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NORTHERN TERRITORY GEOLOGICAL SURVEY REPORT GS 80/6

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DIAMOND DRILLING INVESTIGATIONS, 1978

BIRRINDUDU MAGNETIC ANOMALY, N.T.

by

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DEPARTMENT OF MINES AND ENERGY

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1. SUMMARY

A discrete aerial magnetic anomaly situated approximately 24 kilometres east of Birrindudu homestead was delineated in the course of interpretation of regional magnetic data. The anomaly is located in an area underlain by basalt of the Cambrian Antrim Plateau Volcanics.

A ground magnetic survey was carried out in July, 1978 to define the anomaly on the ground. Concurrently soil samples were taken along two lines of the grid established for the magnetic survey.

Diamond drilling of the anomaly took place in November, 1978. Results indicate that the anomaly is caused by local enrichment of magnetite in the basalt particularly in association with brecciated zones; rather than by a deep-seated basement source. The cause of this magnetite enrichment has not been satisfactorily explained.

2. INTRODUCTION

Following a ground magnetic survey in July, 1978 a drilling programme of two 250 metre diamond drill holes was planned to test the source of an unexplained magnetic anomaly.

Drilling commenced in November, 1978 and the programme was terminated when D.D.H.1 had reached a depth of 196 metres as drilling results had defined and downgraded in an economic sense the source of the magnetic anomaly.

3. LOCATION AND ACCESS

Map : Nongra 1:100,000 Topographic Survey Sheet 4861

Co-ordinates : Lat. : 18° 21' 40"

Long. : 129° 38' 40"

Universal Grid Reference : EE 675698

Birrindudu homestead is situated approximately 680 kilometres in a SSW direction from Darwin. From Birrindudu homestead an ENE trending track is followed for 11 kilometres and passes through three gates. At this point a track follows a due east fence line for 12.8 kilometres at which point the fence heads true south. (OOS/500E Plate 2). The southern fenceline forms the baseline for the survey grid. The track would be impassable during extended wet periods.

4. REGIONAL GEOLOGY

The magnetic anomaly is located in an area covered by Quaternary sands, silts and gravels and underlain by flow basalts of the Cambrian Antrim Plateau Volcanics which outcrop sporadically. Lateritic capping is common in the area.

The Antrim Plateau Volcanics unconformably overly Proterozoic sediments and possibly metamorphosed sediments of the Archean? Tanami Complex in the area of the anomaly, both of which outcrop further to the south. Regional magnetic trends suggest that the anomaly area may be at or near the contact between the Carpentarian Gardiner Sandstone and the Tanami Complex, at depth below the overlying basalts of the Antrim Plateau Volcanics.

Woyzbun (1978A) discussed the nature of the magnetic anomaly and postulated that it was possible that metallic mineralization other than iron may be associated with the anomaly source.

5. GEOCHEMICAL SURVEY

During the ground magnetic survey carried out in July, 1978 (Woyzbun, 1978B), soil samples were taken at 100 metre spacings along two of the survey grid lines. Samples were taken from the "A" horizon in a medium ranging from fine-grained quartz sands to coarse lateritic gravels and consequently different background geochemical values were recorded from samples taken from the different mediums. No broad scale geochemical anomalies associated with the magnetic anomaly were recorded. Two single sample lead anomalies were recorded at 2000E on line 1000S and at 2700E on line 2500S. The cause of these anomalies has not been investigated further but is considered unlikely to be significant.

6. DIAMOND DRILLING RESULTS

One hole totalling 196 metres was completed by the Drilling Section and good core recovery was achieved throughout the hole. All core was geologically logged and 50 split core samples (15cm. sections over 4 metre intervals) were forwarded to the East Point Laboratories, Department of Transport and Works for assay. The samples were assayed for gold and copper.

D.D.H. 1 was a vertical hole sited at 2500S/1450E near the centre of a 350nT magnetic high. Geophysical interpretation (Woyzbun, 1978B) had indicated that the magnetic source was situated at a vertical depth of 70-100 metres at this site. Quaternary sand and silt were intersected between 0 and 13 metres and from this point the hole continued in dark, fine grained basalt to 196 metres. 25 magnetic susceptibility measurements were taken at irregular intervals throughout the basalt intersection and all showed high susceptibility values ranging from $1.2 - 7.4 \times 10^{-3}$ c.g.s. units. These values indicate that the basalt is definitely the source of the magnetic anomaly and when samples of the basalt were crushed the magnetic mineral was found to be magnetite.

A 15cm. split core sample was taken at 4 metre intervals over the whole of D.D.H.1 and each sample was assayed for gold and copper. No gold was detected in any sample and copper showed only normal background values.

7. CONCLUSIONS

Diamond drilling has shown that the source of the magnetic anomaly is concentrations of magnetite within basalt of the Antrim Plateau Volcanics. However why magnetite should be concentrated in the basalt in the confined area of the magnetic anomaly is not explained by the drilling results.

Concentration of magnetite in the basalt could be explained by fractional crystallization but appears an unlikely mechanism as the area of the magnetic anomaly is one small area of magnetite-enrichment in a surface area of several hundred square kilometres of flow basalt. It is more likely that the magnetite has been derived from some basement feature rich in magnetite, possibly rocks of the Tanami Complex. Possible uplift of basement with associated brecciation in the basalt (as noted in drill logs) may have been accompanied by the circulation of iron-rich fluids. A further possible explanation is that the magnetic anomaly is sited over a volcanic vent with enrichment of magnetite near the vent.

Diamond drilling has also shown that the flow basalts of the Antrim Plateau Volcanics are much thicker than previously indicated i.e. 180 + metres as opposed to 30 + metres in this area.

8. REFERENCES

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1978B Birrindudu aerial magnetic
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APPENDIX 1

SOIL GEOCHEMICAL VALUES

<u>Line</u>	<u>Station</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ni</u>	<u>Cr</u>	<u>Mn</u>	<u>%Fe₂O₃</u>	
<u>000S</u>	500E	25	40	10	20	170	250	26.5	
	600E	20	40	12	16	180	150	28.6	
	700E	14	30	10	14	120	250	25.7	
	800E	18	30	10	18	80	200	22.9	
	900E	25	30	12	20	170	200	25.7	
	1000E	30	40	10	16	140	150	28.6	
	1100E	40	30	14	20	190	150	41.5	
	1200E	35	30	10	16	210	150	48.6	
	1300E	35	30	10	16	120	100	50.1	
	1400E	35	30	10	14	130	150	44.3	
	1500E	20	40	18	14	<50	400	5.0	
	1600E	10	12	10	12	<50	300	7.2	
	1700E	20	20	10	14	<50	250	8.6	
	1800E	20	20	14	14	<50	300	17.2	
	1900E	20	30	12	16	50	200	20.0	
	2000E	25	520	10	16	130	200	22.9	
	2100E	25	30	10	18	80	150	21.6	
	2200E	30	30	12	20	70	150	20.7	
	2300E	20	30	10	18	<50	200	15.7	
	2400E	30	30	10	16	80	200	20.7	
	2500E	20	30	10	20	70	300	19.3	
	2600E	40	35	20	35	60	300	17.9	
	2700E	20	30	12	16	70	150	16.4	
	<u>500S</u>	500E	20	12	16	16	<50	300	5.0
		600E	25	14	16	20	<50	300	5.0
		700E	30	20	20	20	<50	300	7.2
		800E	25	20	18	20	<50	450	7.2
900E		20	18	20	25	<50	450	7.2	
1000E		20	10	16	20	<50	400	7.2	
1100E		25	20	16	25	<50	300	10.0	
1200E		25	20	12	20	50	400	10.0	
1300E		16	20	14	20	<50	400	10.7	
1400E		20	25	14	20	120	300	15.7	
1500E		18	25	12	18	120	300	14.3	
1600E		20	30	12	16	170	250	20.0	
1700E		20	20	12	16	140	250	21.5	
1800E		20	25	10	14	100	250	14.3	
1900E		20	30	12	20	<50	300	12.9	
2000E		20	30	10	16	<50	550	23.6	
2100E		30	40	10	16	110	150	27.9	
2200E		25	40	10	14	70	150	25.7	
2300E		25	30	8	12	140	150	28.6	
2400E		20	12	8	<10	190	150	23.6	
2500E		8	14	4	<10	250	150	27.9	
2600E		40	70	10	14	240	150	27.9	
2700E	20	280	10	20	180	200	21.5		
2800E	20	25	10	14	190	200	22.9		
2900E	25	40	12	16	210	300	23.6		

All values in ug/g unless otherwise stated.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT BIRKIN DUBU

REMARKS

HOLE N° 1

CO-ORDINATES

R.L. GROUND

LOCATION

ANGLE FROM HORIZONTAL VERTICAL DIRECTION

DESCRIPTION OF CORE	LOG	CORRECTION	SUSC. UNITS	SAMPLES
3.3 <u>EDGE of brown clay and pisolitic limonite</u> <u>2-5mm size,</u>	-			↑
<u>marked brown/white fine SANDY and</u> <u>CLAY CLAY with limonite pisolites.</u>	- . - . - .			Ds Overturning sand and silt.
10 <u>Marked CLAY</u>	- - - -			↓
15 <u>Brown, porous, low density CLAY; texture</u> <u>indicates weathered basalt; potential</u> <u>confined - water bore drilled to 25.6m</u> <u>has SWL approx 19.0m</u>	- - - -	NO		↑
19 <u>Greenish-brown, weathered, medium to</u> <u>fine grained BASALT; close spaced (20-</u> <u>50mm) joints are coated with grey</u> <u>clay and black manganese oxide.</u>	- / - / - / - /		1.8x10 ³	Etc Antimater Volcanics tholeiitic basalt with vesicular flow tops and bottoms
18 <u>Dark grey fine fine grained BASALT;</u> <u>joints have 1-2mm thick coats of pyrite,</u> <u>chlorite and quartz.</u>	- / - / - / - /	NO	4.8x10 ³	
57.5-58.0 <u>Buccinated zones in greenish</u> →	- . - . - .		2.6x10 ³	
59.5-61.0 <u>grey ophiolitic basalt.</u> →	- . - . - .		6.5x10 ³	
71.8 <u>Buccinated zone</u>	- . - . - .		7.7x10 ³	
75.0 <u>Buccinated zone</u>	- . - . - .		7.9x10 ³	
77.2-77.8 <u>Buccinated zone</u> →	- . - . - .		6.4x10 ³	
81.0 <u>Buccinated zone.</u>	- . - . - .		7.4x10 ³	
84.0 <u>Buccinated zone.</u>	- . - . - .		3.9x10 ³	
			4.8x10 ³	
			6.1x10 ³	
			3.5x10 ³	

NO casing to 19.0m

NO casing to 75.0m

NO casing below 75.0

REFERENCES

LOGGED BY LS

SHEET 1 OF 2

DRAWING N°

GEOLOGICAL LOG OF DRILL HOLE

PROJECT BIRRINGUDU REMARKS _____
 HOLE NO. 1 CO-ORDINATES _____ R.L. GROUND _____
 LOCATION _____ ANGLE FROM HORIZONTAL _____ DIRECTION _____

DESCRIPTION OF CORE	LOG	CORRECTION % CORRECTED	CORRECTION % CORRECTED	SAMPLES STRAT.
101.0 102.5 <i>Brecciated zone.</i>	A A A		2.6×10^{-3}	
112.0 <i>Brecciated zone; chloritic with greenish copper staining.</i>	A O A O A A		1.2×10^{-3}	Elev Antium Detecov Volcanics.
117.5 118.6 <i>Banded chert or ? rhyolite.</i>	// //		7×10^{-5}	
122.4 123.0 124.0 <i>Vesicular and amygdaloidal basalt; chlorite amygdalae.</i>	O O O O O O		1.4×10^{-3}	
<i>Cherty zone.</i>	O O O		1.7×10^{-3}	
<i>Amygdaloidal basalt.</i>	O O O		1.7×10^{-2}	
<i>Uniform section of fine grained basalt; veins contain malachite nodules with calcite centres.</i>	- - -		1.4×10^{-3}	
	- - -		1.7×10^{-2}	
	- - -		1.4×10^{-3}	
	- - -		1.5×10^{-3}	
	- - -		1.7×10^{-3}	
	- - -		1.5×10^{-3}	
? EOH 194.40 m ?				

No casing

REFERENCES

LOGGED BY km

SHEET 2 OF 2

DRAWING NO.

APPENDIX 3

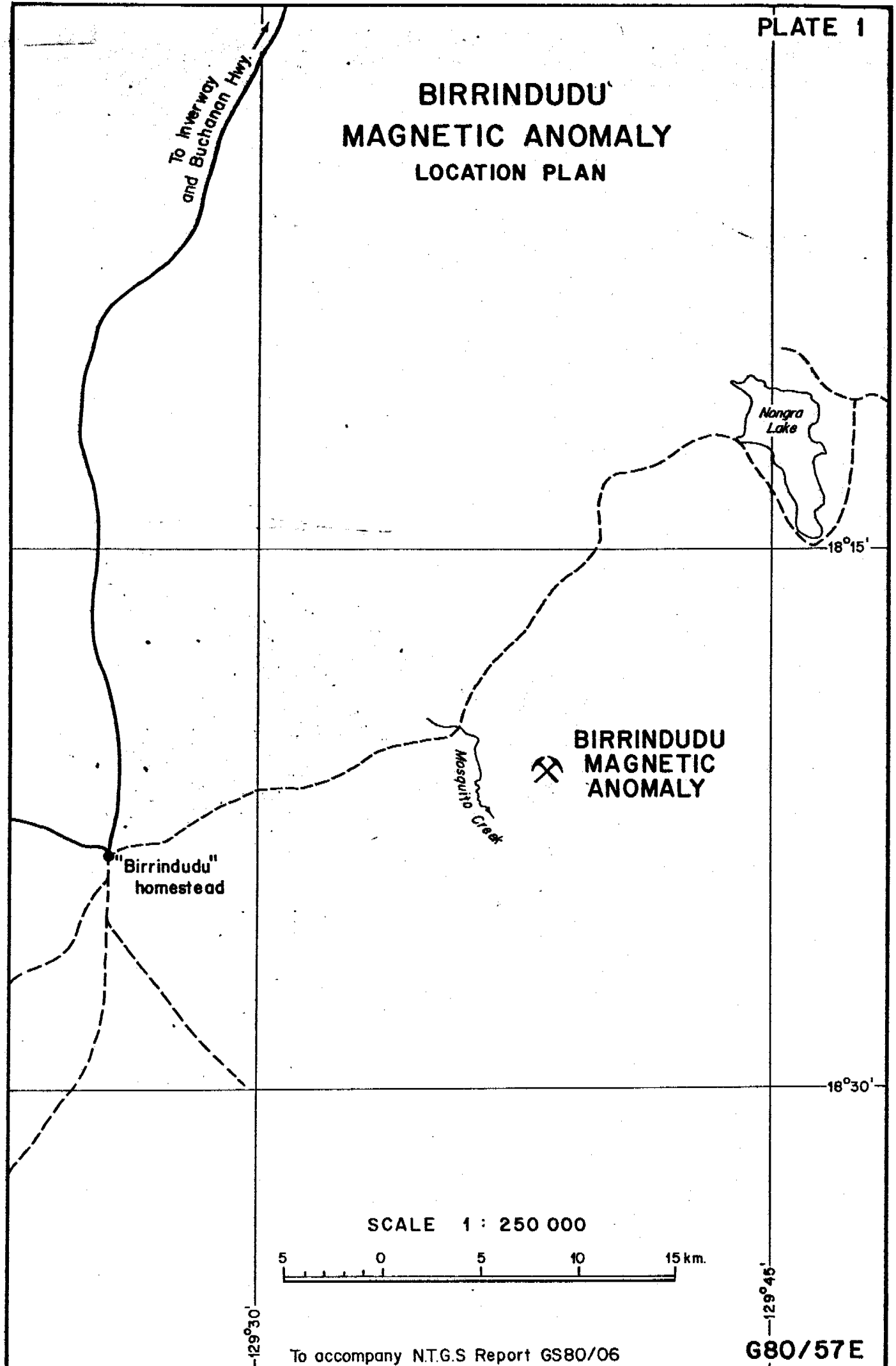
DIAMOND DRILL HOLE ASSAYS

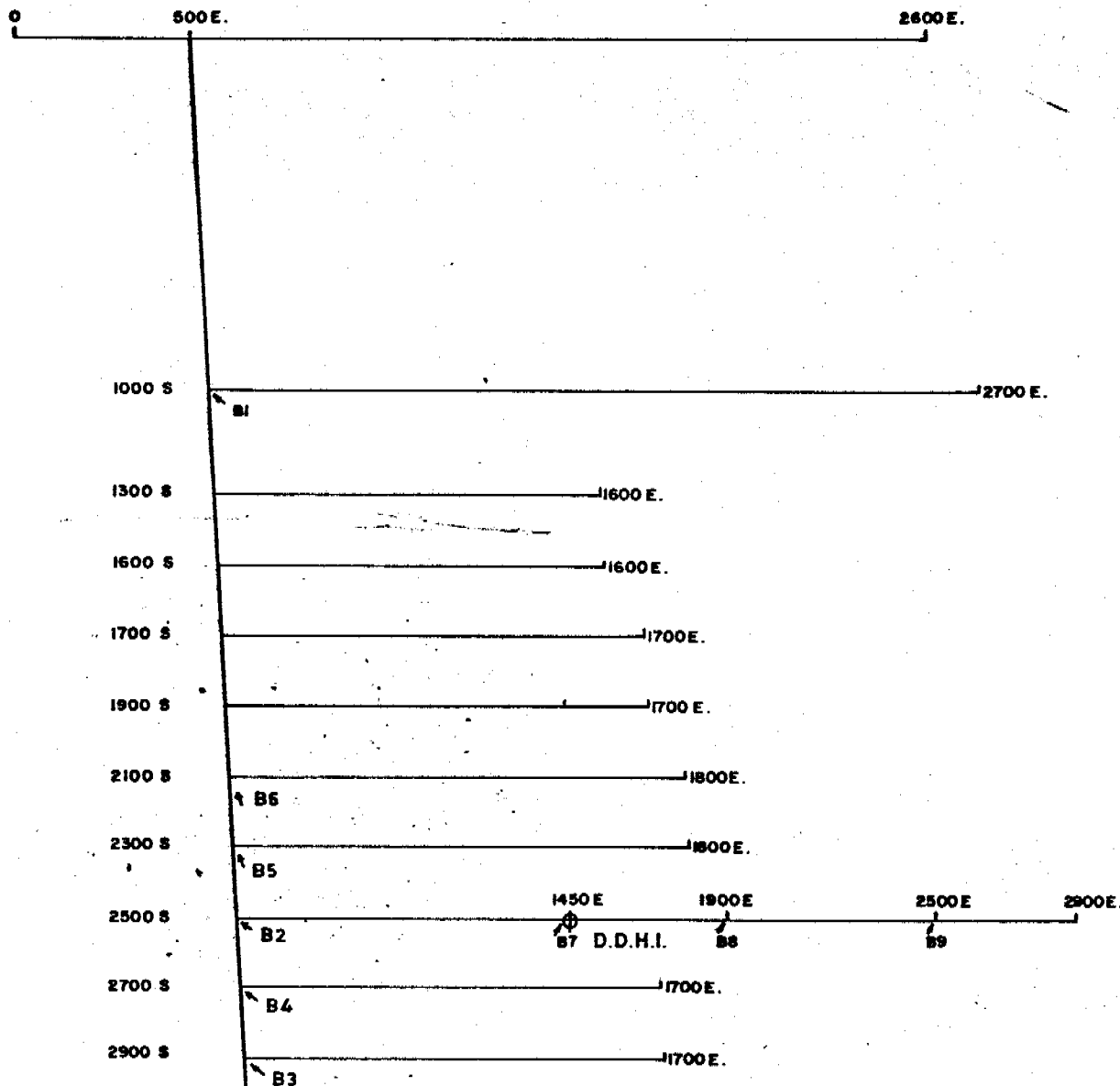
Birrindudu D.D.H.1

<u>Interval</u> (metres)	<u>Au</u> (g/T)	<u>Cu</u> (ug/g)
1-4	-0.2	30
4-8	"	10
8-12	"	35
12-16	"	14
16-20	"	20
20-24	"	14
24-28	"	30
28-32	"	20
32-36	"	12
36-40	"	20
40-44	"	25
44-48	"	25
48-52	"	25
52-56	"	25
56-60	"	8
60-64	"	10
64-68	"	16
68-72	"	18
72-76	"	16
76-80	"	20
80-84	"	- 2
84-88	"	20
88-92	"	30
92-96	"	4
96-100	"	25
100-104	"	18
104-108	"	30
108-112	"	25
112-116	"	10
116-120	"	30
120-124	"	- 2
124-128	"	70
128-132	"	30
132-136	"	40
136-140	"	30
140-144	"	25
144-148	"	20
148-152	"	20
152-156	"	30
156-160	"	30
160-164	"	25
164-168	"	25
168-172	"	30
172-176	"	20
176-180	"	20
180-184	"	25
184-188	"	20
188-192	"	30
192-196	"	30
196	"	30

NOTE:- Preceeding a number denotes less than the detection limit.

BIRRINDUDU MAGNETIC ANOMALY LOCATION PLAN





From "BIRRINDUDU" homestead follow E.N.E. trending road through 3 gates for 11 Kilometres.
Then follow fence line due East (true) for 12.8 Kilometres to reach 005/500E.
Fence then heads due South (true) which is grid Base line.

* B1 denotes DEPT of MINES and ENERGY aluminium tag marked "BIRRINDUDU N°1."

To accompany N.T.G.S. report N° GS 80/6.

Drawn by Dept of Mines and Energy Drafting Section. FEBRUARY 1980.

**SURVEY GRID
BIRRINDUDU MAGNETIC ANOMALY
N.T.**

SCALE - 1:20,000

PLATE 3.

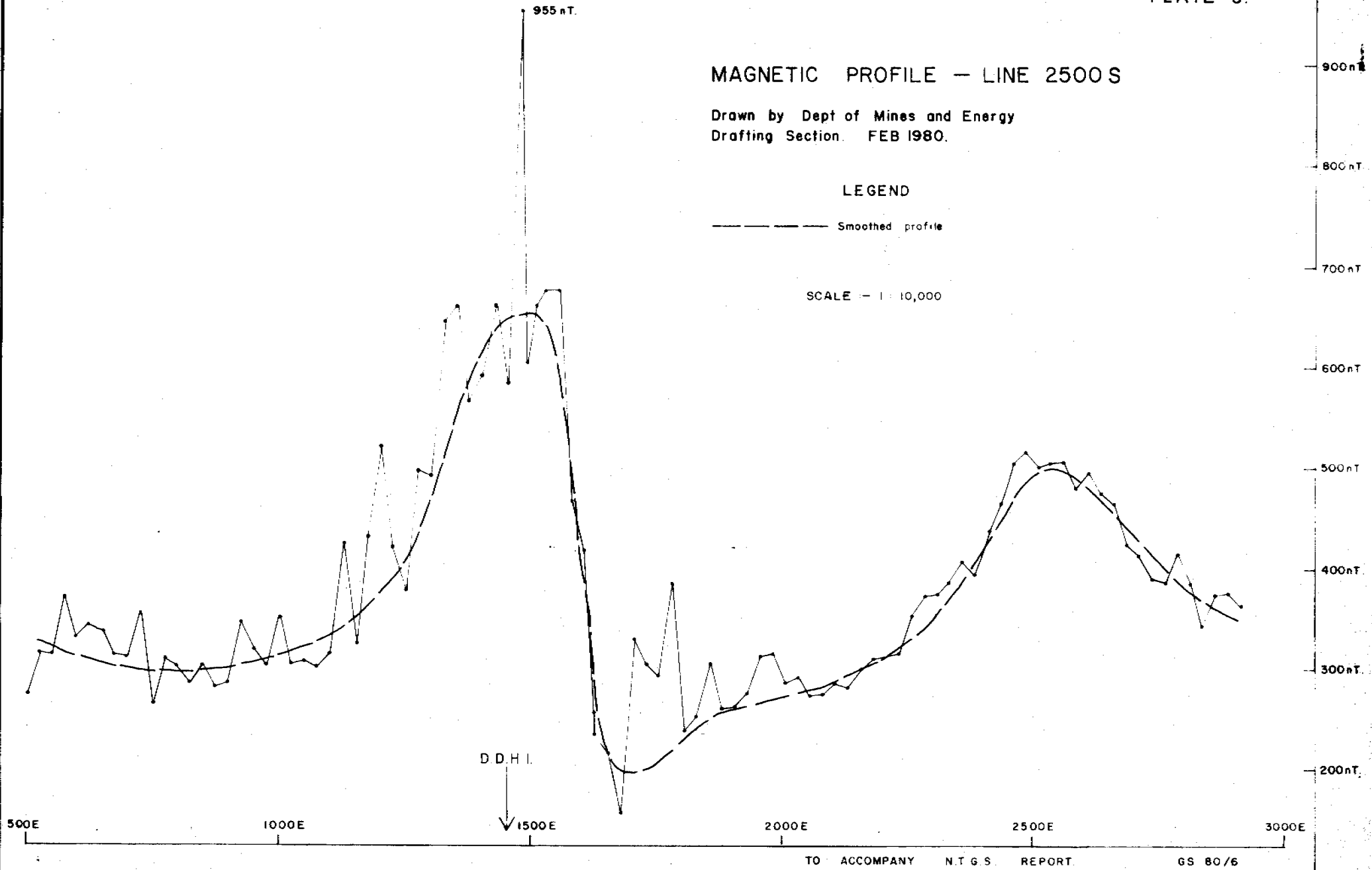
MAGNETIC PROFILE — LINE 2500 S

Drawn by Dept of Mines and Energy
Drafting Section. FEB 1980.

LEGEND

----- Smoothed profile

SCALE — 1 : 10,000



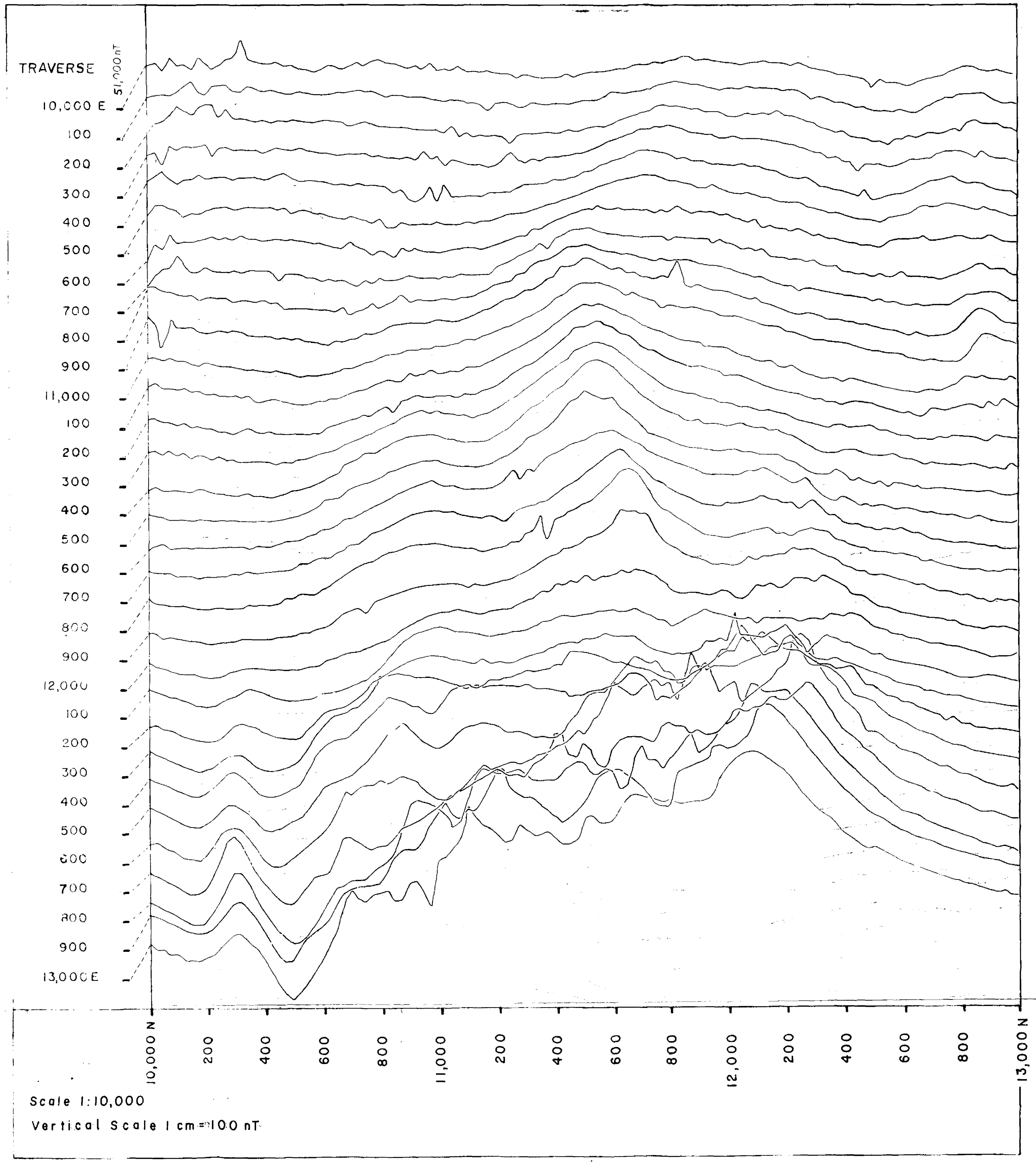
TO ACCOMPANY N.T.G.S. REPORT. GS 80/6

DWG. N° G80/

SURVEY 4 AREA - TENNANT CREEK

Ground Magnetometer Survey

Profiles of Total Intensity

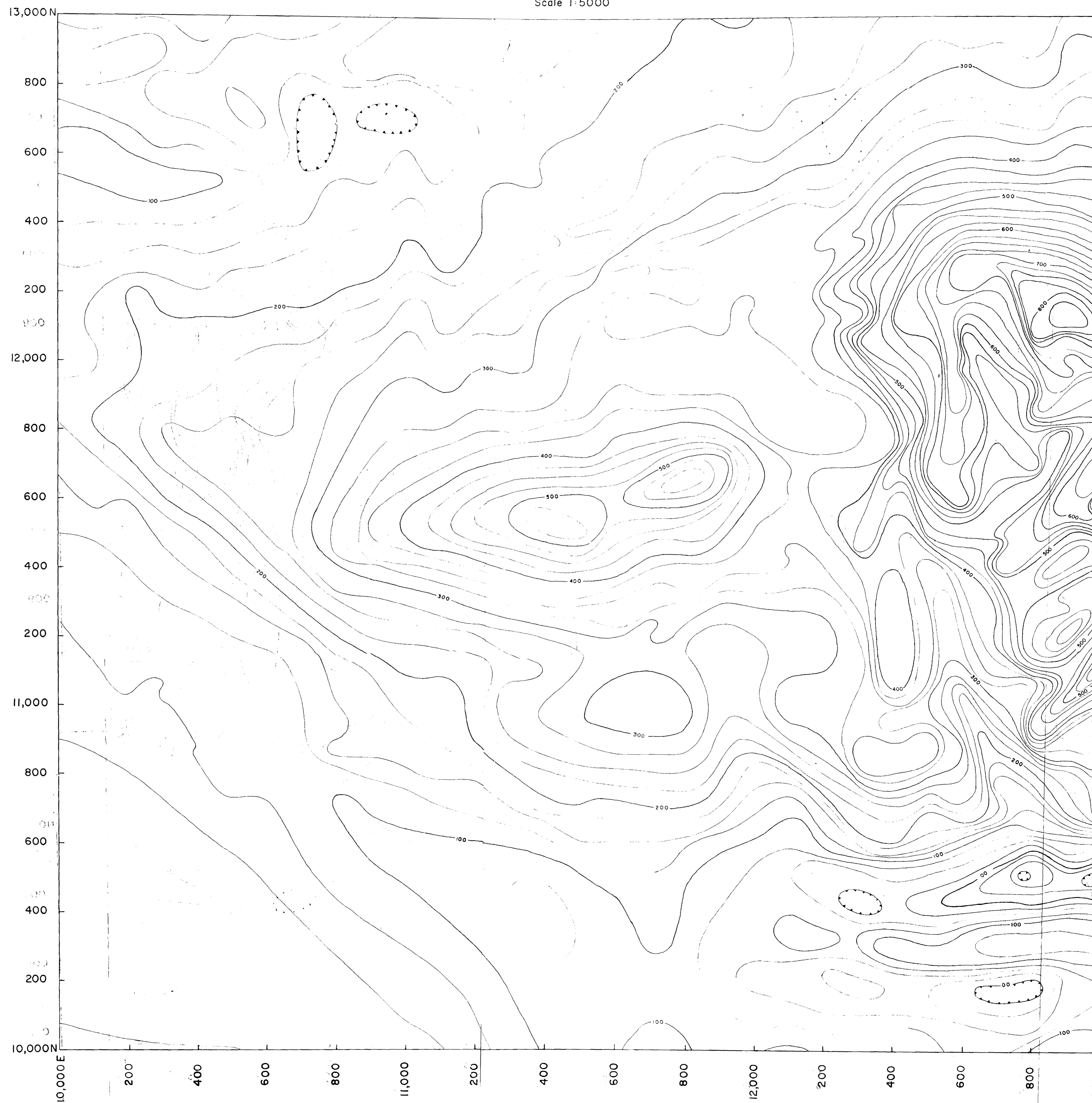


SURVEY 4 AREA- TENNANT CREEK

GROUND MAGNETOMETER SURVEY

TOTAL MAGNETIC INTENSITY CONTOUR MAP

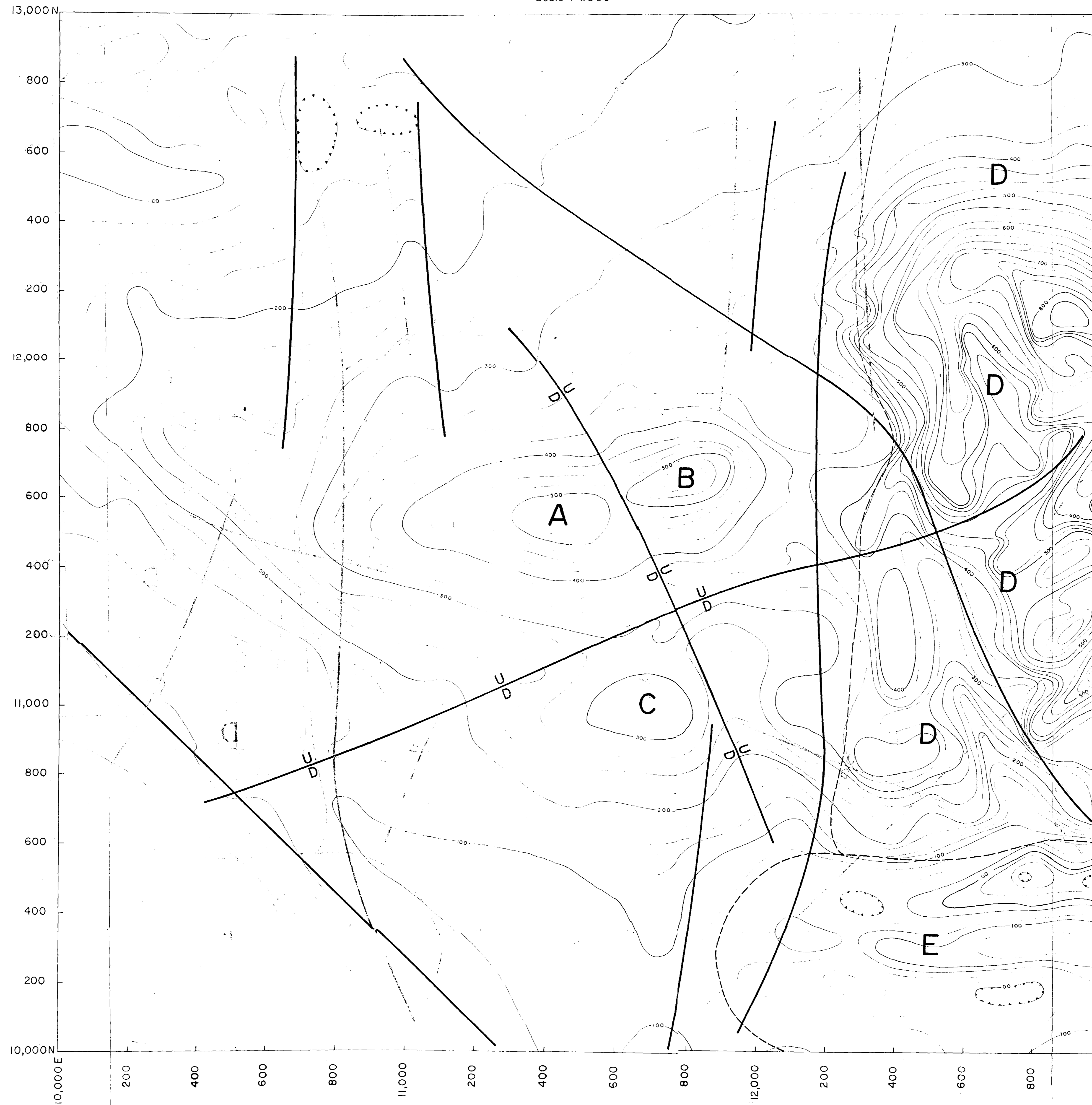
Contour interval 25 nT
Scale 1:5000



SURVEY 4 AREA - TENNANT CREEK

GEOPHYSICAL INTERPRETATION AND TOTAL MAGNETIC INTENSITY CONTOUR MAP

Contour interval 25 nT
Scale 1:5000



- Magnetic discontinuity
- $\frac{U}{D}$ " " showing relative movement.
- - - - - Geological boundary.
- AB, etc. Refer to text.