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LETTER	
15. 9. '87	
REFERS	
Resubmit to	Date

BILLITON AUSTRALIA

THE METALS DIVISION OF
THE SHELL COMPANY OF AUSTRALIA LIMITED

E.L. 20/85 - MT. CLEVELAND

ANNUAL AND FINAL REPORT
PERIOD ENDING 20th OCTOBER, 1987

OPEN FILE

Author : D.B. Hall

Report No. : 08.2496

Date : 15-9-87

Copy No. : 1

Distribution: 1. Mines Department, Tas.
2. Billiton, Melbourne
3. Billiton, Tasmania

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3. PREVIOUS EXPLORATION
4. OBJECTIVES
5. WORK COMPLETED
6. RESULTS
7. CONCLUSIONS AND RECOMMENDATIONS
8. EXPENDITURE STATEMENT

002

PLANS

<u>FIGURE NO.</u>	<u>TITLE</u>	<u>PLAN NO.</u>	<u>SCALE</u>
1	EL 20/85 Location Plan	D/LD11/001	1:1500000
2	Mt. Cleveland, Geology	LD11/1009	1:50000
3	Mt. Cleveland, Aeromagnetics	LD11/1011	1:50000
4	Geology & Geophysics	LD11/1010	1:50000
5	Rachel Anomaly: Geology & Magnetics	LD11/1012	1: 5000
6	Rachel Anomaly: Enhanced Magnetics	LD11/1013	1: 5000
7	Dighem Line 54		1:15000
8	Dighem Line 57		1:15000
9	Dighem Line 61		1:15000
10	Dighem Aeromagnetics Line 54		1: 4000
11	Dighem Aeromagnetics Line 61		1: 4000
12	Rachel Anomaly: Assay Results		1: 5000

1. INTRODUCTION

Billiton Australia tendered for the Mt. Cleveland tenement of 87 sq. km. in February 1985. This tender was accepted by the Department of Mines, and an official application for an Exploration Licence was made in June 1985.

As a result of objections being lodged to the application, and other problems, the licence was eventually granted to Billiton on 21st October, 1986.

Billiton's original justification for applying for the EL was exploration for tin deposits, particularly sulphide replacement deposits of the Cleveland, Bischoff, Renison type.

With the collapse of the tin market as a result of the International Tin Council going bankrupt, there has been a major re-evaluation of the type of tin deposits that could be economic ore bodies in the current situation.

Billiton Australia now feels that there is little potential for the development of "world-class" tin deposits within the licence area, and intends to relinquish the EL.

This report covers work completed by Billiton and represents the first and final report on the area.

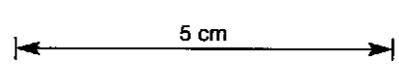
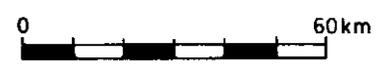
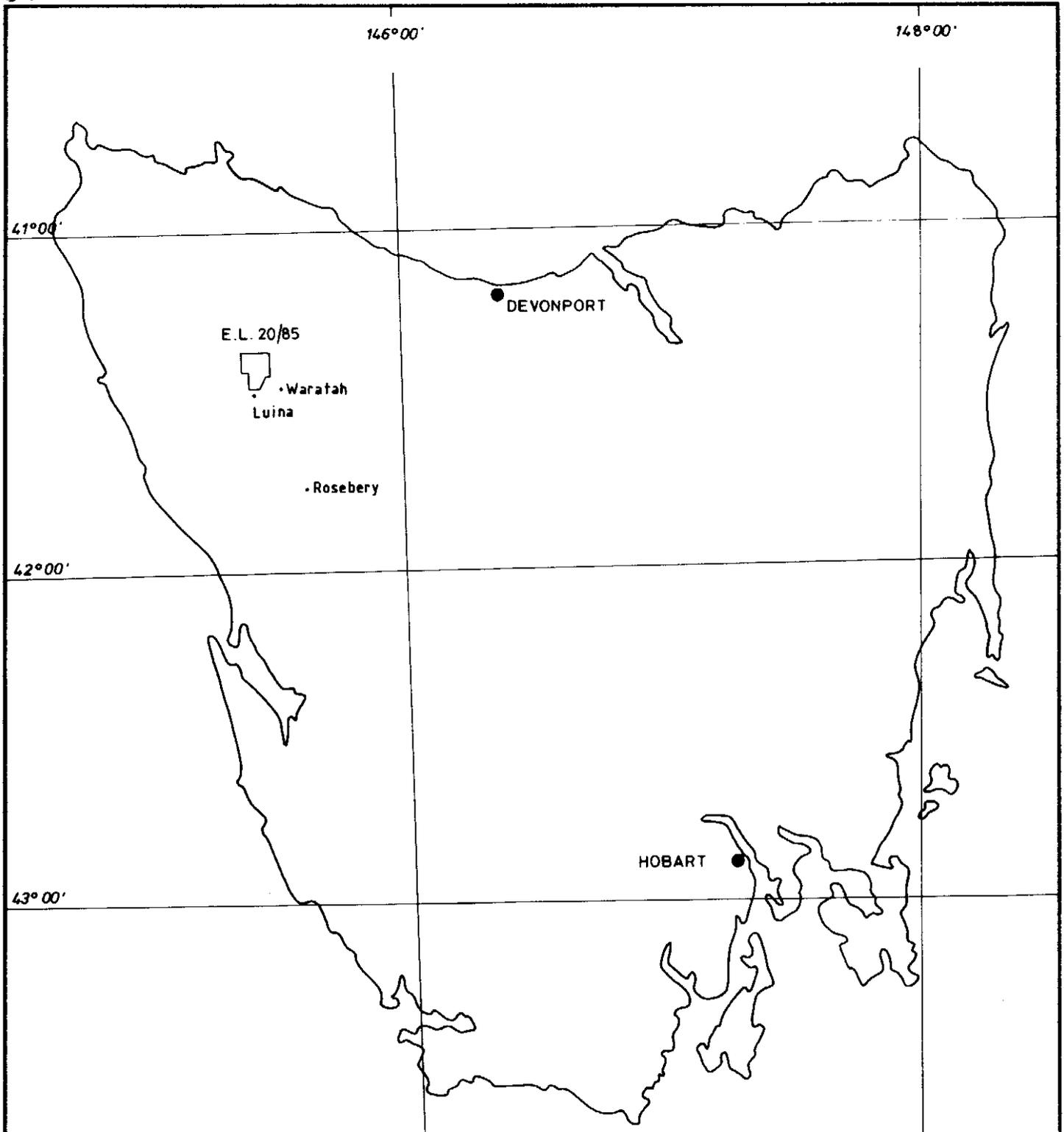
2.0 LOCATION AND ACCESS

Exploration Licence 20/85 covers an area of 87 sq kms and is located north of Luina in western Tasmania. (Figure 1).

Access from the coast is via the Murchison Highway, and the Waratah-Corinna road to Luina.

Access within the EL is via the Telecom road to the repeater station on Mt. Cleveland, and bulldozed tracks previously constructed by Comstaff.

The area is heavily forested with steeply incised topography. Ground movement is difficult.



 Billiton Australia <small>The Metals Division of the Shell Company of Australia Limited</small>			
Project		MT. CLEVELAND	
Title		E.L. 20/85 LOCATION PLAN	
Author	DBH	Date	4/87
Scale	1:1500 000		
Drawn	OH	Office	DPO
Revised	Date		
Drawing No	D/LD 11/001		Fig No 1

3. PREVIOUS EXPLORATION

The area was originally part of EL 1/68, held by Comstaff Pty. Ltd., who carried out a comprehensive stream sediment sampling programme in 1972/73. During this survey, reconnaissance mapping was done, and two lithological successions recognised. Some low-order anomalies were indicated from the sampling.

A major Dighem/aeromagnetic survey was carried out by Comstaff, and identified several anomalies. Some of these were ground located and tested with detailed ground geophysics, soil geochemistry and geological mapping. Two were drilled, and PreCambrian black graphitic and pyritic slates were found.

4. OBJECTIVES

The major objective in the tenement was to test previously defined targets for the presence of sulphide replacement tin mineralisation. The model is the Cleveland/Mt. Bischoff/Renison style of deposit, with metasomatic replacement of carbonate beds by cassiterite bearing pyrrhotite.

Secondary targets were veined/stockwork tin-tungsten deposits related to granite emplacement.

5. WORK COMPLETED

A re-evaluation of the Dighem airborne EM/magnetic survey carried out by Comstaff was completed.

All responses defined by Comstaff were examined, with recommendations made regarding prospectivity and follow-up ground work.

The "Rachel Anomaly" was examined in detail on the ground, with two grid lines erected, mapping, auger drilling, rock chip geochemistry and magnetic susceptibility tests, carried out.

Detailed mapping of the Telecom Road was carried out.

009

6. RESULTS

6.1 Rachel Anomaly

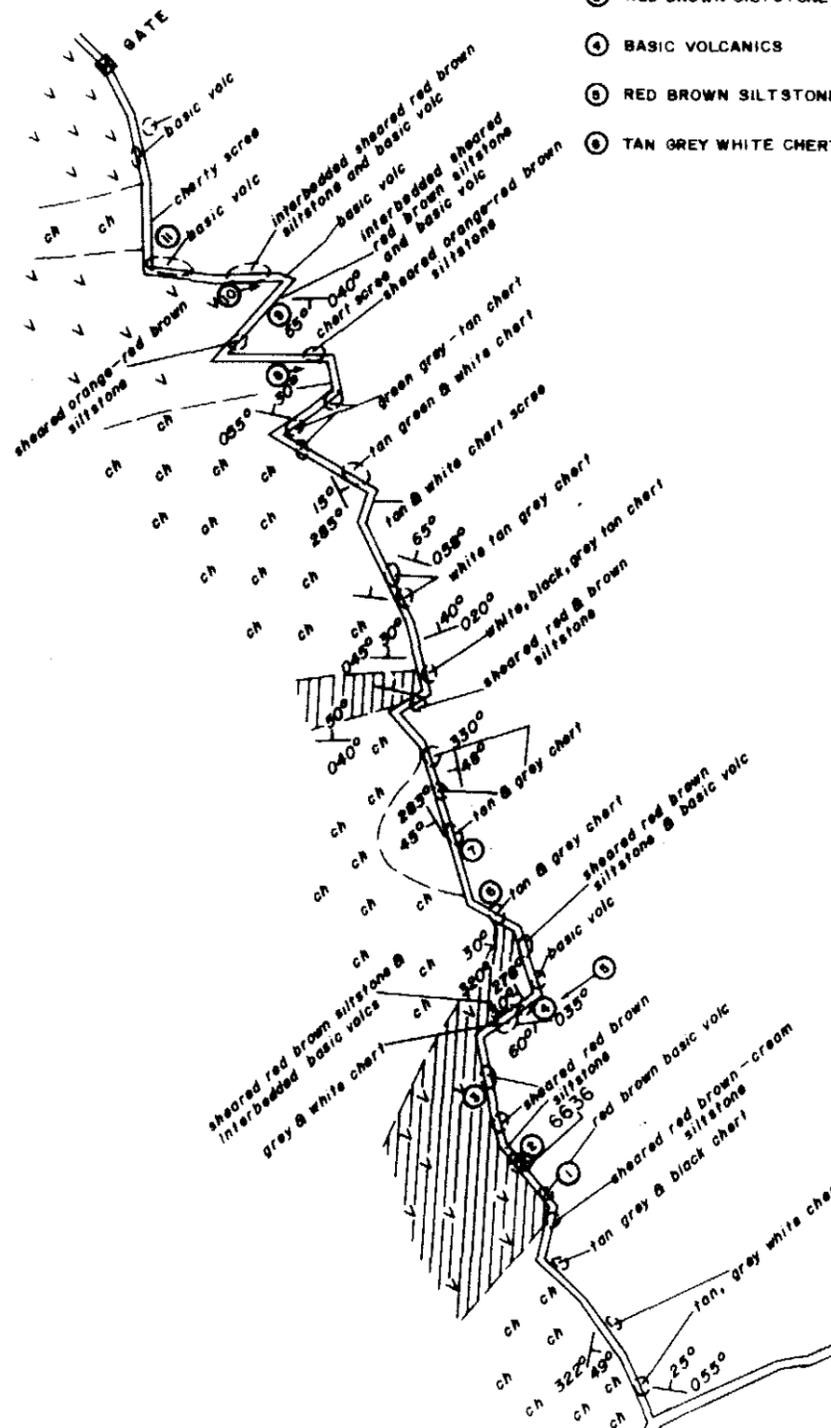
A detailed study of three lines of the Dighem survey, Lines 54, 57 and 61 confirmed the location of the magnetic response, together with a very weak EM response. (Figures 7, 8, 9).

2 grid lines were erected across the centre of the anomaly at 5410200N, 365200E.

A ground magnetometer survey across both lines, using a Geometrics G856 Proton Precession Magnetometer, confirmed the anomaly (Figure 5). Magnetic susceptibility readings were also taken, along the grid lines, and along the Telecom Road along strike from the grid. The values on the grid lines were consistent with no obvious magnetic source. On the road traverse, consistently high readings were obtained from outcropping weathered basalt. Intervening cherts and siltstones gave low readings. (Figure 6).

Auger drilling along the grid lines did not penetrate to bedrock. Assaying for Sn, W, Cu, Pb, Zn, Ag, Ni, Cr and Mn, did not produce any significant values. Sn was particularly low. A rock chip sample from weathered basalt on the Telecom road (sample no. 6636) produced slightly elevated values for Cu, Pb, Zn, Ni and Mn, possibly related to Mn scavenging. (Figure 12).

ROAD TRAVERSE



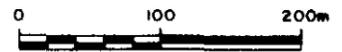
Traverse started at ON, ended at I250N
 Survey angle at ON is direction to 50mN.
 Surveys taken at 50m intervals and at major road bends.

MAGNETIC SUSCEPTIBILITY READINGS - ROAD TRAVERSE

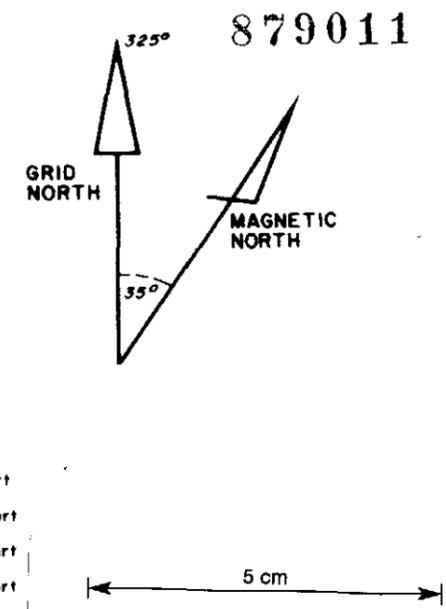
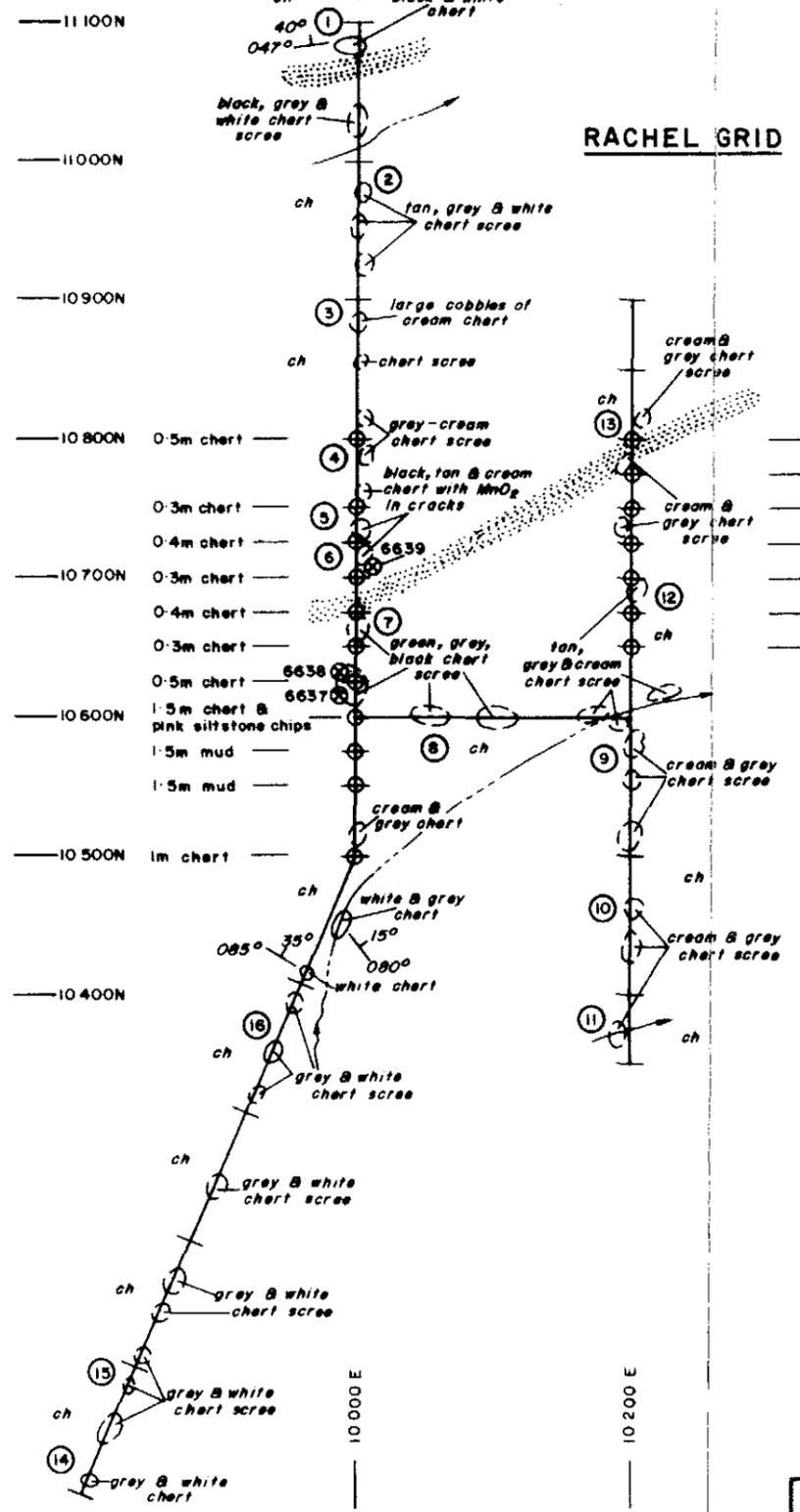
	$\times 10^{-5} SI$		$\times 10^{-5} SI$
① BASIC VOLCANICS	400-700	⑦ TAN GREY WHITE CHERT	10-20
② " "	400-1500	⑧ TAN SILTSTONES	20-40
③ RED BROWN SILTSTONE	20-40	⑨ BASIC VOLCANICS	400-1500
④ BASIC VOLCANICS	600-800	⑩ " "	800-1300
⑤ RED BROWN SILTSTONE	20-30	⑪ " "	400-550
⑥ TAN GREY WHITE CHERT	10-15		

MAGNETIC SUSCEPTIBILITY READINGS RACHEL GRID

①	10-15 $\times 10^{-5} SI$	⑪	5-10 $\times 10^{-5} SI$
②	5-15 " "	⑫	5-10 " "
③	5-10 " "	⑬	5-10 " "
④	5-10 " "	⑭	5-10 " "
⑤	5-10 " "	⑮	5-10 " "
⑥	5-10 $\times 10^{-5} SI$	⑯	5-10 " "
⑦	5-10 " "	⑰	5-10 " "
⑧	5-10 " "		
⑨	5-10 " "		
⑩	5-10 " "		



RACHEL GRID



- BASIC VOLCANICS
- CHERT
- INTERBEDDED BASIC VOLCANICS
- MAGNETIC SUSCEPTIBILITY READING
- 0.5m chert DEPTH, ROCK TYPE, AUGER HOLE
- 047° 140° STRIKE, DIP
- SCREE / SUBOUTCROP
- OUTCROP
- 6637 ROCK CHIP SAMPLE
- SPUR LINE

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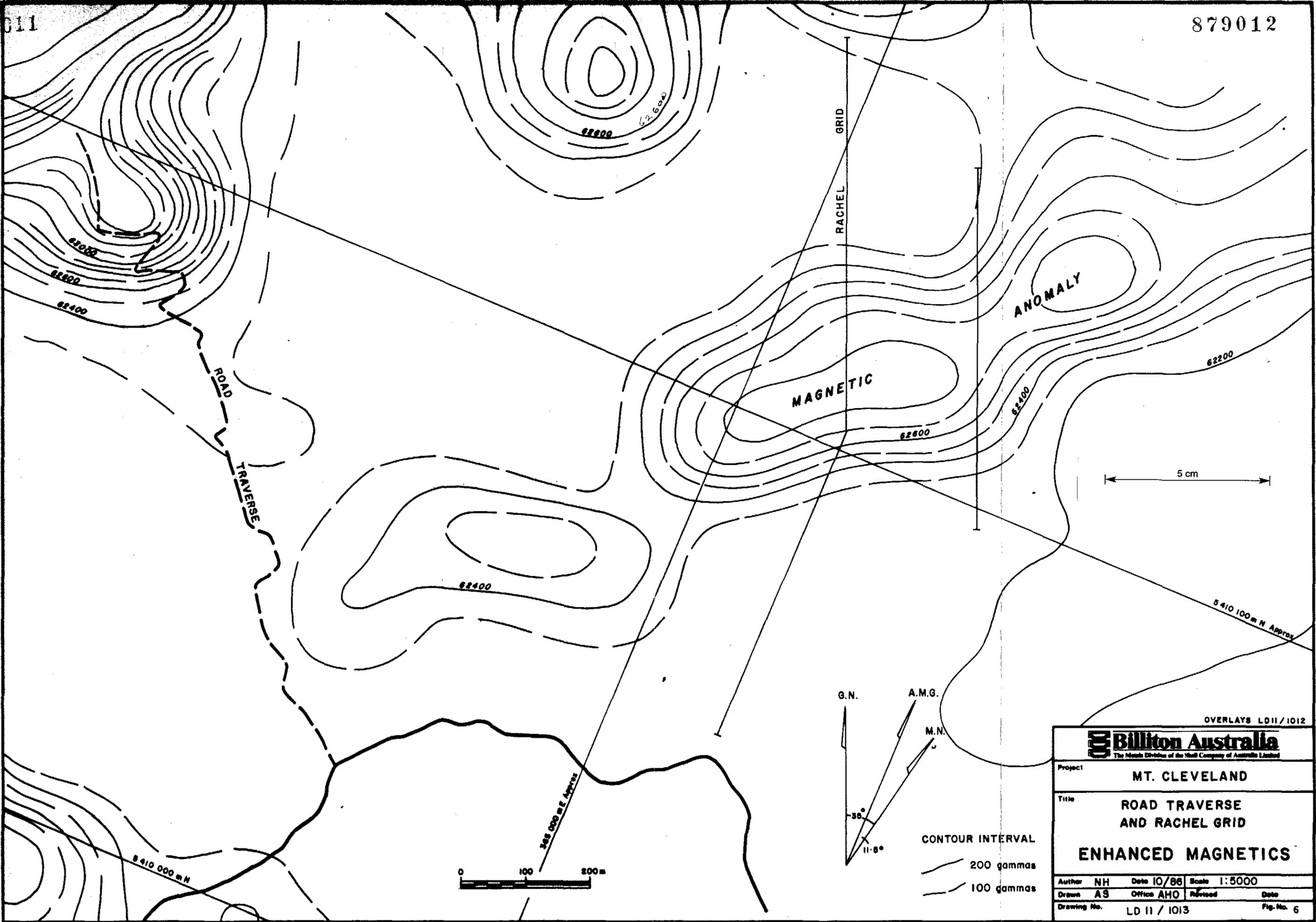
Project: **MT. CLEVELAND**

Title: **ROAD TRAVERSE AND RACHEL GRID GEOLOGY, MAGNETICS AND SAMPLE LOCATIONS**

Author: AW, NH Date: 10/86 Scale: 1:5000

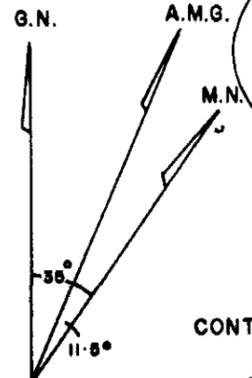
Drawn: HMR, AS Office: AHO Revised: Date:

Drawing No.: LD11/1012 Fig. No. 5



5 cm

0 100 200m



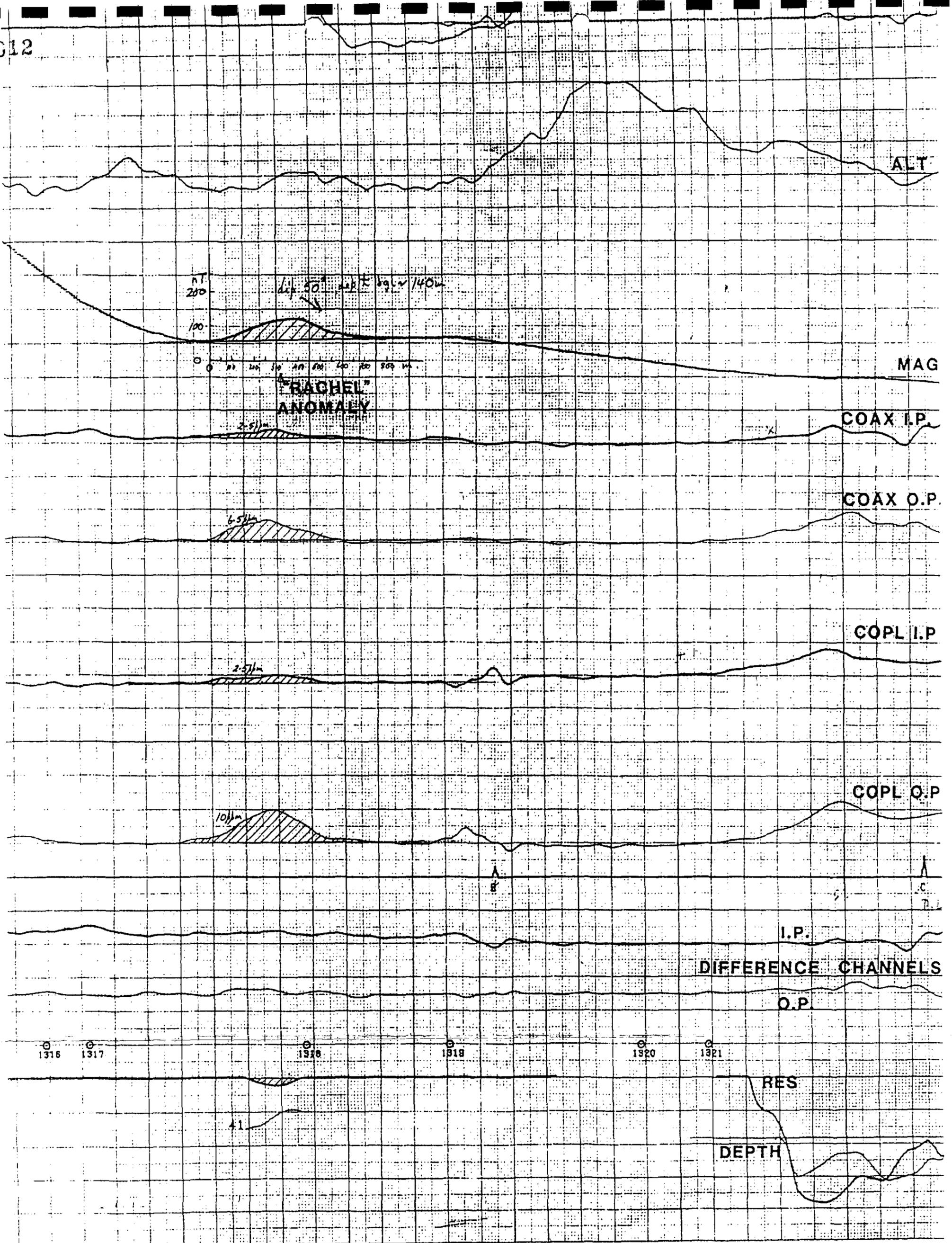
CONTOUR INTERVAL
 ——— 200 gammas
 - - - 100 gammas

OVERLAYS LD11/1012

Billiton Australia
The Metals Division of the Hall Company of Australia Limited

Project	MT. CLEVELAND		
Title	ROAD TRAVERSE AND RACHEL GRID		
	ENHANCED MAGNETICS		
Author	NH	Date	10/86
Scale	1:5000		
Drawn	AS	Office	AHO
Revised		Date	
Drawing No.	LD 11 / 1013		Fig. No. 6

012



E.M. BIRD @ 44m nominal height
 MAG BIRD @ 64m nominal height
 SPEED 100 kph nominal

1:15,000

0 500 1000 m

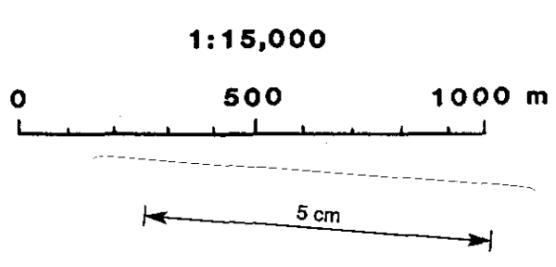
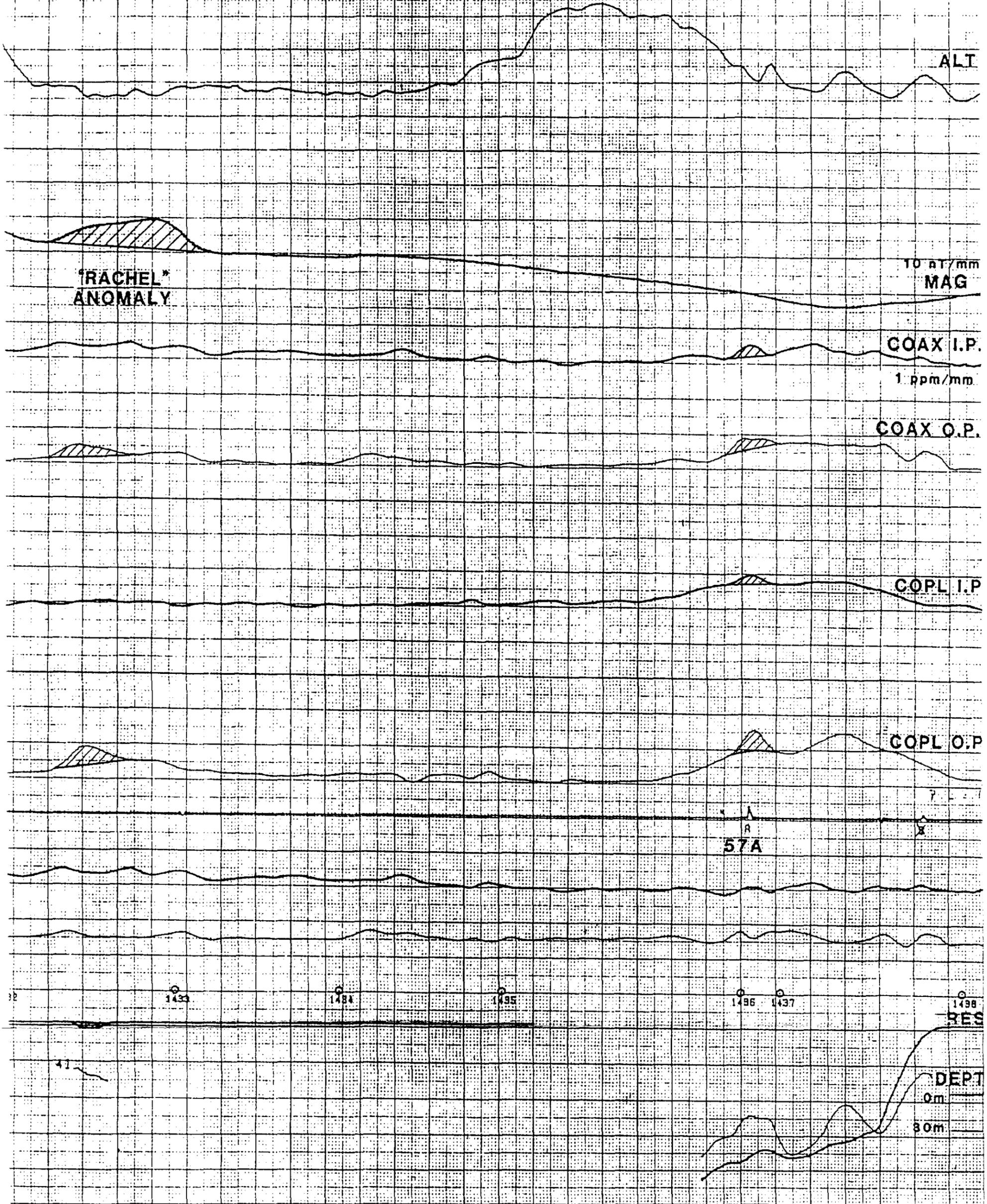
5 cm

MT. CLEVELAND
 RACHEL ANOMALY
 DIGHEM LINE 54

FIG. 7

879013

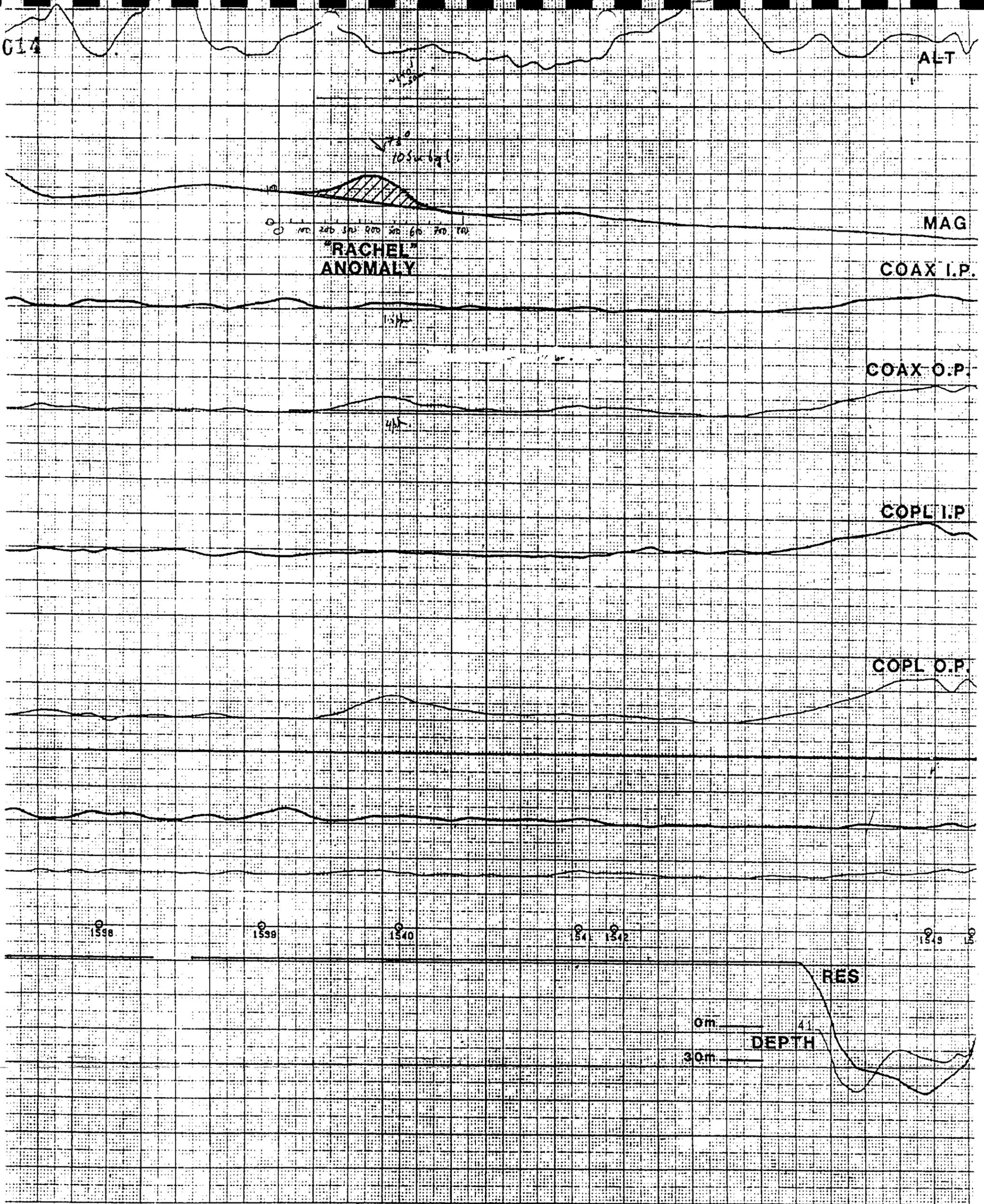
013



MT. CLEVELAND
 RACHEL ANOMALY
 DIGHEM LINE 57

FIG. 8

879014



1:15,000

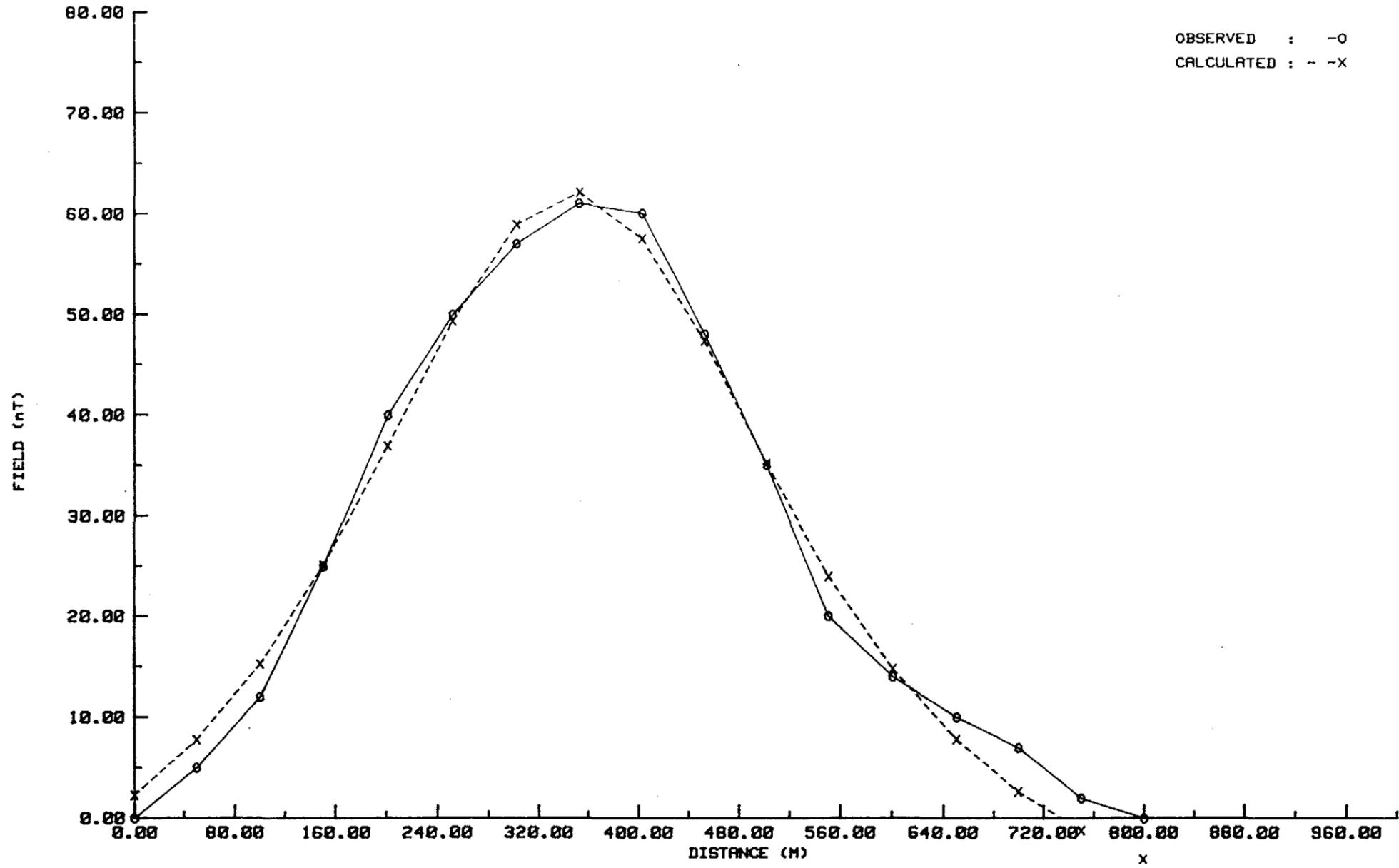
0 500 1000 m

5 cm

MT. CLEVELAND
RACHEL ANOMALY
DIGHEM LINE 61

FIG. 9

879015



OBSERVED : -O
 CALCULATED : --X

5 cm



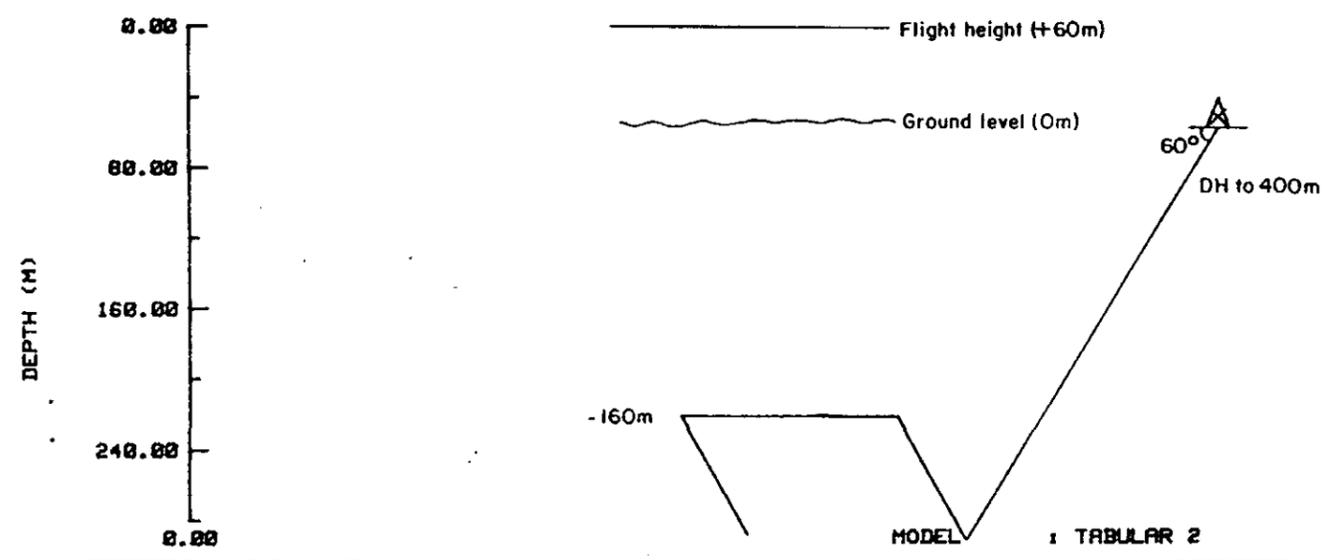
R.O.C.S.
 INVERSE MAGNETIC MODELLING

PROGRAM : MAGMOD

MAGNETIZN	184.9453
DIP	68.4618
BASE LEVEL	-13.8854
BASE SLOPE	8.0000
POSITION	341.2726
HALF WIDTH	61.9744
HALF LENGTH	388.0000
DEPTH	228.4574
THICKNESS	2455.3172
INCLINATN	-71.0000
DECLINATN	135.0000
FIELD	8.0000
ORIENTATN	18.0000

SCALE

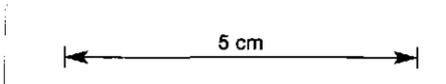
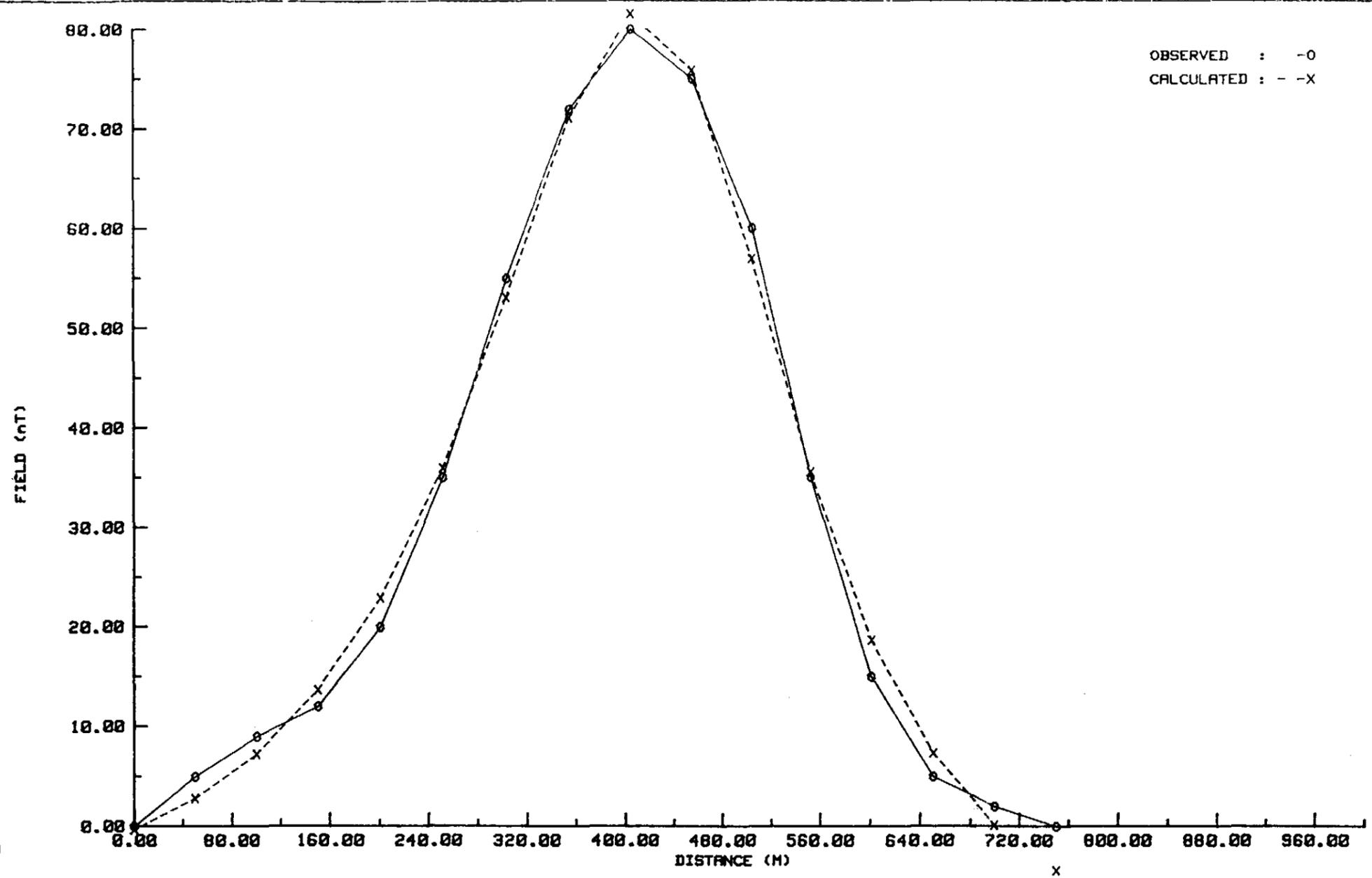
DEPTH :	48.00 Mt/CH
DISTNCE :	48.00 Mt/CH
MAGNET. :	5.00 nT/CH
1 : 4000	



SHELL COMPANY OF AUSTRALIA
 METALS DIVISION

N.W. TASMANIA
 MT. CLEVELAND
 DIGHEM AEROMAG
 LINE 54
 RACHEL ANOMALY

FIG. NO:	10	REPT. NO:	
ENCL. NO:		DRG. NO:	
DATE:	February 1985	AUTHOR:	
DRAWN:		OFFICE:	AHO



R.O.C.S.
INVERSE MAGNETIC MODELLING

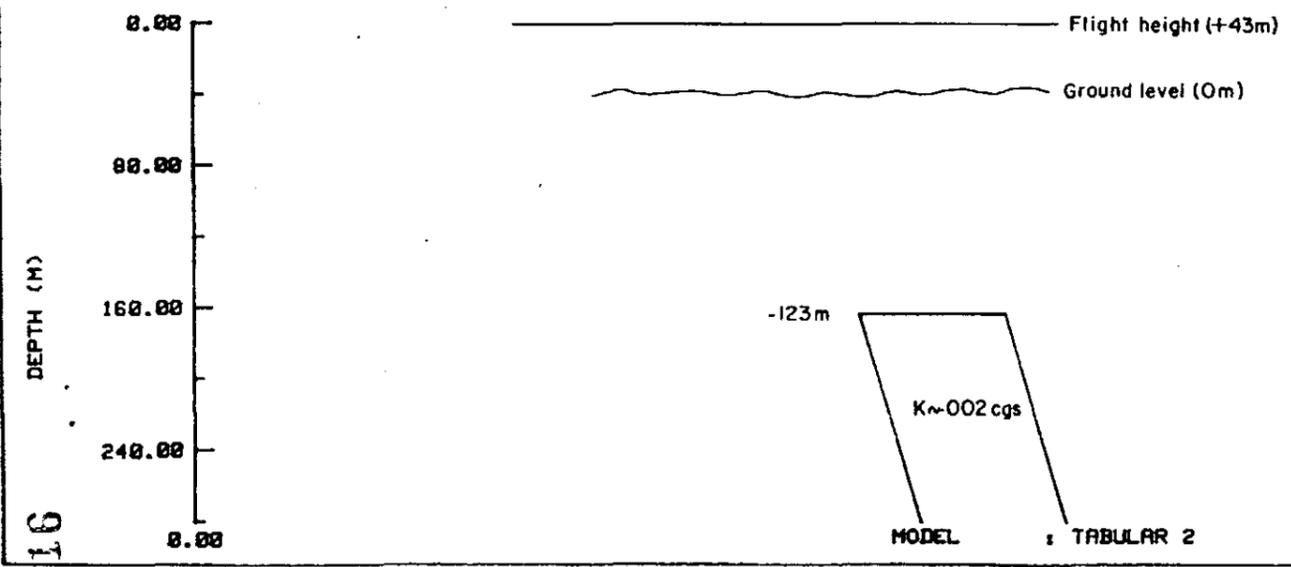
PROGRAM : MAGMOD

MAGNETIZN	120.0294
DIP	72.7817
BASE LEVEL	-9.0000
BASE SLOPE	0.0000
POSITION	423.0000
HALF WIDTH	42.0000
HALF LNTH	300.0000
DEPTH	163.1194
THICKNESS	1049.0170
INCLINATN	-71.0000
DECLINATN	135.0000
FIELD	0.0000
ORIENTATN	10.0000

SCALE

DEPTH :	40.00 Mt/CM
DISTNCE :	40.00 Mt/CM
MAGNET. :	5.00 nT/CM

1:4000



SHELL COMPANY OF AUSTRALIA METALS DIVISION	
N.W. TASMANIA MT. CLEVELAND DIGHEM AEROMAG LINE 61 RACHEL ANOMALY	
FIG. NO: 11	REPT. NO:
ENCL. NO:	DRG. NO:
DATE: February 1985	AUTHOR:
DRAWN:	OFFICE: AHO

016

017

879018



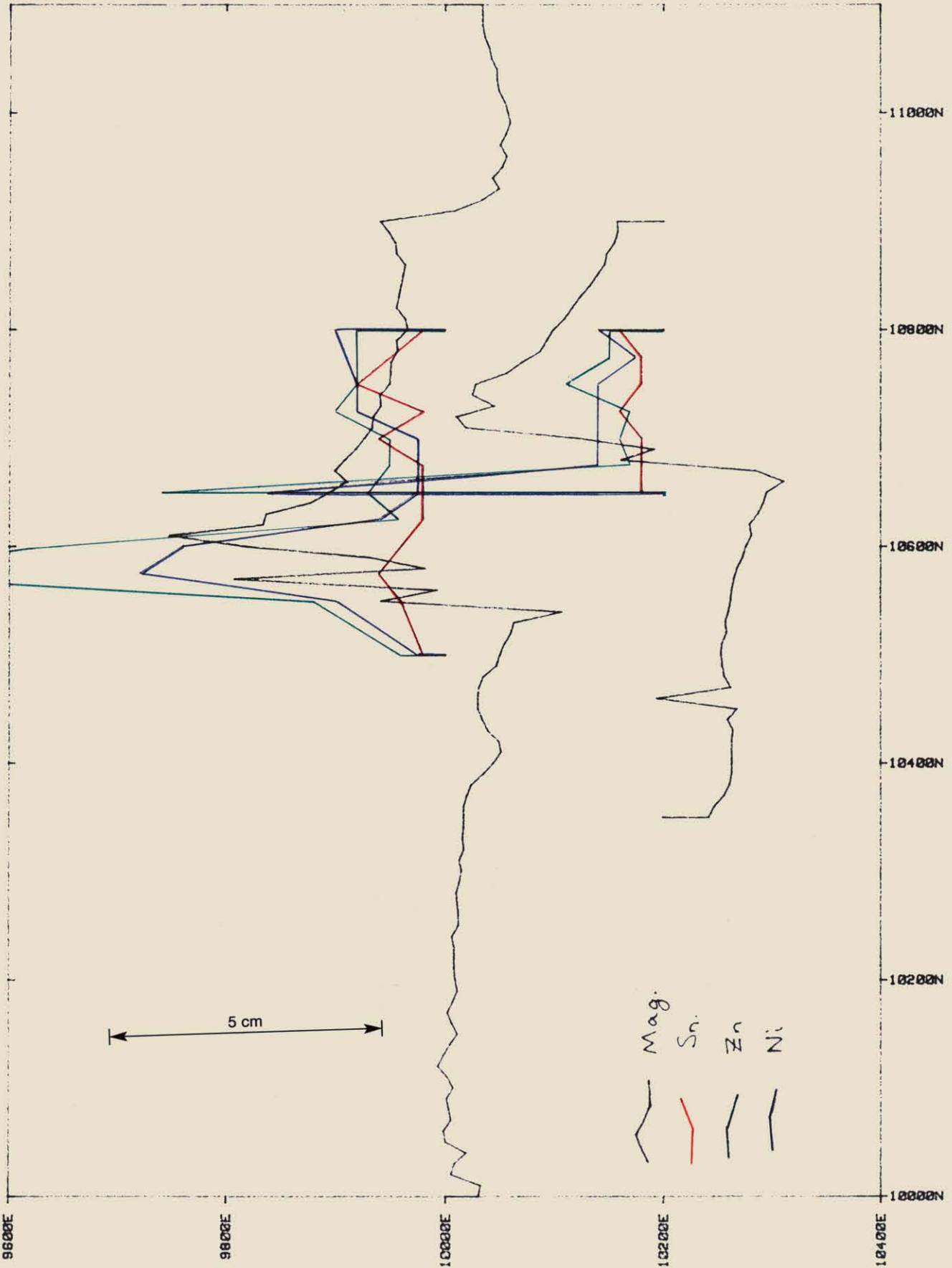
SHELL COMPANY OF AUSTRALIA
METALS DIVISION
R.O.C.S. - PROFILE

N.W. TASMANIA
MT. CLEVELAND
RACHEL ANOMALY
MAG / SN / ZN / NI
SCALE 1 : 5000.00

FIG No : 12
DATE : 8/86
AUTHOR : NH
OFFICE : AHO
DRAWN : -

LEGEND

1cm = 5 ppm



EASTING (M)

NORTHING (M)

It is concluded that the magnetic response is due to a basalt unit within the sedimentary sequence and is therefore not prospective for Sn mineralisation.

6.2 Dighem Anomaly 57A

This anomaly is a weak 2-line conductor, interpreted as a shallow bedrock source within a very linear and extensive low resistivity zone - possibly related to the alluvials of the Whyte River. A prominent aeromagnetic anomaly (present on the Dighem and Mines Department surveys) occurs about 500m to the NE of the Dighem anomaly and almost on strike. This is attributed to gabbro.

A five-line grid was erected by Comstaff to ground check the anomaly. A Max-Min survey indicated an intermediate conductor at 20-40m depth, parallel to a narrow, limited strike length, magnetic response about 50m to the NE. Modelling of the anomaly indicates dips are vertical or steep to the SE.

As would be expected, outcrop in the grid area is very poor to non-existent. River alluvials are extensive, but there is some outcrop in the river bed. To the west of the Whyte River the bulk of float is sediments, usually chert, siltstone or micaceous sandstones. To the east of the river it is essentially basic to ultramafic gabbroic. The magnetic anomaly is probably reflecting the gabbroic complex, and the

Max-Min/Dighem response is possibly a contact effect.

The grid was sampled using a hand auger to attempt to reach C-horizon. The only elevated values were from Ni, obviously reflecting the ultramafic and corresponding with the ground magnetic anomaly.

The conductivity and magnetic anomalies are considered to be due to lithology/stratigraphy and not due to massive pyrrhotite.

6.3 Dighem Anomalies 59B & 63A

These conductors occur in PreCambrian sediments, probably Oonah Formation correlates and are moderate bedrock responses, but with no aeromagnetic response.

Ground checking of the anomalies with Genie EM indicated good, shallow bedrock conductors with steep north dips. The conductor is associated with black carbonaceous and pyritic slates, which are interpreted as the anomaly source.

6.4 Dighem Anomaly 70A

This is a very weak bedrock conductor that has not been specifically ground checked. Previous mapping by Comstaff indicated it occurs in an argillite sequence. There is no associated magnetic response, but is close to the southern

020

edge of a broad NE trending magnetic high, possibly reflecting underlying ultramafic units.

The anomaly is not considered significant, and no ground work is warranted.

6.5 Dighem Anomaly 45

This is a weak conductor with no supporting evidence for it being related to a sulphide source. It is associated with a broad magnetic high, probably caused by underlying ultramafic.

021

7.0 CONCLUSIONS AND RECOMMENDATIONS

None of the Dighem anomalies interpreted as bedrock conductors are due to a sulphide (pyrrhotitic) source.

The ultramafics that may underlie the sedimentary units may be prospective for platinum group elements, but as they do not outcrop, they do not represent a suitable exploration target.

No further work is recommended and the EL should be relinquished.

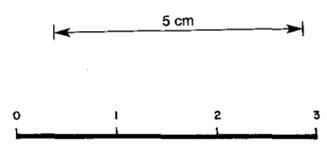
8.0 EXPENDITURE STATEMENT

Total exploration expenditure to 20th October, 1987 is
as follows:

STAFFING	\$11,564
VEHICLE & EQUIPMENT	2,110
FIELD & OFFICE COSTS	2,673
ANALYSES	160
GEOPHYSICS	4,064
DRAFTING	2,867
COMPUTING	334
ADMINISTRATION	2,497
TENEMENT COSTS	<u>1,108</u>
TOTAL EXPENDITURE	<u>\$27,377</u>

- Qa Alluvium, gravel, talus, fluvial deposits
- Tb Alkali, olivine basalt
- Dg Granite; Dpy - dyke
- S-Du Sandstone, mudstone
- Eb Basalt, coarse to fine grained flows with minor sedimentary horizons
- Eb-gb Eb (as above) + microgabbro - gabbro massive flows and sills
- Cdr Microdolerite basalt flows and highlevel intrusives interlayered with sediments
- Ebs-b Ebs + Eb
- Ebs Pillowed or vesicular spilitic basalt lava
- Edi Diorite complex
- Epx Pyroxenite - undifferentiated
- Epi Peridotite - undifferentiated
- Edu Dunite - minor peridotite and pyroxenite, generally serpentinised
- Cam Amphibolite
- Egc Basalt gabbro complex with rafts of ultramafics
- Ecc Undifferentiated
- Eccch Banded chert
- Ecar Basic volcaniclastic lithicwacks
- Eccsh Red and green argillite or silicified mudstone, may contain horizons of banded chert and carbonate, eg ore horizon at Cleveland mine
- Ecfu Shale
- Ecfu Micaceous sandstone
- Ess Black mudstone, siltstone and minor sandstone
- Eu Oonah Formation - sequences of quartzite and slate

- Geological contact (inferred)
- Fault
- Bedding
- Drill hole
- Dighem anomaly



879024

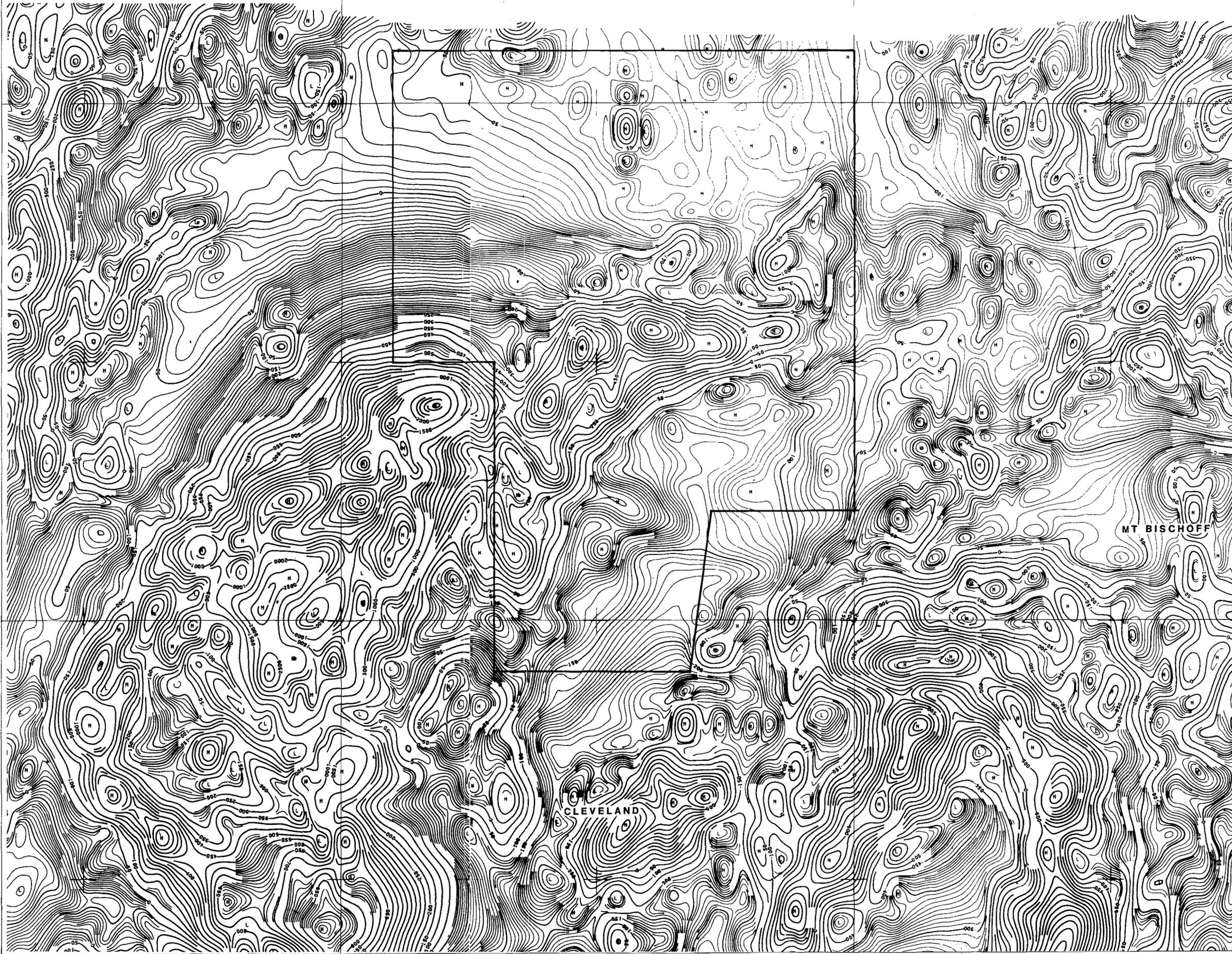
The Shell Company of Australia Limited
METALS DIVISION

N.W. TASMANIA 87-2709
ELA 20/85
MT. CLEVELAND
GEOLOGY

(Modified from Comstaff report 85/2316)

SCALE	1:50,000	DATE	Feb. 1985
AUTHOR	N.H. & D.C.	DRAWN	A.S.
OFFICE	AHO	REP.No.	
DRG.No.	LDII/1009	FIG.No.	2





5 420 000 N

5 410 000 N

Flight line separation 500 m E-W
 Mean sensor height 135 m
 Base contour interval 5 nT

5 cm

0 1 2 3 KM

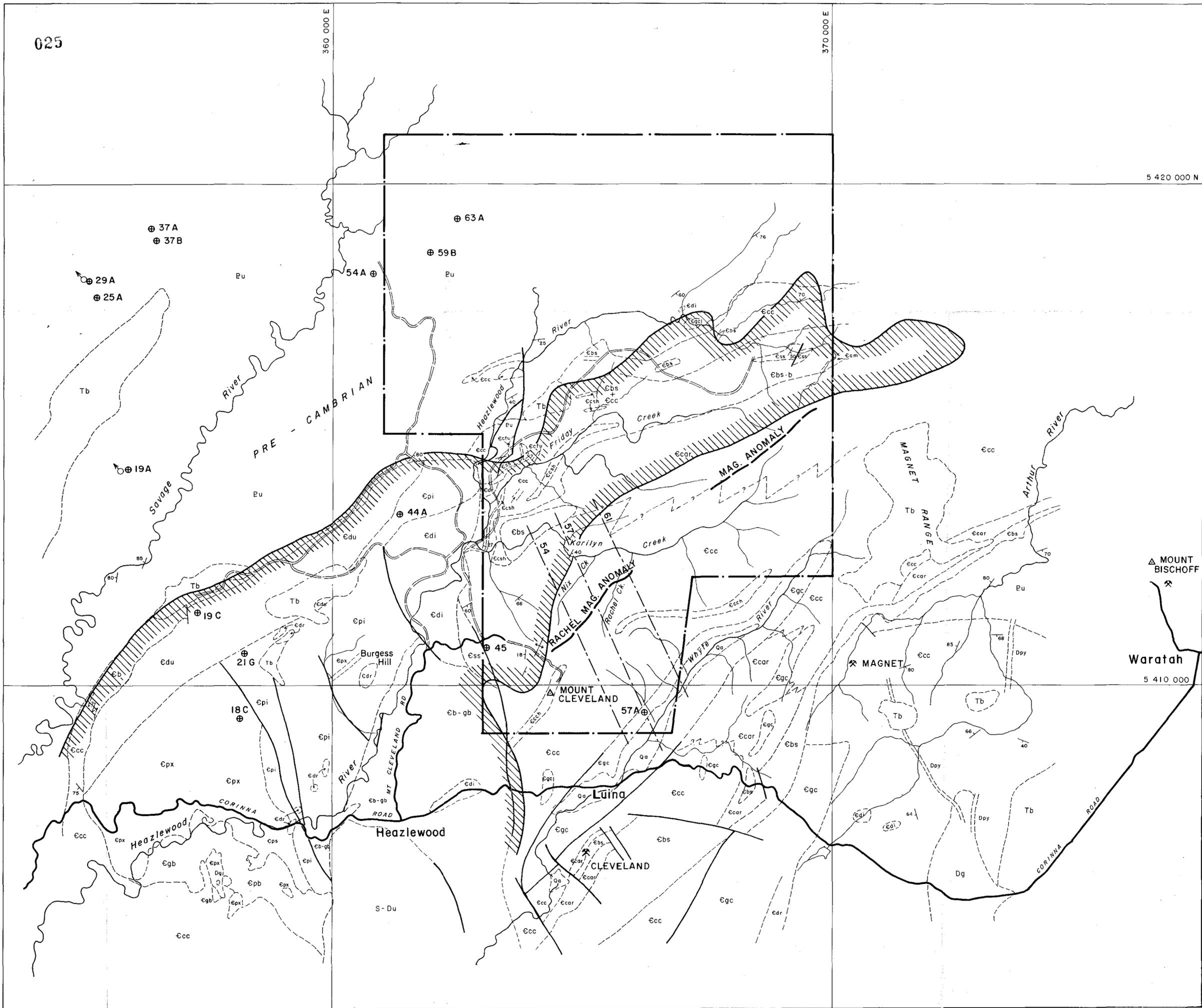
879025

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 METALS DIVISION

N.W. TASMANIA 87-2709
 ELA 20/85
 MT. CLEVELAND
 AEROMAGNETICS

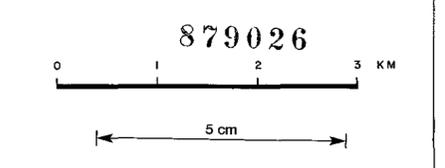
(after Tas. Mines Dept.)

SCALE	1: 50,000	DATE	February 1985
AUTHOR		DRAWN	
OFFICE	AHO	REP.No.	
DRG.No.	LD11/1011	FIG.No.	3



- Qa Alluvium, gravel, talus, fluvial deposits
- Tb Alkali, olivine basalt
- Dg Granite; Dpy - dyke
- S-Du Sandstone, mudstone
- Eb Basalt, coarse to fine grained flows with minor sedimentary horizons
- Eb-gb Eb (as above) + microgabbro - gabbro massive flows and sills
- edr Microdolerite basalt flows and highlevel intrusives interlayered with sediments
- Ebs-b Ebs + Eb
- Ebs Pillowed or vesicular spilitic basalt lava
- Edi Diorite complex
- Epx Pyroxenite - undifferentiated
- Epi Peridotite - undifferentiated
- Edu Dunite - minor peridotite and pyroxenite, generally serpentinised
- Com Amphibolite
- Egc Basalt gabbro complex with rafts of ultramafics
- Ecc Undifferentiated
- Ech Banded chert
- Ecar Basic volcaniclastic lithicwacks
Red and green argillite or silicified mudstone, may contain horizons of banded chert and carbonate, e.g. ore horizon at Cleveland mine
- Ecs Shale
- Ecu Micaceous sandstone
- Ess Black mudstone, siltstone and minor sandstone
- Eu Onah Formation - sequences of quartzite and slate

- Geological contact (inferred)
- Fault
- Bedding
- Drill hole
- Dighem anomaly
- Approx. location Dighem flight lines referred to in text
- Approx. boundary of Mafic / Ultramafic complex, from aeromag.



**The Shell Company of Australia Limited
METALS DIVISION**

87-2709
**N.W. TASMANIA
ELA 20/85
MT. CLEVELAND
GEOLOGY & GEOPHYSICS**

(Modified from Comstaff report 85/2316)

SCALE 1: 50,000	DATE Feb. 1985
AUTHOR N.H. & D.C.	DRAWN A.S.
OFFICE AHO	REP.No.
DRG.No. LDII / IOIO	FIG.No. 4