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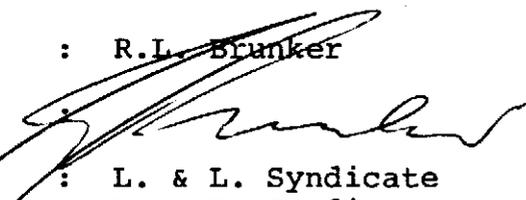
**MICROFILMED**

RESULTS OF GEOPHYSICAL SURVEYS  
IN THE BALFOUR AREA (NW TAS.)

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## 1. INTRODUCTION

A review of the geophysical work completed in the Balfour area was undertaken. All the available data on magnetic, IP and Dighem are compiled and the results interpreted.

The details of geology and geochemistry will be reported separately.

## 2. SUMMARY

Detailed ground magnetics carried out over the Balfour area have defined three major and one minor anomaly. These occur in a linear pattern trending approximately 320° mag. One of these anomalies occurs above Specimen Hill.

Two linear IP anomalies have been identified as shown on Plan No. Tv 335. The IP anomaly on the eastern portion of the grid extends along strike for some 800 m and co-incides with a clearly defined Sn and Zn geochem anomaly. Also this zone lies along the lithological boundary separating the green chloritic shale sequence and the grey shale/quartzite sequence as identified in the regional mapping.

During 1980, a Dighem survey was flown over the Balfour area. Three distinct linear EM anomalies were defined on the western portion of the grid. Lithologies in this area are dominantly black and grey shales. The Dighem survey failed to give any response over the Murray's Reward Cu mineralisation.

## 3. CONCLUSIONS AND RECOMMENDATIONS

The Specimen Hill area is a significant magnetic anomaly. Results from the BHP drilling suggest that this magnetism is caused by disseminated pyrrhotite in the grey shales. The shape of the anomaly would suggest that there may also be some deeper seated "magnetic basement" feature.

IP results show two clearly defined anomalies. Further fill-in IP work has recently been completed over the eastern anomaly to better define this zone. This anomaly co-incides with a Sn and Zn geochem anomaly and represents an excellent drill target.

## 4. GRAVITY SURVEY

Carried out in the early '60's, the survey appears to be of little use as no terrain corrections were applied. Anomalies can be directly correlated to topographic relief. Original data is unavailable.

## 5. MAGNETIC SURVEYS

In 1965/66 BHP carried out the first ground magnetic survey over the Specimen Hill area, to investigate an anomaly detected by the 1956 Rio Tinto aeromag survey of NW Tasmania. The survey isolated three distinct anomalies, two of which were drilled with vertical holes with no success. In February of 1979 CRAE covered the area with ground magnetics once again to update the older (torsion balance) version and further define the anomalies.

A low level aeromag survey was carried out in March of 1979 over Specimen Hill and Frankland River prospects to obtain a more regional feel of the significance of the Specimen Hill anomaly and its relation to a second anomaly at Frankland River. Apart from this regional information, the survey showed little else.

An extension of the grid in May of 1980 saw the ground magnetic coverage extended on both the eastern and western flanks of the original grid. This was to allow more complete coverage of the southmost magnetic anomaly (Plan No. Tv 86) and to investigate IP responses to the east.

Three major anomalies are known, two of which have been modelled. Line 108N has been modelled to show a westward dipping "dyke" at a depth of 70 m whilst line 89N shows a steeply eastward dipping "dyke" at a depth in excess of 300 m (Plan No. Tv69).

BHP drilled a hole into the southernmost magnetic anomaly centred on line 88N. This hole (DD B5) intersected disseminated pyrrhotite in a sequence of interbedded shales and quartzites with minor white quartz veining. The core was relogged by Geopeko/CRAE and it was concluded that the anomaly could not be explained by the results of the drill hole because the amount of disseminated pyrrhotite was usually less than 5% (vol.) of the shale. To clarify this it was decided to submit core samples of DD B5 to the CSIRO with a request to carry out magnetic susceptibility measurements. The results (Appendix 1) show that the remnant susceptibility ( $\bar{Q}$ ) is about 20 times larger than the mean susceptibility. It is likely that the orientation of this remnant susceptibility is parallel with the earth's field, thus giving a positive anomaly. The results show that the remnant magnetism of the pyrrhotite is sufficient to explain the size of the magnetic anomaly.

## 6. IP SURVEYS

An IP survey was commissioned in May of 1979 to cover selected portions of the Specimen Hill grid. These areas included the magnetic anomaly on line 108N and tin anomalies on the eastern portions of 90N and 96N. In general, none of the anomalous IP zones were associated with magnetic anomalies; they were, however, correlatable to the elevated tin values.

- 3 -

A second survey was designed to test the continuity of zones delineated in the previous survey and to test the southern magnetic high. The anomalous zones were shown to be linearly continuous. A weak IP response was detected over the southern magnetic anomaly (Plan No. Tv 335).

Self-potential (or spontaneous potential) readings taken concurrently with this survey were inconclusive.

Further IP work was carried out in December 1980 to completely cover the IP anomaly defined on the eastern portion of the grid. The following lines were completed between 10000E and 10600E:

Lines - 92N, 93N, 94N, 98N, 99N, 100N.

As well, line 94N was completed from 10000E to 9400E. The purpose of this line is to test the IP responses in the area of the Dighem anomalies on the western black shale - grey shale sequence.

Also, IP measurements were made over the Zn geochem anomaly on the south-western portion of the grid.

Lines 86N, 88N and 89N were completed from the base line west.

The results of this recent survey are being assessed and will be reported in a later memo.

## 7. DIGHEM II SURVEY

During March of 1980 an airborne electromagnetic survey utilizing the Dighem Multicoil II system was carried out. The survey consisted of ten two-kilometre lines spaced at 150 metres. The EM bird height was a nominal 30 m whilst the magnetometer bird height was 50 m. The lines were oriented east-west and designed to detect and test conductors in the Specimen Hill vicinity. An EM response map (Plan No. Tv 75), resistivity map (Plan No. Tv 74) and aeromag map (Tv 72) were produced.

The survey detected a number of seemingly continuous conductors to the west of and parallel to the magnetic anomalies (Plan No. Tv 86). These conductors strike at approximately 155° MN and appear to dip steeply to the west. Black, micaceous, carbonaceous siltstones have been mapped in the area.

The northern end of these conductors have been covered with IP on lines 100N and 101N. Anomalous IP responses are coincident with the EM anomalies, whilst a general resistivity low is associated with the whole length of the conductors.

- 4 -

Poorer quality EM anomalies occur over the magnetic anomaly on lines 96N to 103N and are probably indicative of deeper seated sources. Stronger anomalies associated with the southmost magnetic anomaly may, however, deserve greater attention as their correlation to a possible IP anomaly and their proximity to the magnetic anomaly is significant.

Finally, attention is drawn to the possible EM anomaly south of line 94N in the east. The anomaly is coincident with high tin geochem values, is along strike of an IP response and resides in an area of generally depressed resistivity values. As altitude fluctuations interfered with the EM readings at this point (over Peter's Ridge) follow-up ground work will have to be done to determine its potential.

KEYWORDS

Geophysics, magnetics, IP, EM, tin, pyrrhotite.

Locality: Burnie 1:250 000 Sheet SK 55-3

LIST OF PLANS

<u>Plan No.</u>	<u>Title</u>	<u>Scale</u>
Tv 86	SPL 781 - Specimen Hill Grid Ground Magnetics Survey	1:5 000
Tv 335	Balfour Grid Summary of Geophysics	1:5 000
Tv 75	Dighem Survey Balfour Test Area Electromagnetics	1:10 000
Tv 74	Dighem Survey Balfour Test Area Resistivity	1:10 000
Tv 72	Dighem Survey Balfour Test Area Magnetics	1:10 000
Tv 69	Dighem Line 9 Magnetic Profile	



for A.D. MC KAY

APPENDIX I

MAGNETIC PROPERTIES OF LAMINATED GREY SHALES  
WITH DISSEMINATED FINE GRAINED PYRRHOTITE  
INTERSECTED IN BHP HOLE DD B5

Depth	No. of Specimens	$\bar{k}$ (Range)	$\bar{J}$ (Range)	$\bar{Q}$ ( $\pm$ SE)
360 ft	4	520 (210-820)	8040 (3090-13310)	24 $\pm$ 1
452 ft	3	600 (130-840)	7340 (1750-10540)	20 $\pm$ 1

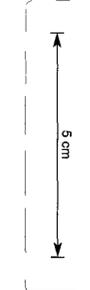
$\bar{k}$  = mean emu susceptibility  $\times 10^6$  (= cgs)

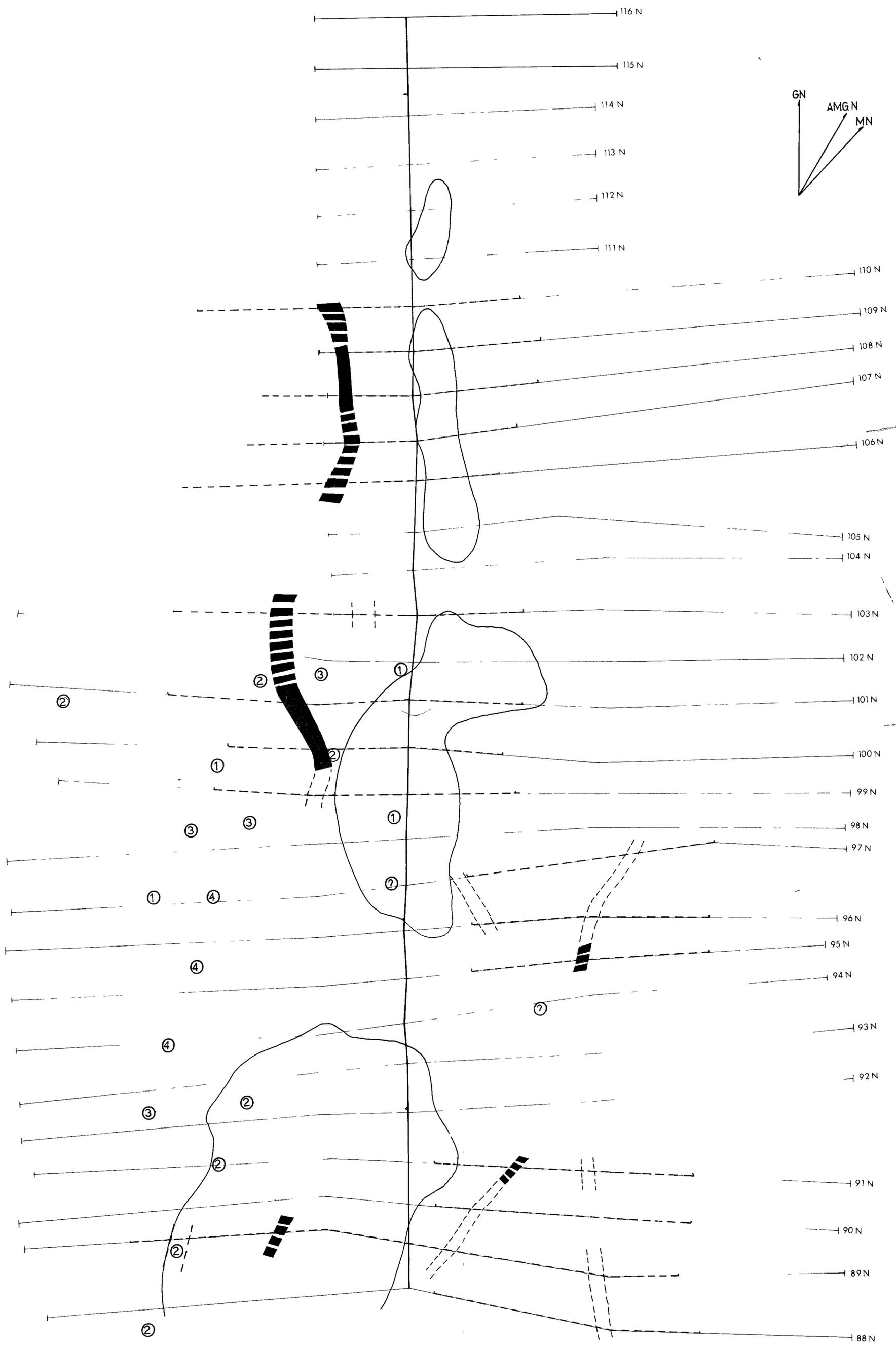
$\bar{J}$  = mean NRM intensity in mircogauss

$\bar{Q}$  = Koenigsberger ratio =  $J/kH$  ( $H = 0.63$  Oersteds)

The results, although based on the very limited number of samples, indicate that remanence dominates induction in these pyrrhotite-bearing rocks.

CRA EXPLORATION PTY LIMITED  
 010008  
 SPL 781 - SPECIMEN HILL GRID  
 GROUND MAGNETICS SURVEY  
 BASE LEVEL 62000 NT  
 geologist M.D.M.M. scale 1:5000 report no 10467  
 drawn R.G.W. date April 1980 plan no TV 86





010009

CRA EXPLORATION PTY LIMITED

BALFOUR GRID

SUMMARY OF GEOPHYSICS

geologist	scale 1:5000	report no 10467
drawn: MF	date 17/80	plan no Tv 335

5 cm

81/1516

DIPHEM ANOMALY (SHOWING GRADE)

③

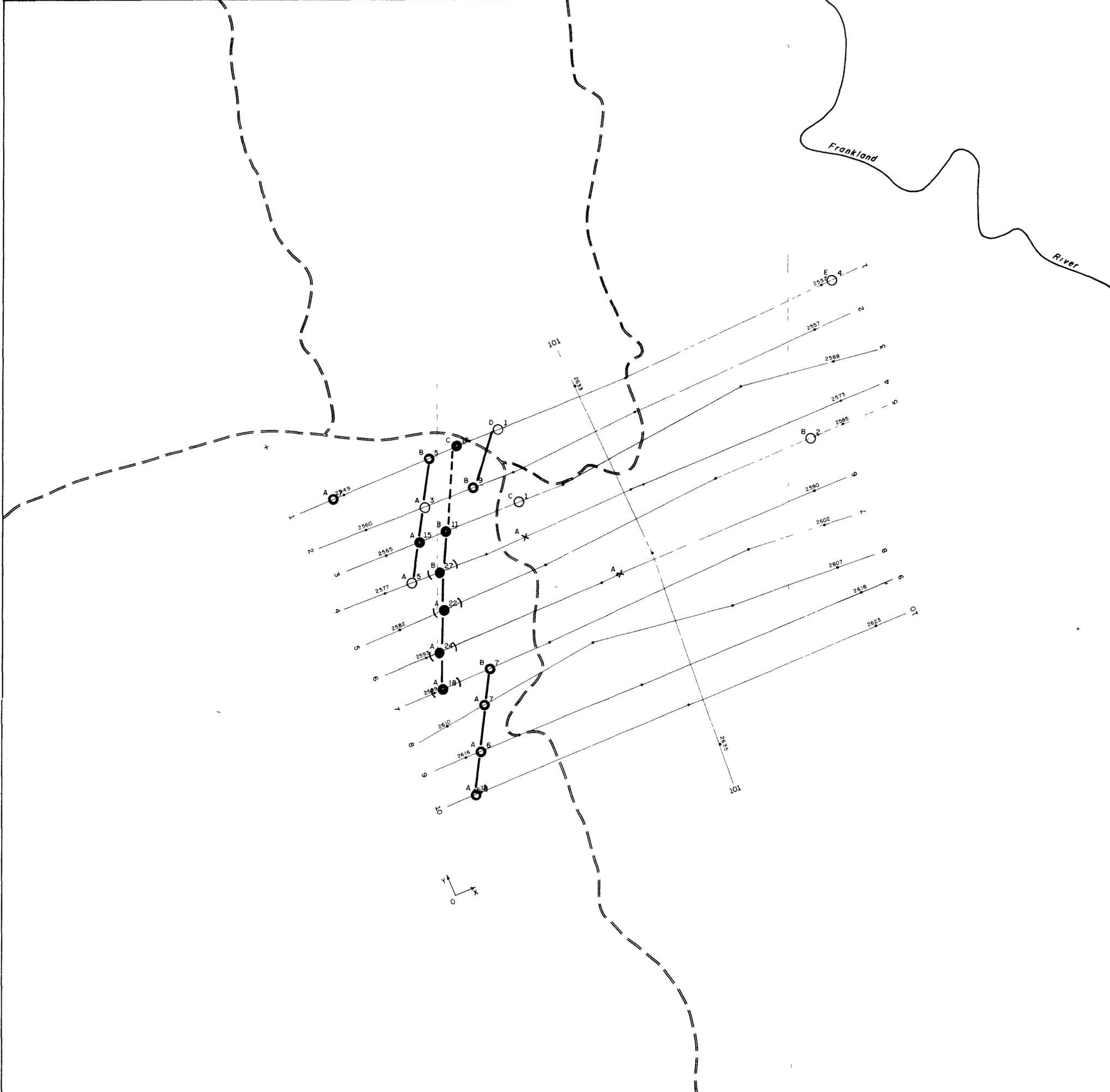
GROUND MAG ANOMALY

IP LINE

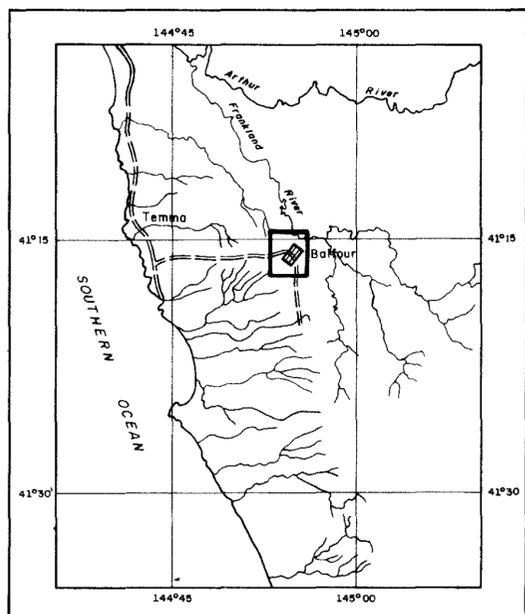
IP ANOMALY - DEFINITE

PROBABLE

POSSIBLE



LOCATION MAP

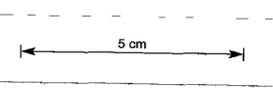
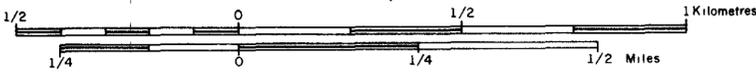


Scale 1 500,000

# DIGHEM<sup>II</sup> SURVEY

## BALFOUR TEST AREA ELECTROMAGNETICS FOR GEOPEKO

SCALE 1 10,000



ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE	
6	●	> 100	<p>DIGHEM anomalies are divided into six grades of conductivity - thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance and is a geologic parameter. Most swamps yield Grade 1 anomalies but highly conducting clays can give Grade 2 anomalies. The multi-coil anomaly shapes often allow surface conductors to be recognized and these are indicated by the letter 'S' on this map. The remaining Grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies of the Magosi River camp yield Grade 4 anomalies while Matobi and Whistler give Grade 5 Graphite and sulphides can span all grades but in this survey area field work may show that the different grades indicate different types of conductors.</p>
5	●	50 - 99	
4	●	20 - 49	
3	●	10 - 19	
2	○	5 - 9	
1	○	< 4	
	X		Possible conductor

Identifier	mho value																				
<table border="1"> <tr> <th>Depth</th> <th>50 ft</th> <th>100 ft</th> <th>150 ft</th> <th>200 ft</th> </tr> <tr> <td>5 ppm</td> <td>10 ppm</td> <td>15 ppm</td> <td>20 ppm</td> <td></td> </tr> </table>	Depth	50 ft	100 ft	150 ft	200 ft	5 ppm	10 ppm	15 ppm	20 ppm		<table border="1"> <tr> <th>Depth</th> <th>50 ft</th> <th>100 ft</th> <th>150 ft</th> <th>200 ft</th> </tr> <tr> <td>5 ppm</td> <td>10 ppm</td> <td>15 ppm</td> <td>20 ppm</td> <td></td> </tr> </table>	Depth	50 ft	100 ft	150 ft	200 ft	5 ppm	10 ppm	15 ppm	20 ppm	
Depth	50 ft	100 ft	150 ft	200 ft																	
5 ppm	10 ppm	15 ppm	20 ppm																		
Depth	50 ft	100 ft	150 ft	200 ft																	
5 ppm	10 ppm	15 ppm	20 ppm																		

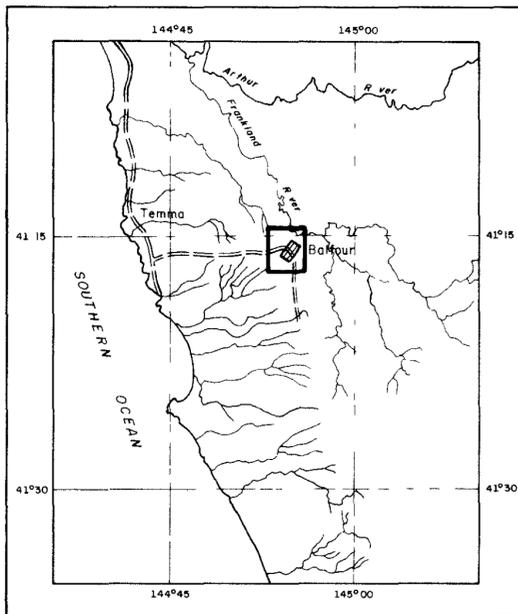
The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line or because of a shallow dip or conductive overburden effects.

S	Possible surface response	<p>DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a follow-up program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns while being helpful to those who wish this information. The map provides an interpretation of all conductors in terms of length, strike, direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.</p>
L	Possible line (power, telephone, pipe or fence)	
?	Possible line	
Q	Questionable anomaly	
V	Apparent thickness > 10m	
100%	Direct magnetic correlation of 100 gamma	

010010  
31-1516  
CRAE Plan No. TV 75  
REPORT No. 10467



LOCATION MAP



Scale 1 500,000

# DIGHEM<sup>II</sup> SURVEY

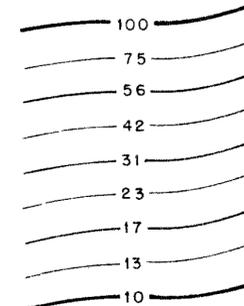
## BALFOUR TEST AREA RESISTIVITY FOR GEOPEKO

SCALE 1 10,000



**LEGEND**

Contours in ohm - m  
at eight intervals per decade



**Note**

The numbers face in the  
direction of increasing value

Flight line

Fiducials  
and  
numbers

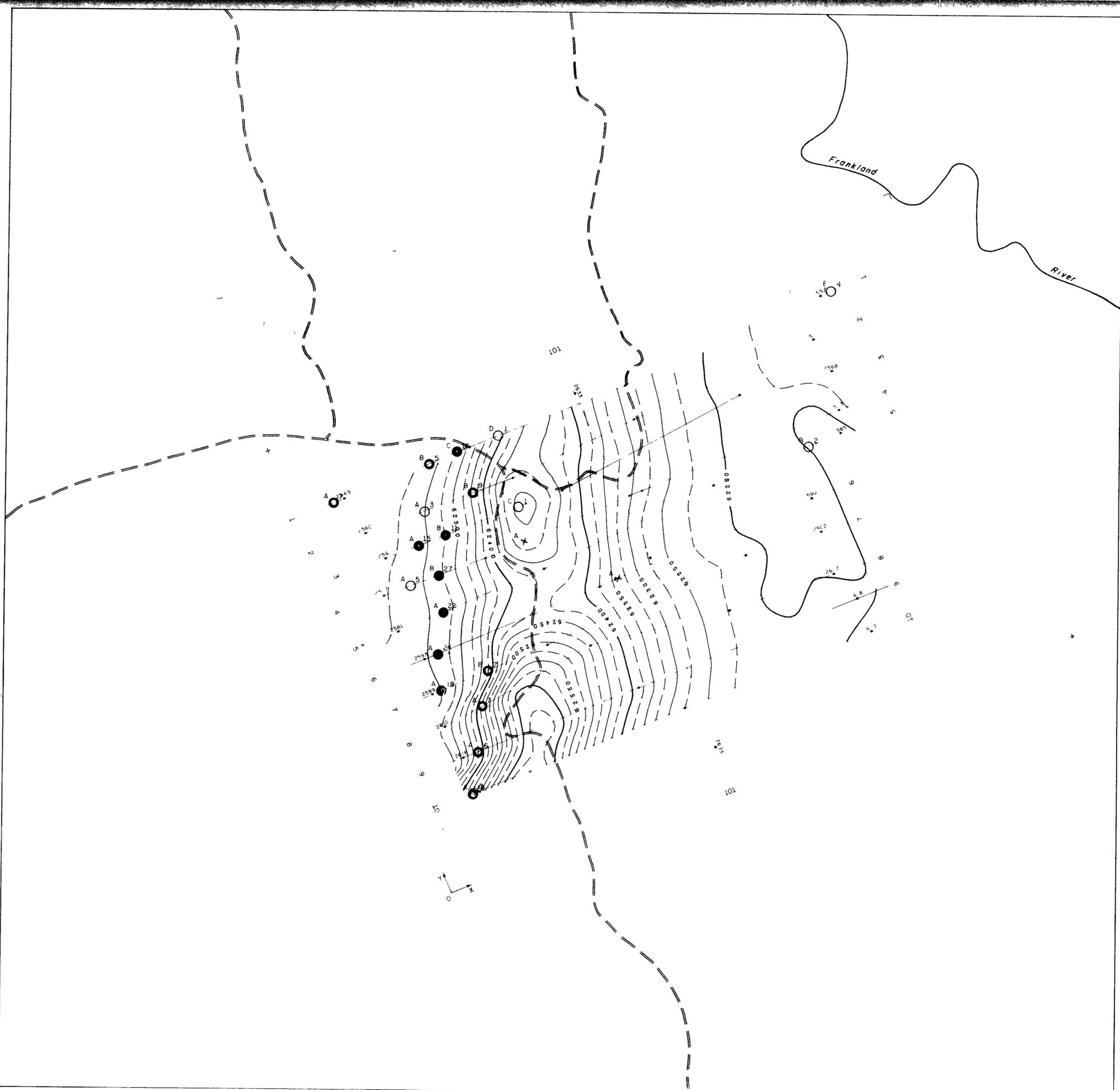
2500  
2500

TV 74 -

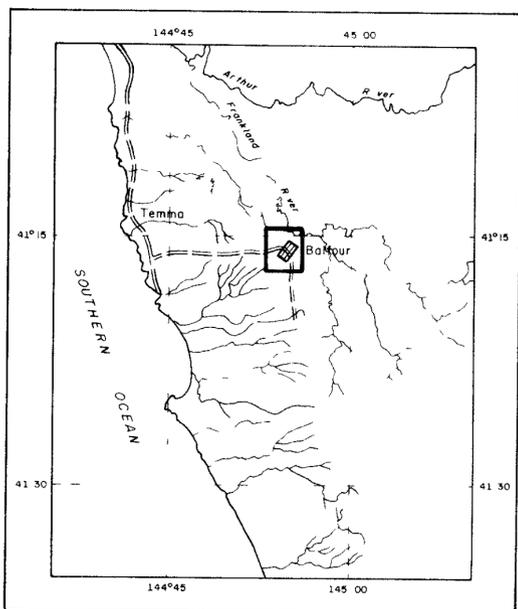
PLAN No 5 I64 S/B

010011

CRAE Plan No TV 74  
REPORT No: 10467



LOCATION MAP

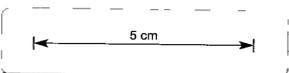
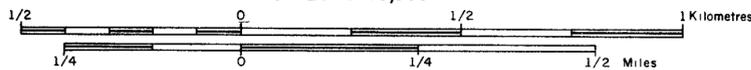


Scale 1 500,000

# DIGHEM<sup>II</sup> SURVEY

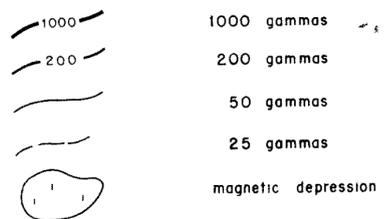
BALFOUR TEST AREA  
MAGNETICS  
FOR  
GEOPEKO

SCALE 1 10,000



**ISOMAGNETIC LINES**

(total field)

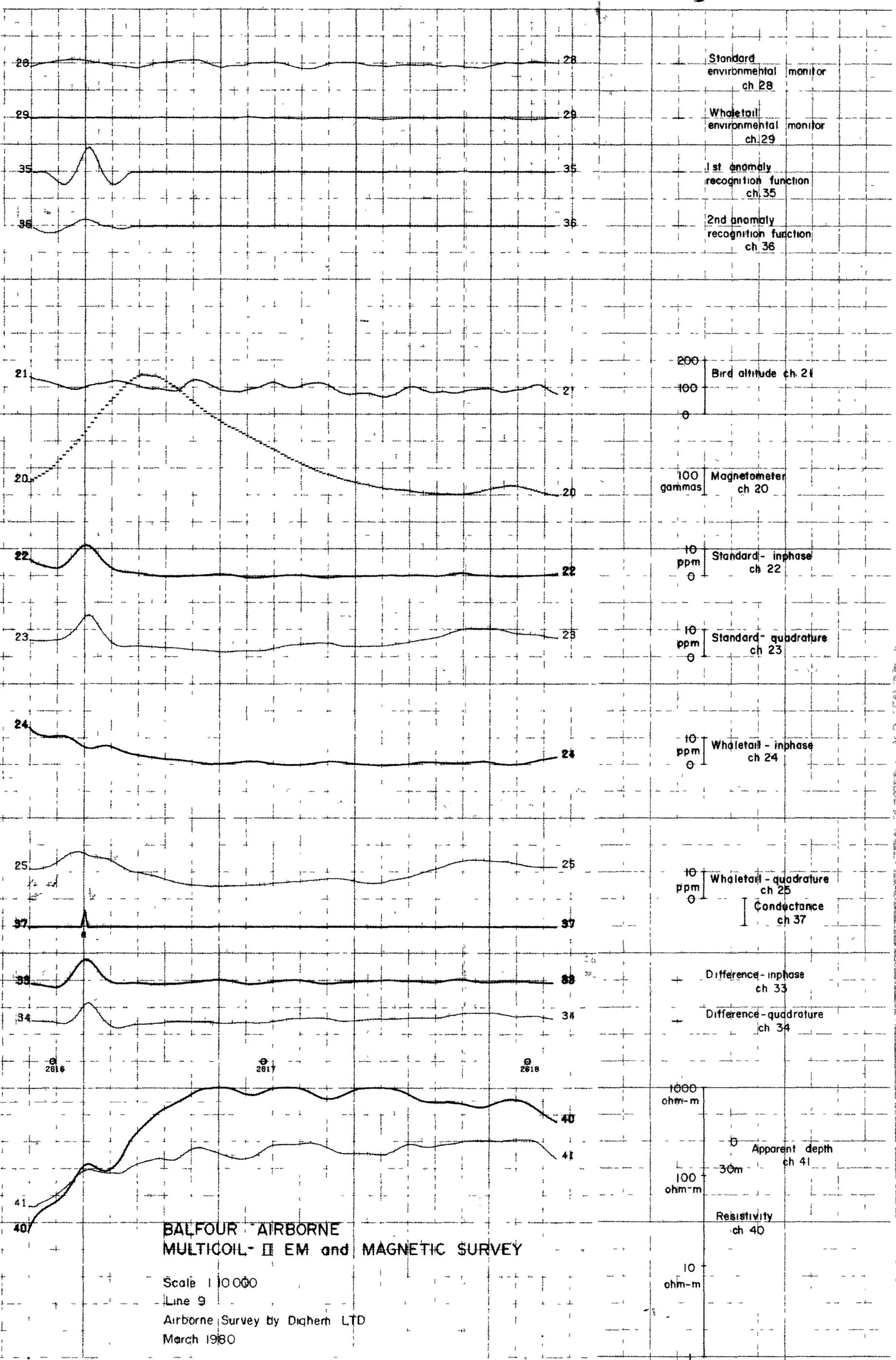


Flight line



Fiducials and numbers

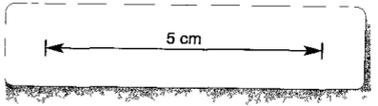
Magnetic Inclination within the survey area 72°



**BALFOUR AIRBORNE  
MULTICOIL- II EM and MAGNETIC SURVEY**

Scale 1:10000  
Line 9  
Airborne Survey by Digheem LTD  
March 1980

LINE 9



LINE 9

010013  
Plan No: TV 69  
REPORT NO: 10467