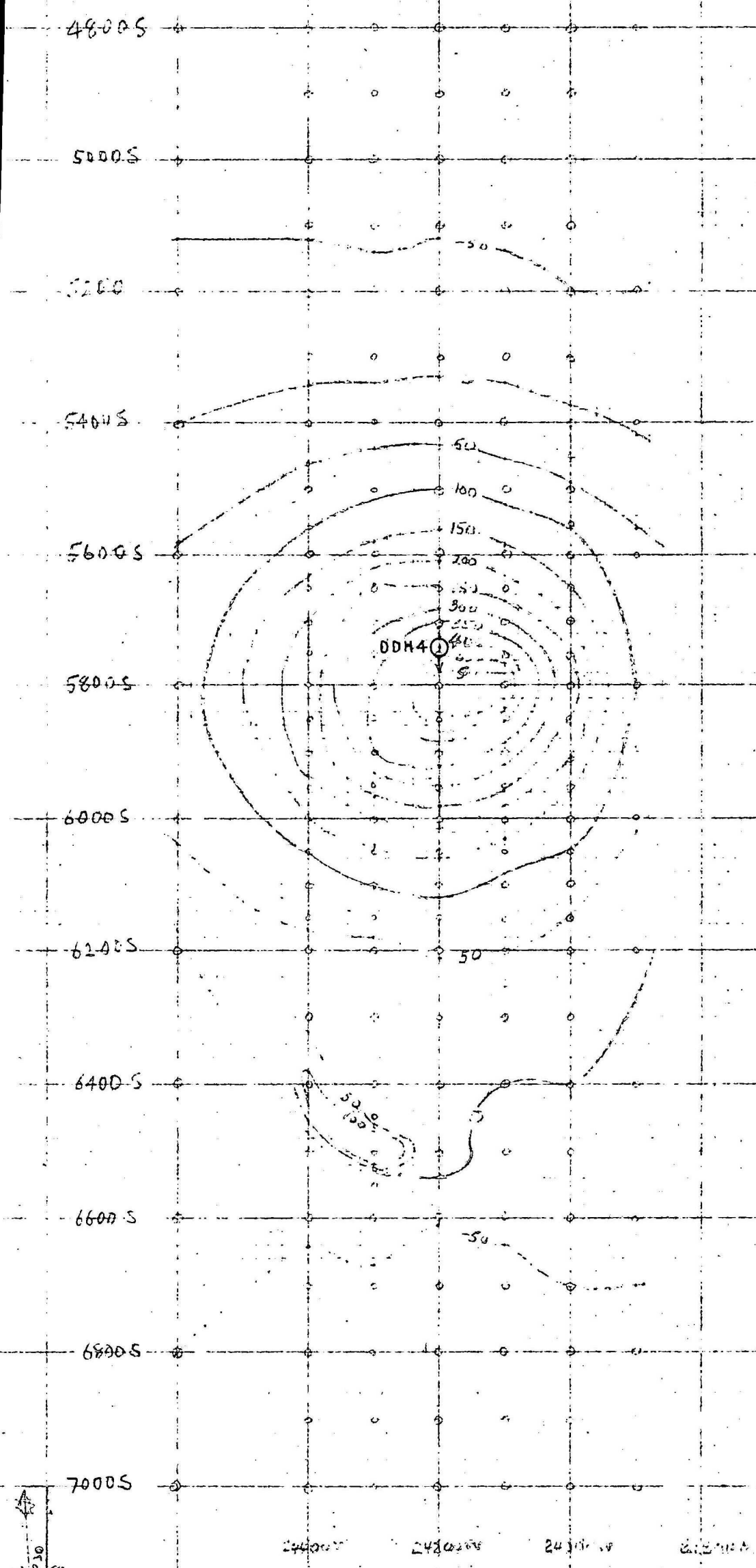
GEOPHYSICIST

Geophysics Section, Bureau of Mineral Resources, Geology and Geophysics.

To accompany Records 1959 N° 45

G110-55

PLATE 4



CONTINUED FROM MAP SURVEY AREA, NEW COAST, N.T. DISTRICT
 CONTINUED OF VERTICAL MAGNETIC INTENSITY
 AREA NO. 1C

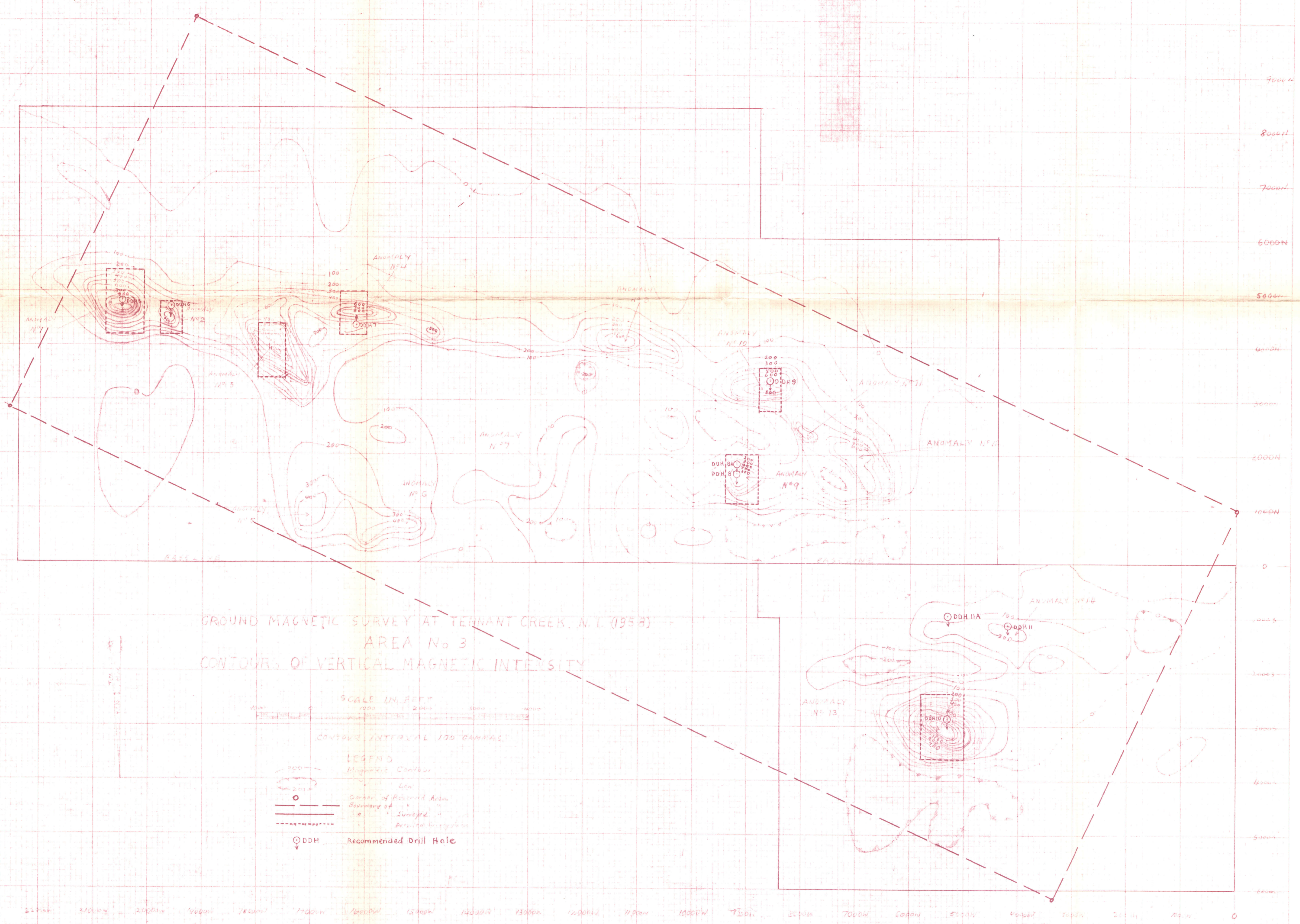
SCALE IN FEET

CONTINUED FROM MAP SURVEY AREA, NEW COAST, N.T. DISTRICT

DDH RECOMMENDED DRILL HOLE

G110-56

To accompany Records 1959 N°45



GROUND MAGNETIC SURVEY AT TENANT CREEK, N.T. (1958)

AREA No. 3 ANOMALY No. 1

CONTOURS OF VERTICAL MAGNETIC INTENSITY

CONTOUR INTERVAL 100 GAMMAS

SCALE IN FEET



LEGEND

300 — Magnetic Contour
o Magnetometer Station

DDH Recommended Drill Hole

5400N

5200N

5000N

4800N

4600N

4400N

4200N

20800E

20750E

20600E

20500E

20400E

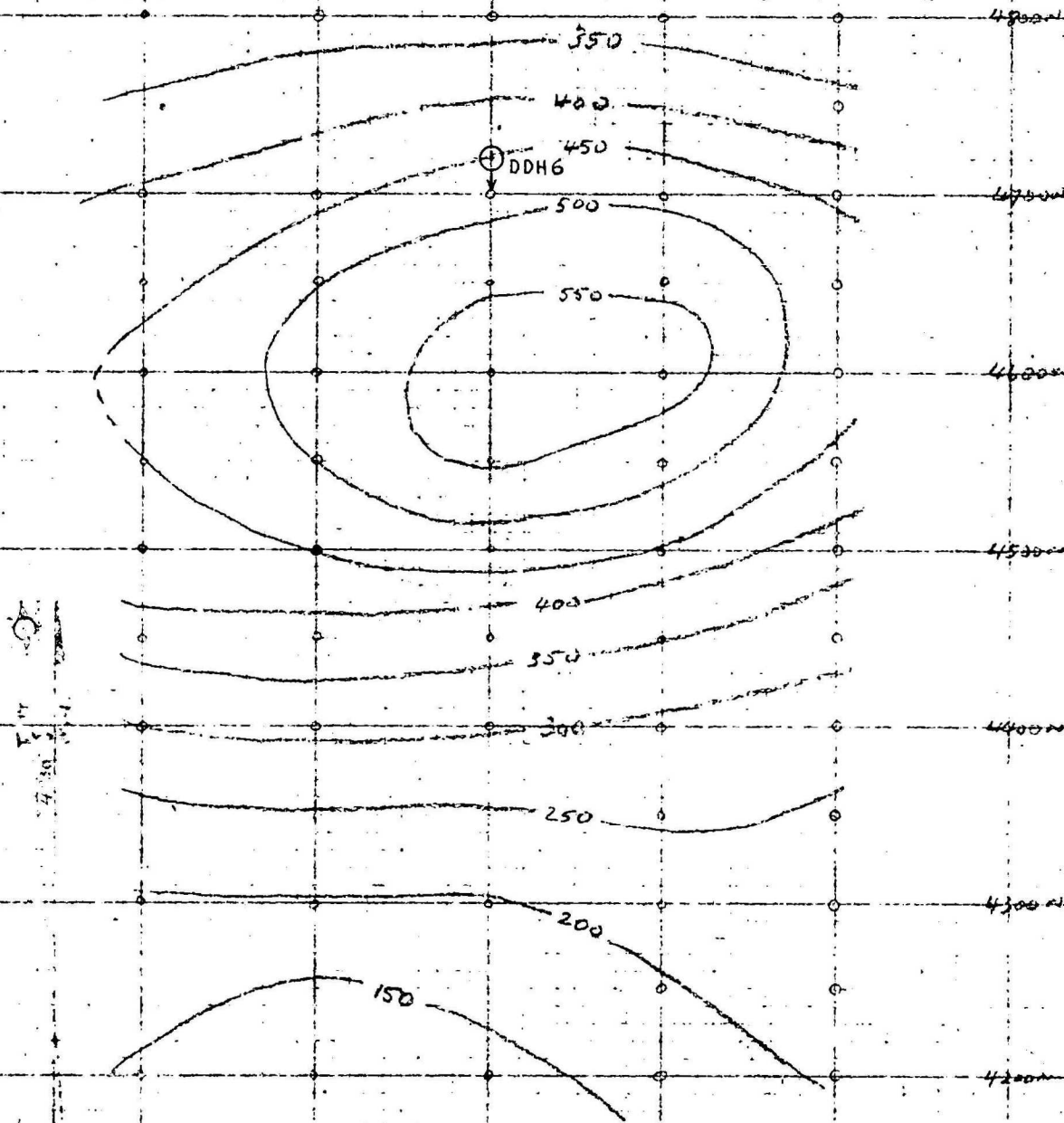
20300E

20200E

20100E

G110-58

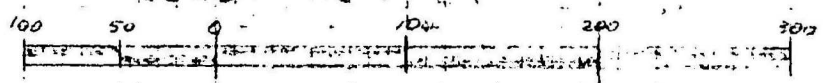
To accompany Records 1959 No. 45



GROUND MAGNETIC SURVEY AT TENNANT CREEK,
N.T. (1958)
AREA No 3 ANOMALY No. 2
CONTOURS OF VERTICAL MAGNETIC INTENSITY

CONTOUR INTERVAL 50 GAMMAS

SCALE IN FEET



LEGEND

MAGNETIC CONTOUR

MAGNETIC STATION

RECOMMENDED DRILL HOLE

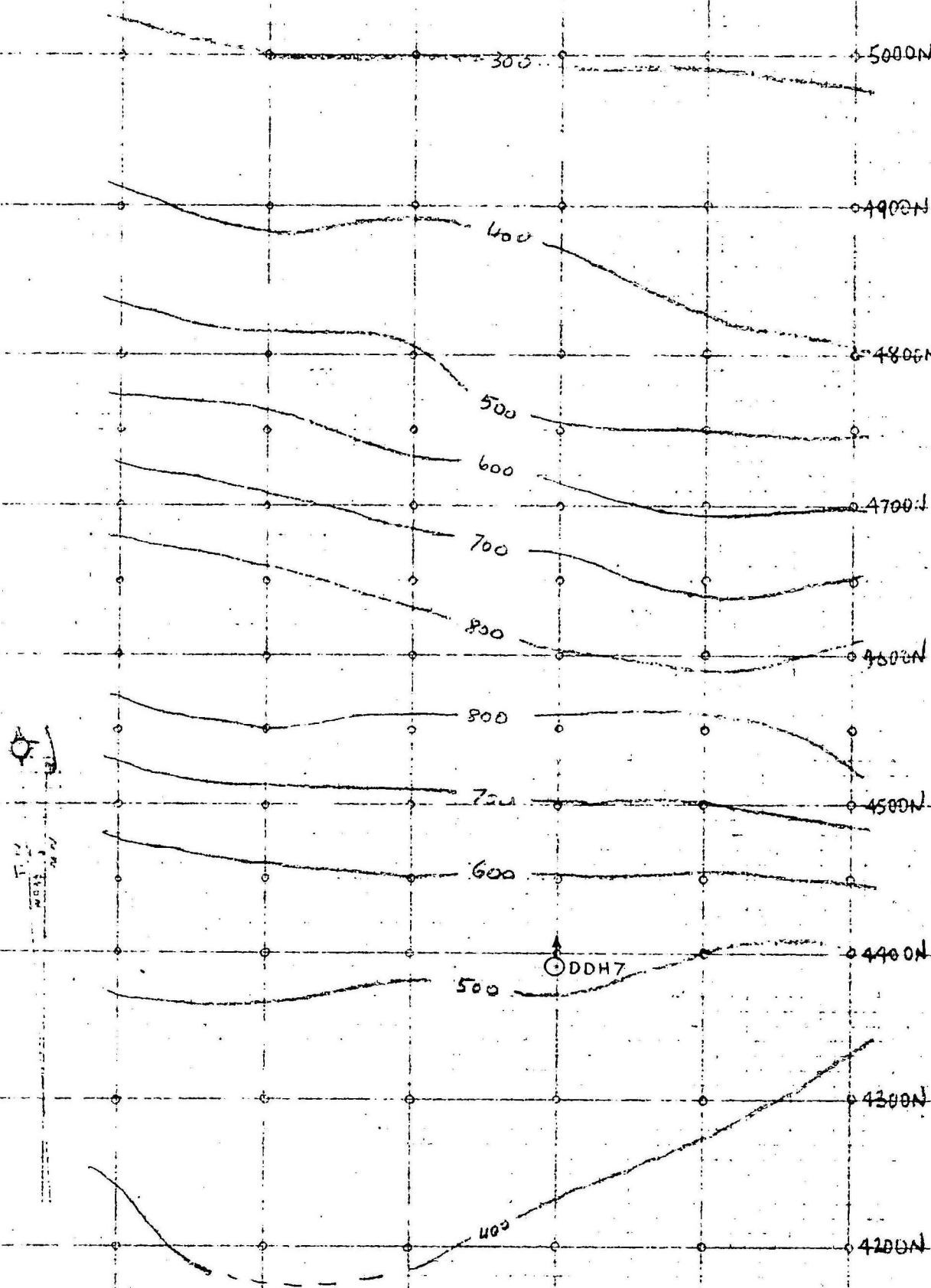
DDH

G110-59

To accompany Records 1959

Nº 45

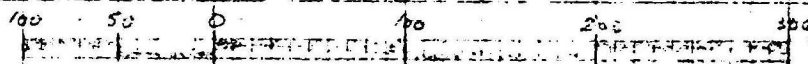
16500W 16400W 16300W 16200W 16100W 16000W



GROUND MAGNETIC SURVEY AT TENNANTCREEK, N.T. (1958)
 AREA No. 3 ANOMALY No. 4
 CONTOURS OF VERTICAL MAGNETIC INTENSITY

Contour Interval 100 gammas

SCALE IN FEET

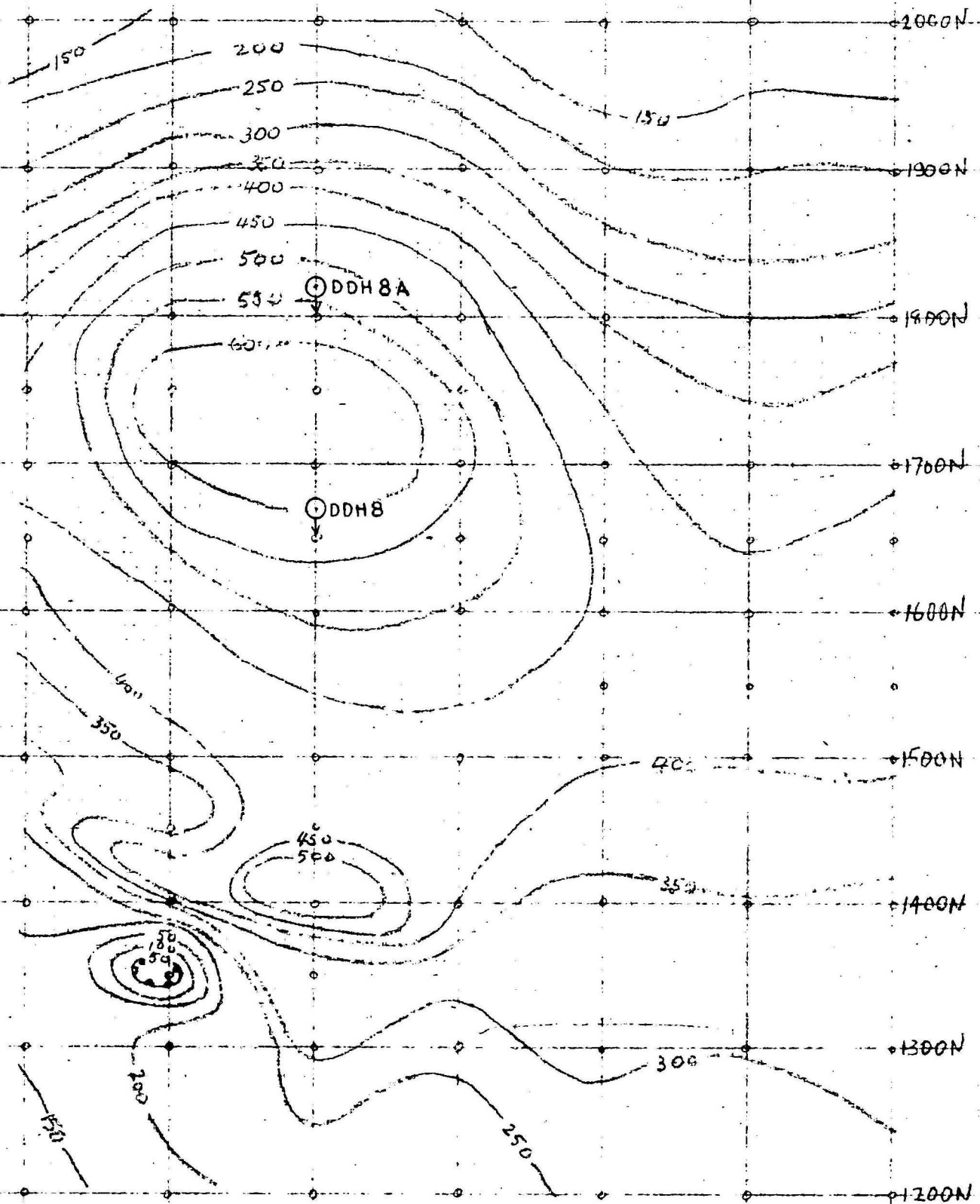


LEGEND

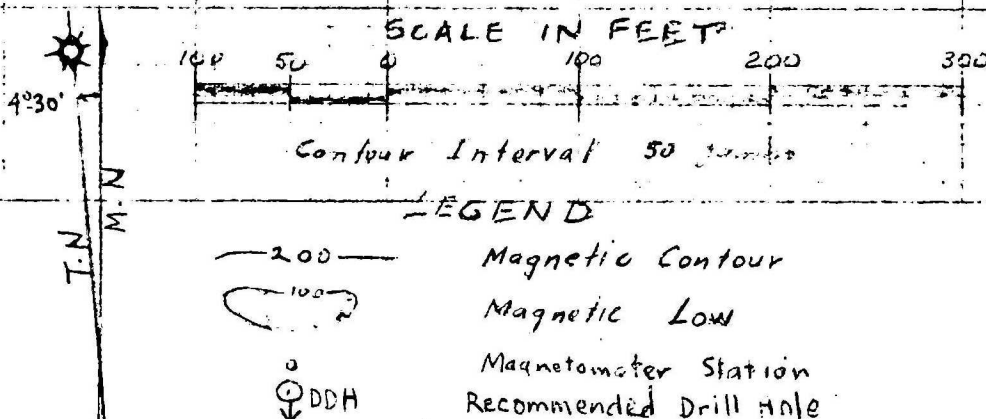
- 300 — MAGNETIC CONTOUR
- MAGNETOMETER STATION
- ↑ DDH RECOMMENDED DRILL HOLE

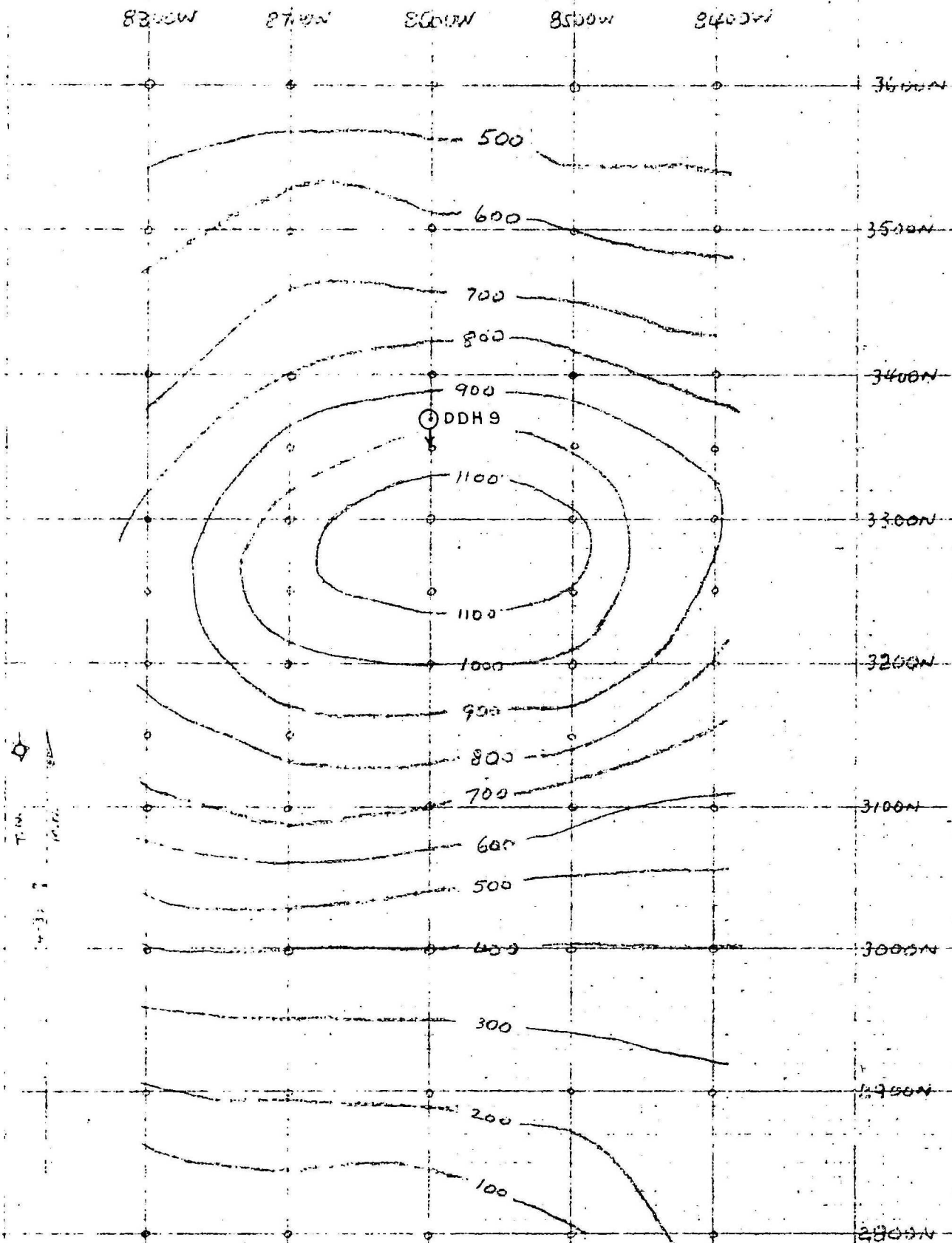
G110-60
 To accompany Records 1959

9400W 9300W 9200W 9100W 9000W 8900W 8800W

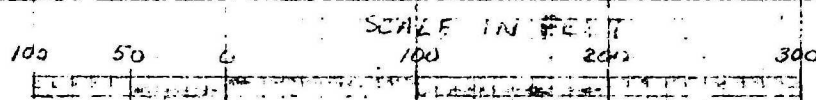


GROUND MAGNETIC SURVEY AT TENNANT CREEK, N.T. (1958)
 AREA No. 3 ANOMALY No. 9
 CONTOURS OF VERTICAL MAGNETIC INTENSITY.





GROUND MAGNETIC SURVEY AT TENANT CREEK, N.T. (1959)
 AREA No. 3 ANOMALY No. 10
 CONTOURS OF VERTICAL MAGNETIC INTENSITY



Contour Interval 50 gammas.

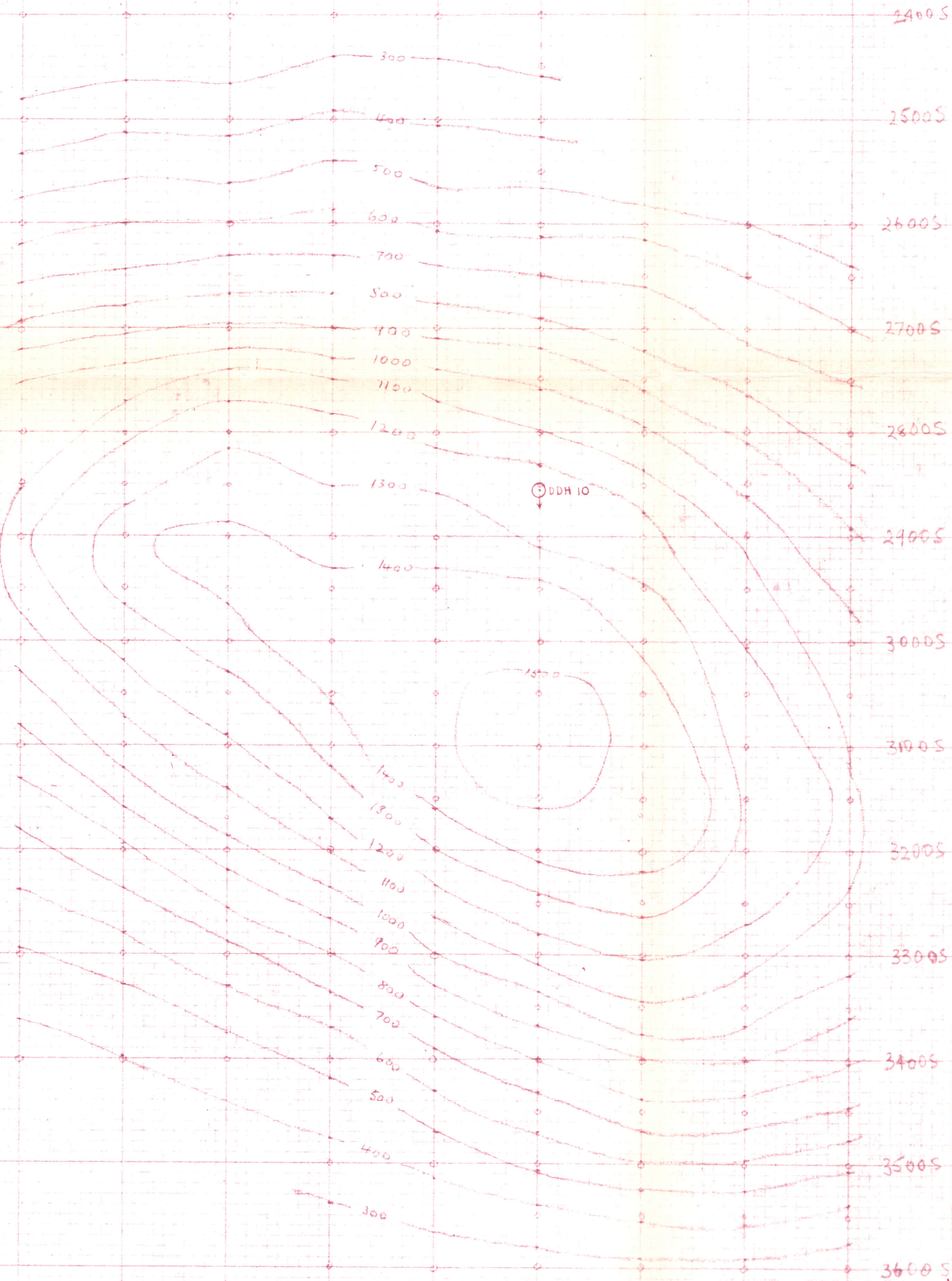
LEGEND

— 200 — MAGNETIC CONTOUR
 o Magnetometer Station

o DDH Recommended Drill Hole

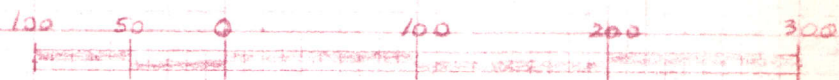
G110-62
 To accompany Records 1959.
 No. 45

5800W 5700W 5600W 5500W 5400W 5300W 5200W 5100W 5000W



GROUND MAGNETIC SURVEY AT TENNANT CREEK, N.T. (1958)
AREA No 3, ANOMALY No 13
CONTOURS OF VERTICAL MAGNETIC INTENSITY.

SCALE IN FEET



Contour interval 100 gamma

LEGEND

- Magnetic contour
- Magnetometer station
- ⊙ DDH Recommended Drill Hole



G110-63

To accompany Records 1959 N°45.

