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BILLITON AUSTRALIA

THE METALS DIVISION OF
THE SHELL COMPANY OF AUSTRALIA LIMITED

E.L. 39/83 - CATTLEY RANGE

RELINQUISHMENT REPORT

Authors : J.P. Randell
N. Hungerford

Report No : 08.4942

Date : 16th February, 1990

Copy No :

Distribution : 1. Dept. of Mines, Hobart
2. Billiton, Melbourne
3. Billiton, Devonport

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DEPARTMENT OF MINES – TASMANIA
MINERAL INDUSTRY UNPUBLISHED REPORT

DATA SHEET

REPORT NUMBER TCR _____

☐ CF ☐ RF ☐ OF

AUTHOR(S): J. RANDELL
N. HUNGERFORD DATE: JAN 1990

TITLE: E.L. 39/83 CATTLEY RANGE
RELINQUISHMENT REPORT

COMPANY(S): BILLITON AUSTRALIA

FORMAT: No. of Volumes: 1 Structure: 1 FIG 1 APPENDIX

COMPANY REF. (if any): 08.

LICENCE / LEASE: EL 39/83

LOCALITY: SK55– ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

Map sheet: BURNIE

Geographic: (not in title) MT. CATTLEY

MAPPING – GEOLOGICAL
- ☐ Surface – scale: _____
- ☐ Mine/Underground

DRILLING
- ☐ Diamond
- ☐ Percussion
- ☐ Auger
- ☐ _____
- ☐ Logs
- ☐ Analysis
- ☐ Metallic Minerals
- ☐ Non–metallic Minerals

GEOPHYSICS
GND/AIR
- ☐ Magnetic
- ☒ Electromagnetic
- ☐ Radiometric
- ☐ A.P. ☐ S.P. ☐ E.P.
- ☐ E.I.P./M.I.P ☐ Resist.
- ☐ Gravity
- ☐ Seismic – Refraction
- ☐ Seismic –Reflection
- ☐ _____
- ☐ On – shore ☐ Off–shore
- ☐ Well–logging

GEOCHEMISTRY
- ☐ Stream Sediment
- ☐ Soil: _____
- ☐ Rock – chip
- ☐ Gossan
- ☐ Water: _____
- ☐ Biogeochemistry
- ☐ _____
- ☐ Cu ☐ Pb ☐ Zn
- ☐ Sn ☐ W ☐ Mo
- ☐ Rock: ☐ Maj. ☐ Tr.

- ☐ PETROLOGY
- ☐ ORE GENESIS
- ☐ ORE RESERVES
- ☐ FEASIBILITY STUDY
- ☐ MINERAL PROCESSING
- ☐ MINING
- ☐ ENVIRONMENT
- ☐ ENGINEER. GEOLOGY
- ☐ INDUST. MINERALS
- ☐ CONSTRUCT. MAT.
- ☐ FUELS: _____

MINERALS: Lead Zinc Copper Gold

MINE / DEPOSIT NAME(S): _____

OTHER KEY WORDS: Down Hole E.M. Self Response

ANNOTATION: Spurious down hole E.M. anomalies have been resolved by additional surveying. The licence has been satisfactorily explored for base metal mineralisation and is recommended for relinquishment.

LIST OF CONTENTS

1. INTRODUCTION

Exploration Licence 39/83, covering 44km², was granted to the Shell Company of Australia Ltd. on 22nd August, 1983. The tenement was reduced by 50% in area on the 22nd August 1988 and a separate report has documented exploration completed on the relinquished portion. (Billiton Report 08.4107).

This report describes the exploration results achieved within the retained licence area since 22nd August, 1989, the anniversary of the tenement. This is a final report for the tenement as it has been recommended for relinquishment.

2. PREVIOUS EXPLORATION

Details of exploration carried out prior to the current term are listed in the following Billiton reports: 08.2489, 08.2887, 08.3410, 08.3545, 08.4106, 08.4107, 08.4172.

In particular, report 08.4106, "Progress Report on Exploration for the Period 23/8/87 to 22/8/88" summarizes previous exploration by Billiton up to the 1988 period. Exploration completed in 1988-89 is detailed in report 08.4172.

3. EXPLORATION COMPLETED 1989-90

Outstanding results to be reported since the 1989 anniversary report are confined to the following account by Billiton's geophysicist, N. Hungerford.

Drill hole CRD 88-1 was logged in March 1989 with an EM-37 drillhole TEM probe, using a transmitter loop (2) (200 x 200m) positioned for maximum coupling with expected steep east dips. The survey indicated shallow conductors due either to the proximity of the transmitter wire to the probe or to the few metres of steel casing at the top of the hole. This survey also showed an anomalous response at the end of the drill hole, which could have indicated proximity to an off-hole conductor.

Since the previous surface EM-37 survey (1986) had not detected a steeply-dipping conductor at this location, it was thought that this was because of poor coupling to the surface survey loop. This would have placed the conductor under the down-hole loop in a flat-lying (shallow dip) and deep position. To test for this possibility loop 3 (400 x 300m) was laid and both drillholes, CRD 88-1 and CRD 86-1 were surveyed. Neither survey clearly indicated any down-hole conductor.

In order to further confirm, or otherwise, the apparent off-hole anomaly from loop 2, a series of loops were laid around the drill hole. This is the conventional means to determine the position and attitude of a down-hole conductor. The positions of these 4, 200 x 200m, loops are indicated on the loop plan. (Fig. 1).

The down hole EM plots together with schematic "field" diagrams are attached as Appendix 1.

Apart from some near surface responses, with probable causes as mentioned above for loop 2, there are no down-hole conductors. This discrepancy is hard to explain since loops 4 and 5 are in very similar positions to loop 2.

Unusual drill hole responses can sometimes be explained by 'probe self-response', in which the probe itself is acting as a conductor, and the response varies with the direction of the primary field.

Primary field vector plots for a homogeneous earth can indicate where a self-response anomaly may occur since this will be the position at which the primary field direction changes position (and amplitude). At Cattley, loop 3 has a change in direction at about 50 metres, loops 6 and 7 at about 100 metres

but loops 2, 4 and 5 have no change. This is of course only approximate since the 'real' earth is not at all homogeneous. The main point however is that there is no obvious reason for an anomaly due to probe self-response at 300 metres down CRD 88-1 for loop 2. This anomaly may be spurious (due to instrument problems) although the data look 'clean', and it could also be verified by carrying out a duplicate survey.

This cannot be justified, and thus no further work is recommended on this prospect.

4. CONCLUSIONS

Billiton has completed 6 years of exploration within EL 39/83 without locating economic mineralization. The licence has been geologically mapped, gridded, auger soil sampled, costeaned and ground magnetic/EM 37 surveys have been completed. Percussion drilling and diamond drilling programmes have been completed on geological-geochemical-geophysical anomalies but only trace mineralization has been intersected.

Intense alteration has been observed whilst mapping and logging drill core but isotopic evidence suggests that this is a low temperature local hydrothermal pattern caused by the intrusion of quartz porphyries. Lead isotopic determinations of

mineralization support a Cambrian origin for the sulphide species but the nature and style of the mineralization suggest a remobilized system.

There remains conflict as to the nature of intermediate rocks at the southern end of the licence; the author (JPR) favours an extrusive origin whilst Department of Mines personnel suggest that these rocks are intrusive.

During the latter part of 1989, the property was offered for joint venture to several companies as Billiton could not justify continued exploration. No firm offers were made by competitors.

Having reviewed the results of the previous exploration, it is Billiton's conclusion that there is insufficient potential recognised for the development of a significant body of base metal mineralization.

5. RECOMMENDATIONS

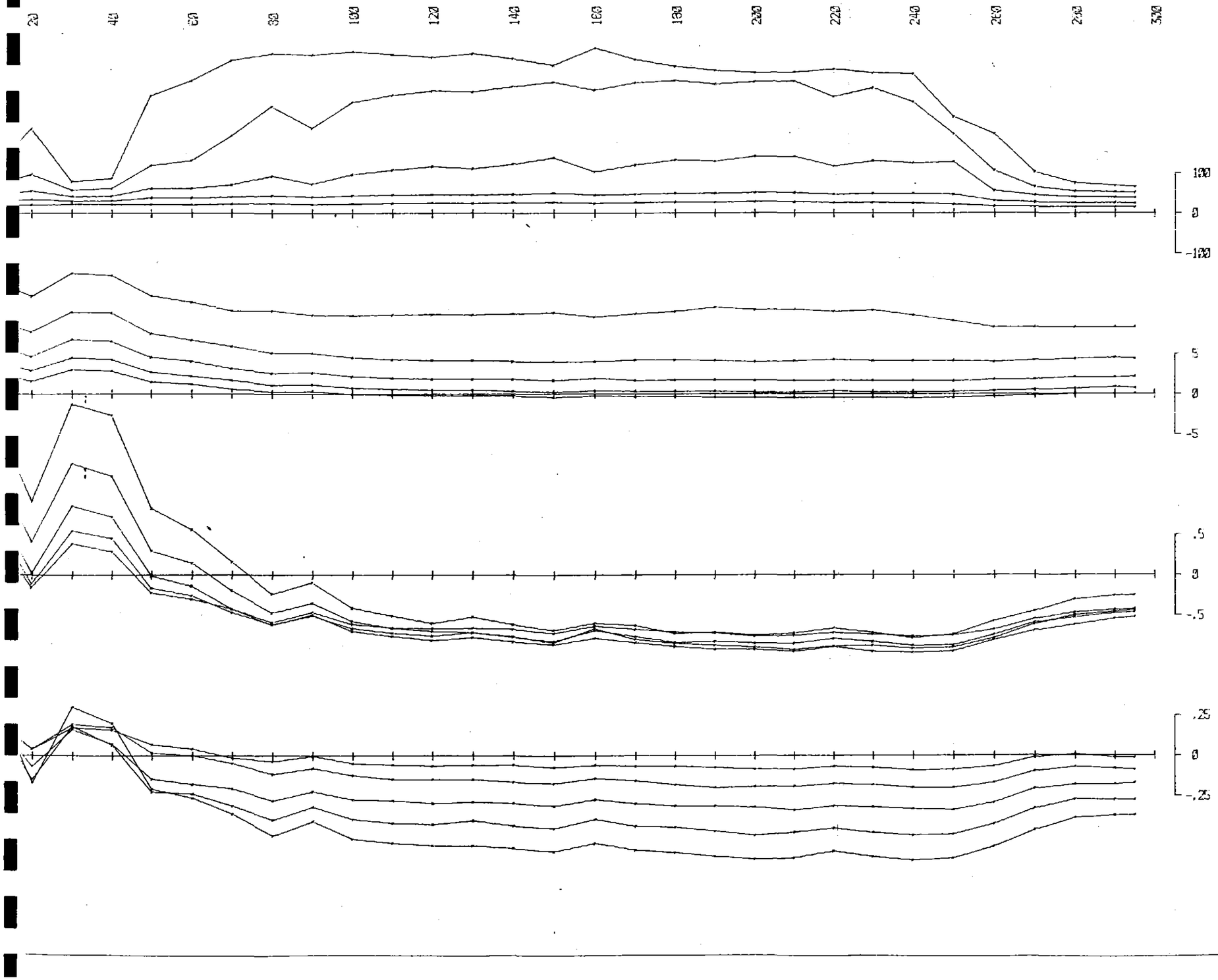
It is recommended that the licence be prematurely relinquished to allow other companies the opportunity to assess all data.

APPENDIX 1

009 520010

5 cm

AXIAL COMPONENT B (Z)



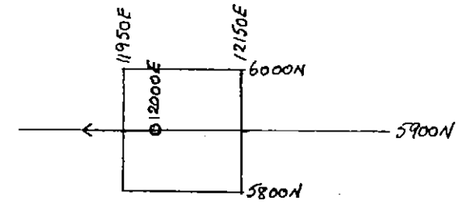
nanovolts per amp metre squared

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES	:	06000N 11950E
	:	05800N 12150E
TX LOOP SIZE	:	200 m X 200 m
TX TURN OFF TIME	:	228 microsecs.
FIRST GATE TIME	:	88.5 microsecs.
CURRENT	:	24.2 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:1000
SURVEYED BY	:	SDBG
DATE	:	04/03/1989

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-108

CLIENT : BILLITON AUSTRALIA

PROJECT : CATTLEY RANGE

AREA : WARATAH TASMANIA

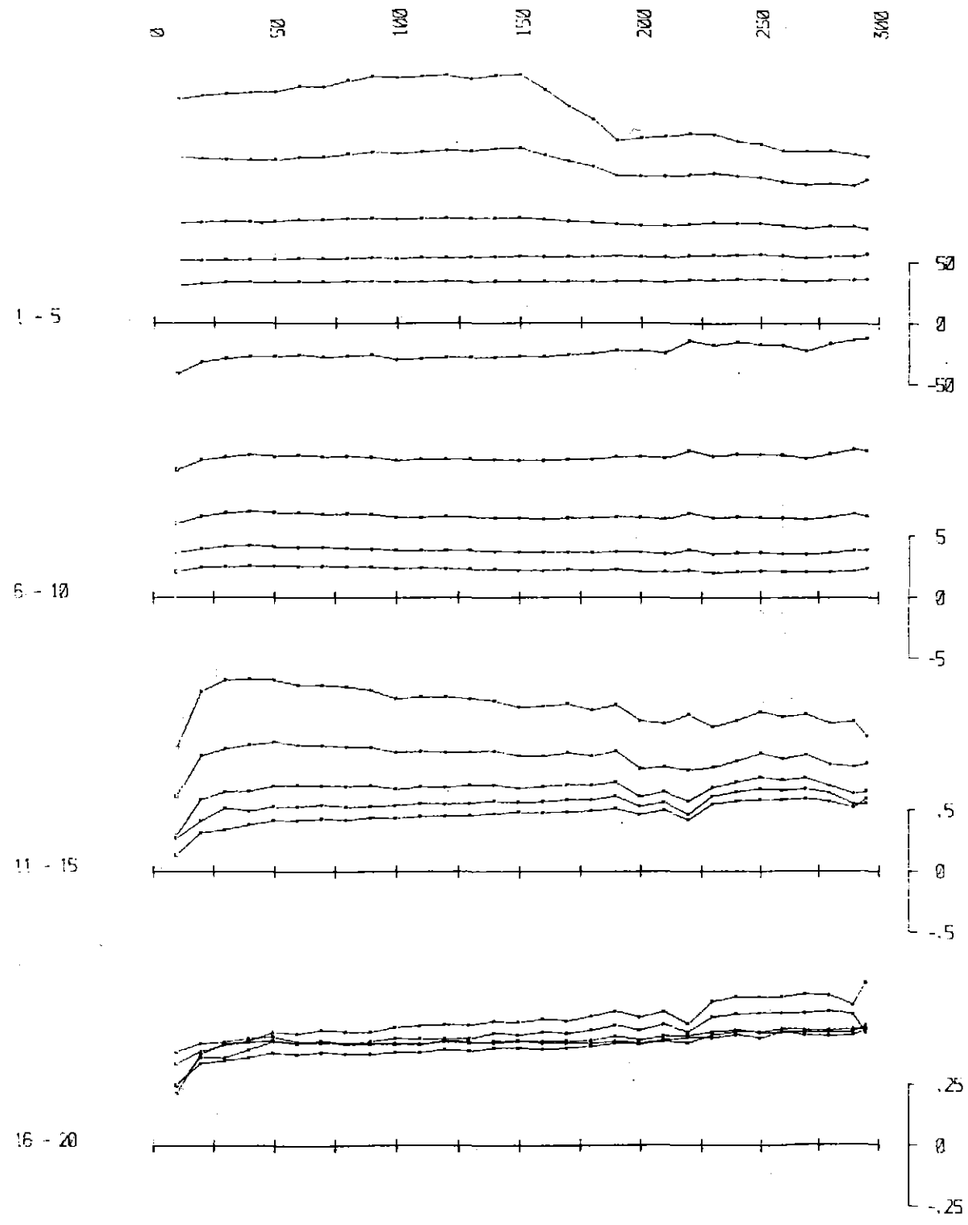
BOREHOLE : CRD881 A

TX LOOP : 2

010

520011

AXIAL COMPONENT B (Z)



nanovolts per amp metre squared

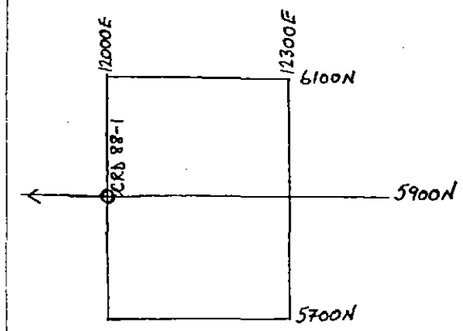
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES	: 05700N	12000E
	: 06100N	12300E
TX LOOP SIZE	: 400 m X 300 m	
TX TURN OFF TIME	: 195 microsecs.	
FIRST GATE TIME	: 88.5 microsecs.	
CURRENT	: 15.5 amps	
FREQUENCY	: 25 Hz.	
INTEGRATION TIME	: 1024 cycles	
SYNC MODE	: CRYSTAL	
HORIZONTAL SCALE	: 1:2500	
SURVEYED BY	: SMDG	
DATE	: 20/04/1989	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-108

CLIENT : BILLITON AUSTRALIA

PROJECT : CATTLEY RANGE

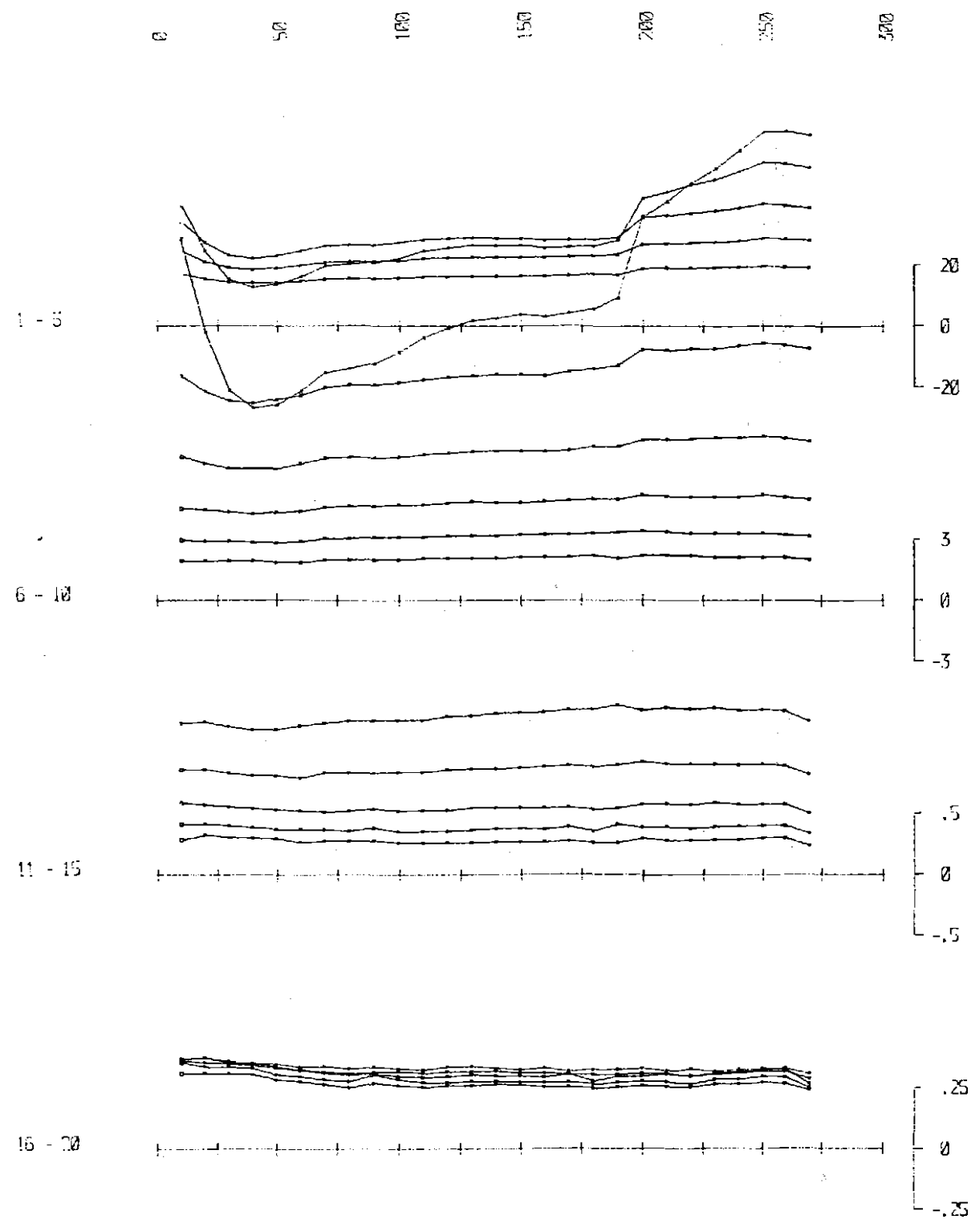
AREA : EL 39/83 TASMANIA

BOREHOLE : CRD881 A

TX LOOP : 3

Oil 520012

AXIAL COMPONENT B (Z)



nanovolts per amp metre squared

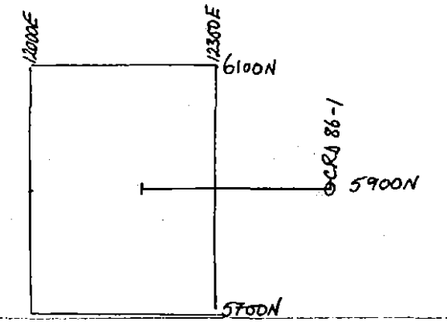
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES	:	05700N	12000E
	:	06100N	12300E
TX LOOP SIZE	:	400 m X 300 m	
TX TURN OFF TIME	:	195 microsecs.	
FIRST GATE TIME	:	88.5 microsecs.	
CURRENT	:	15.5 amps	
FREQUENCY	:	25 Hz.	
INTEGRATION TIME	:	1024 cycles	
SYNC MODE	:	CRYSTAL	
HORIZONTAL SCALE	:	1:2500	
SURVEYED BY	:	SMDA	
DATE	:	20/04/1989	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.	PROJECT NO. 4-108

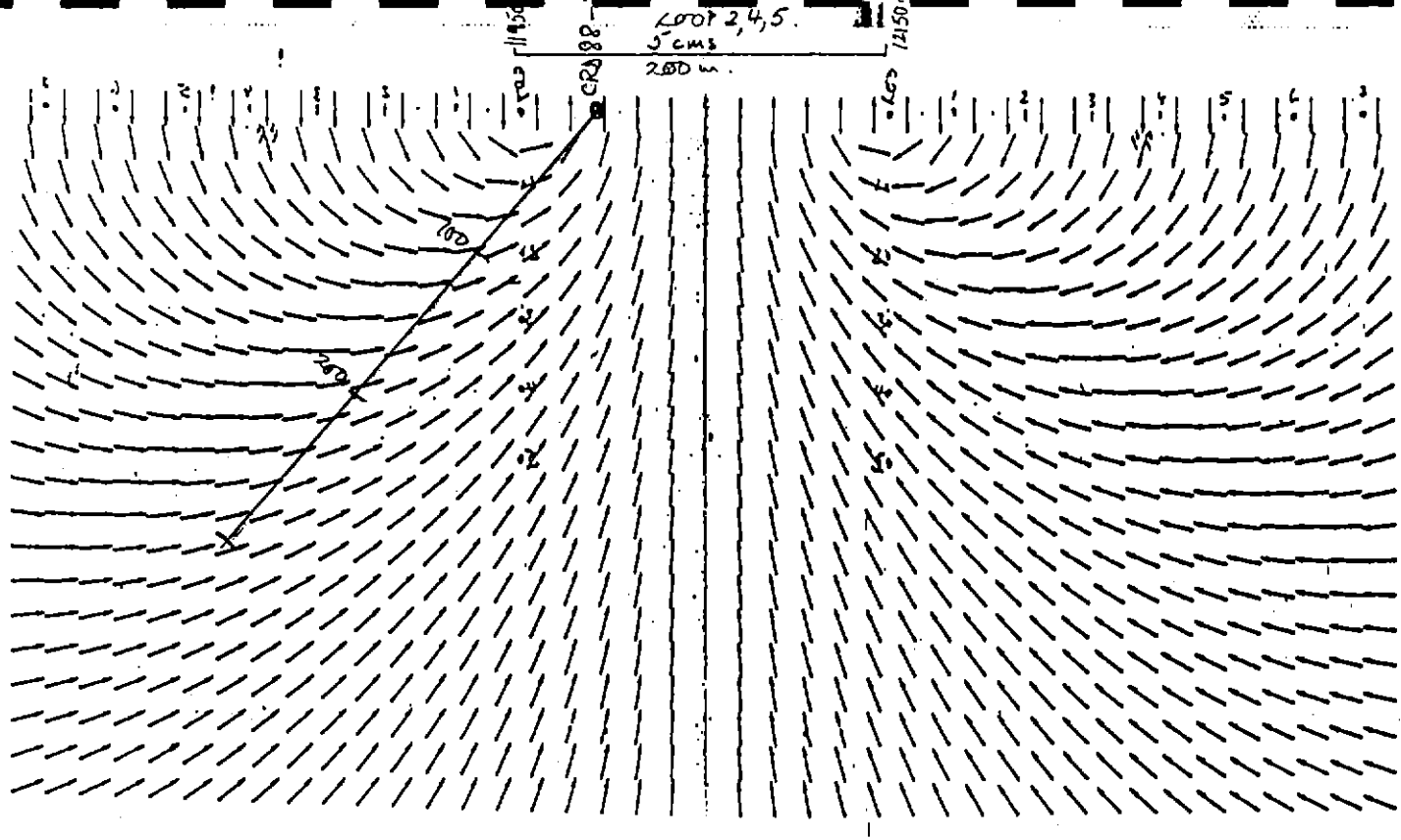
CLIENT . BILLITON AUSTRALIA

PROJECT : CATTLEY RANGE

AREA . EL 39/83 TASMANIA

BOREHOLE : CRD861 A

TX LOOP : 3

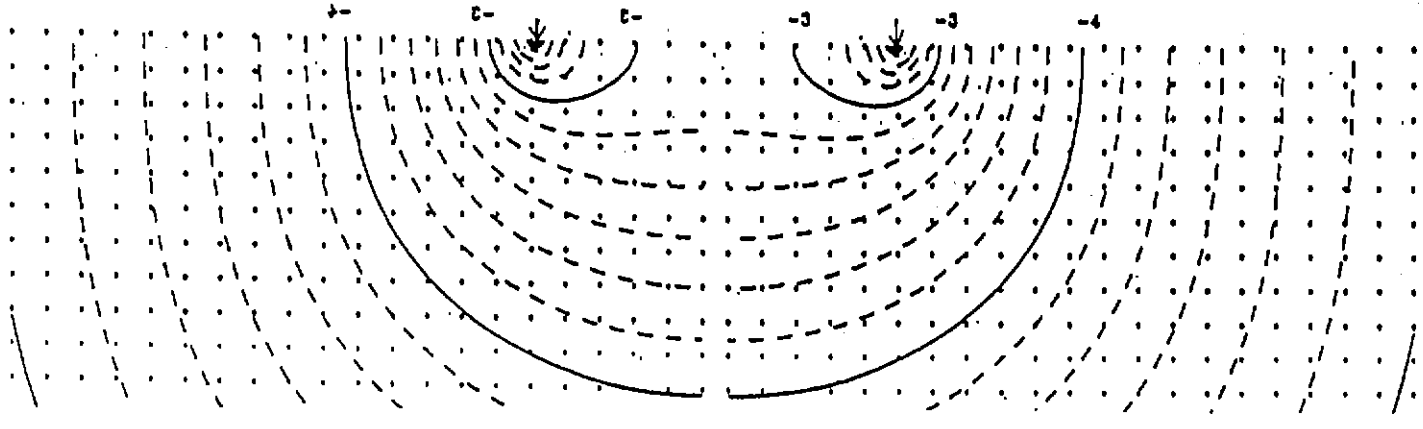


CATTLEY / LOOP 2.
+ 4,5

H

CASE V01
see Fig 2.

012

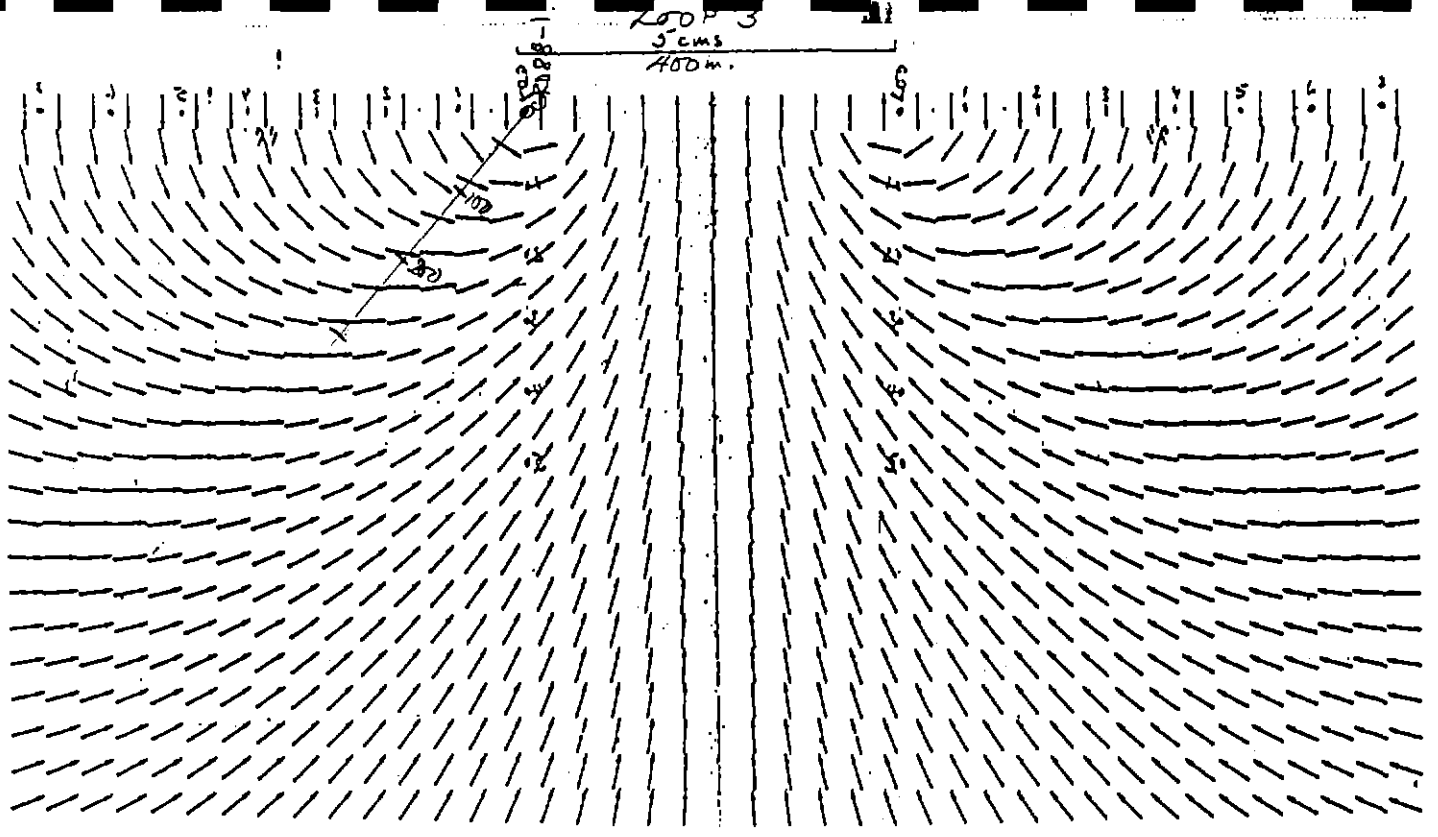


H

CASE V01

520013

CATTLEY.



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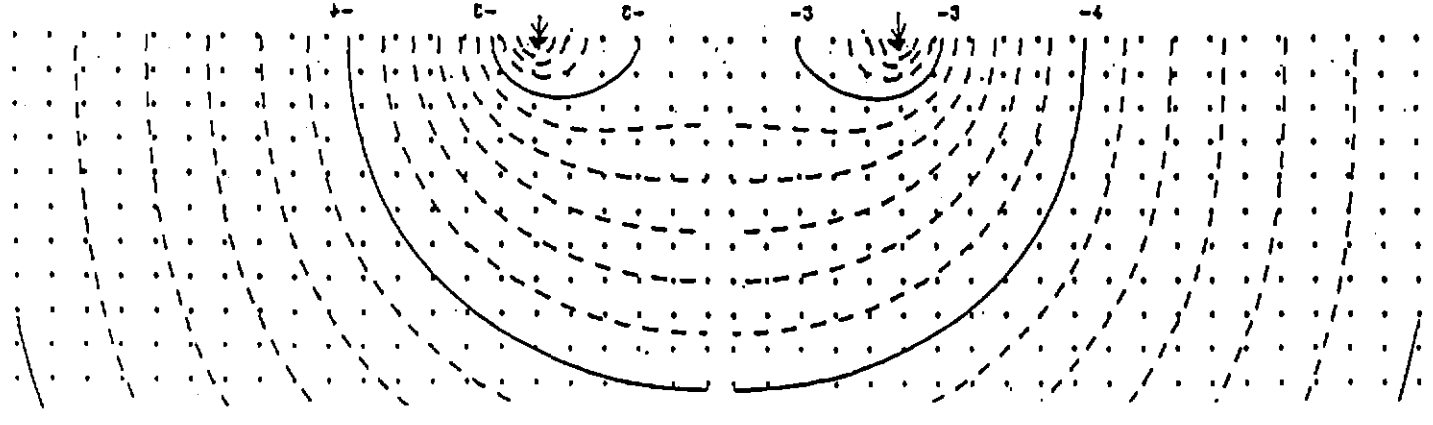
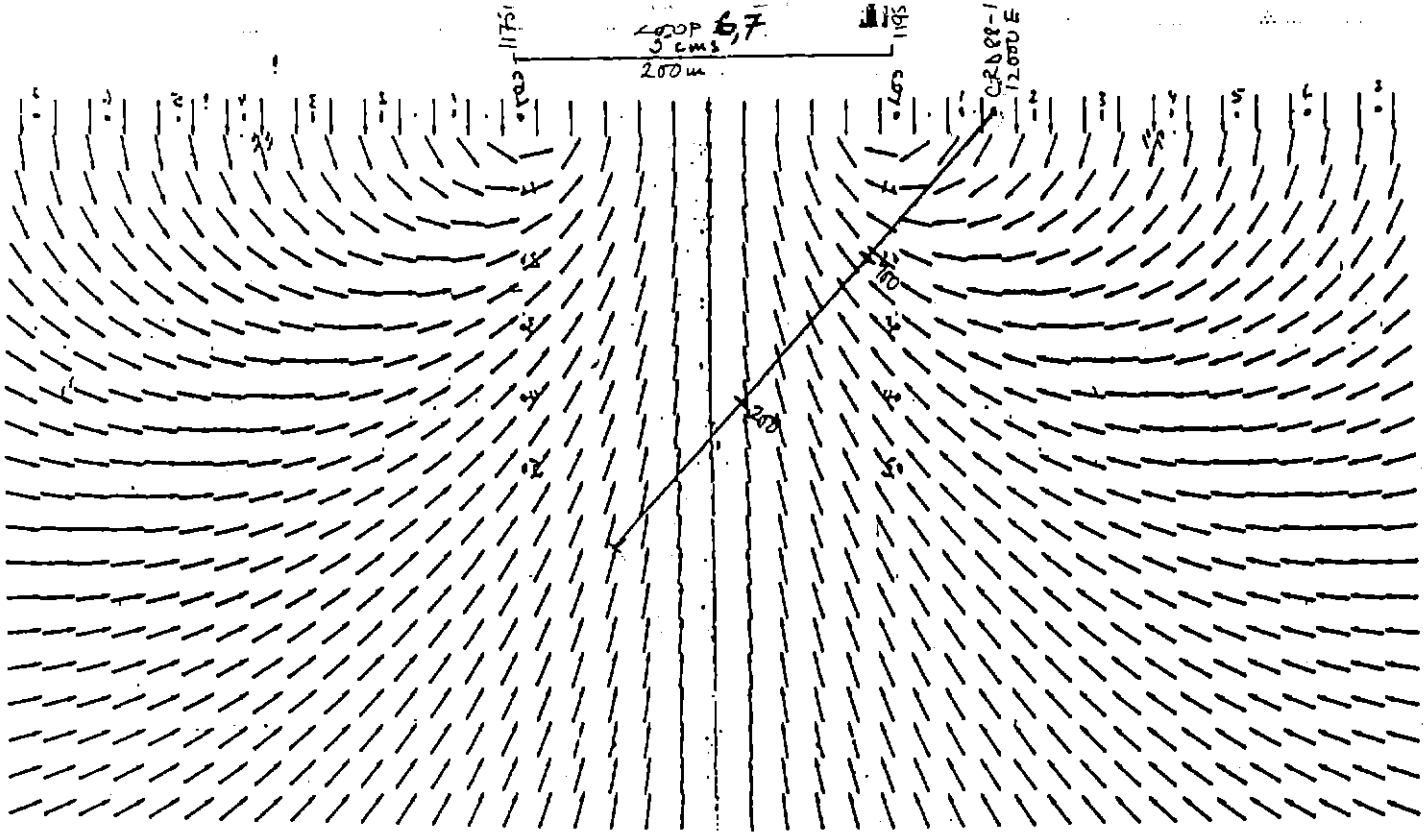
CASE_V01
see Fig 2.



H

CASE V01

CATTLEY LOOPS
6,7



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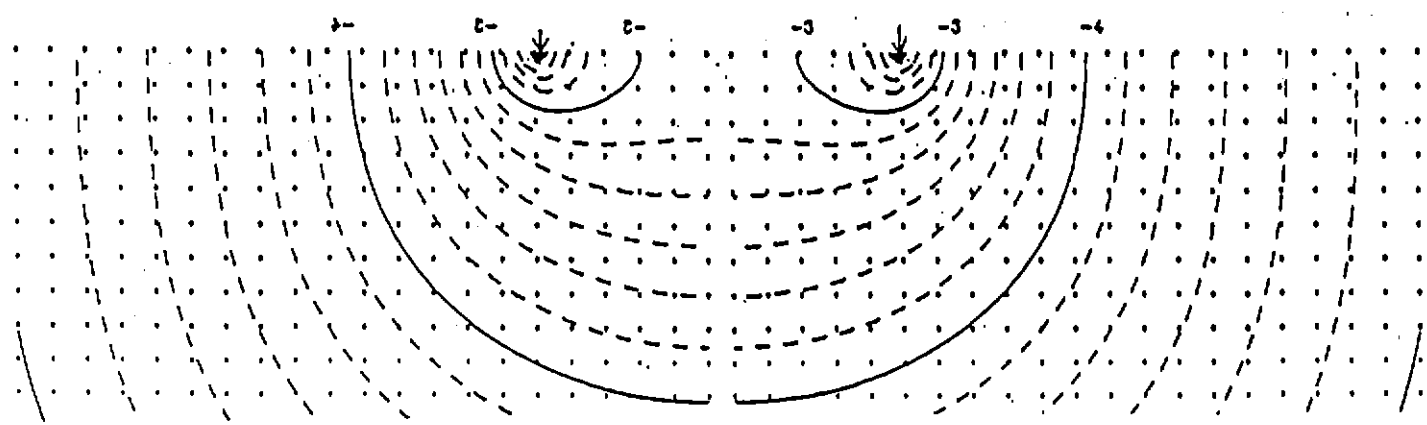
CASE V01
see Fig 2.

014



H

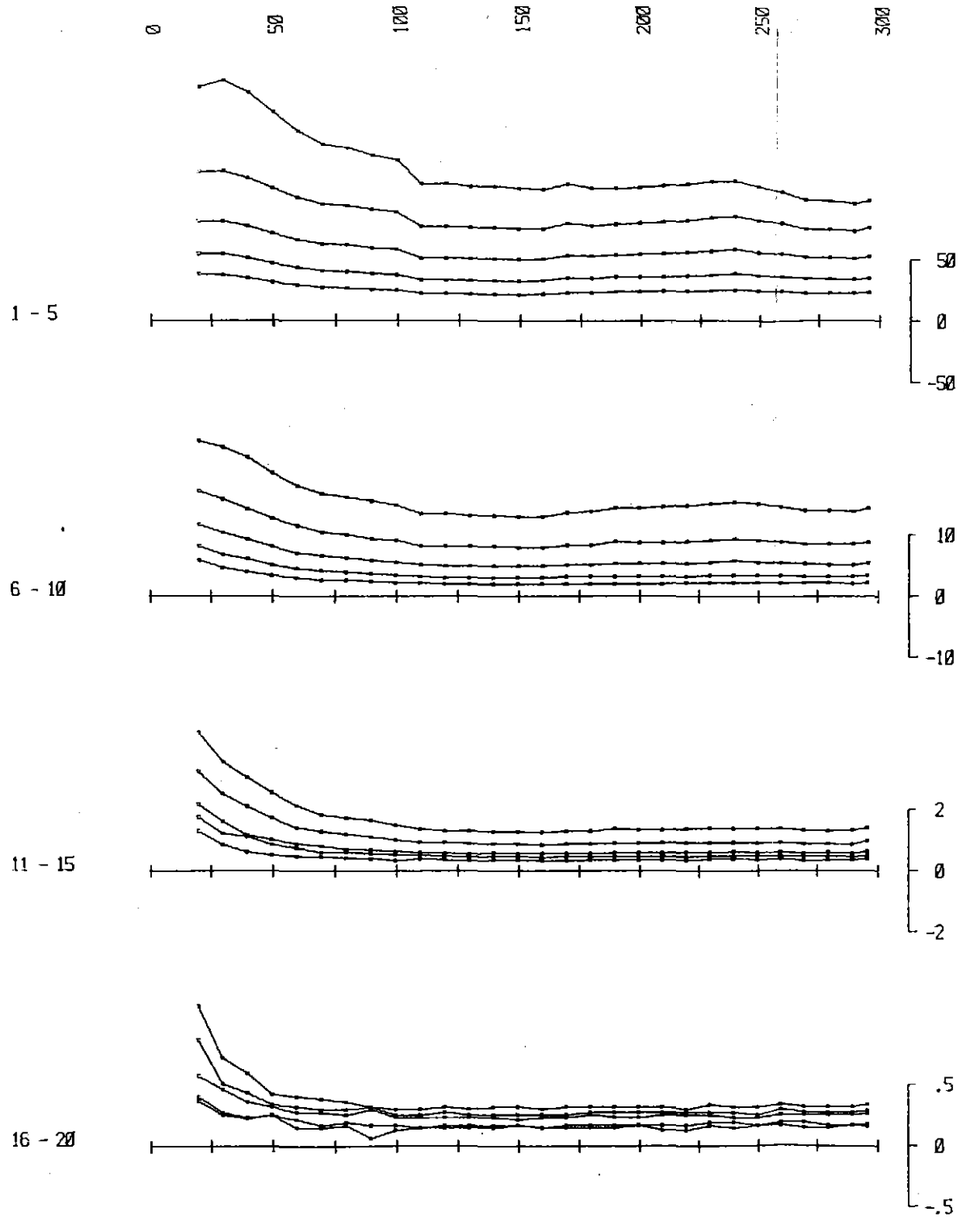
CASE V01

520015

520016

9267

AXIAL COMPONENT Ḃ (Z)



nanovolts per amp metre squared

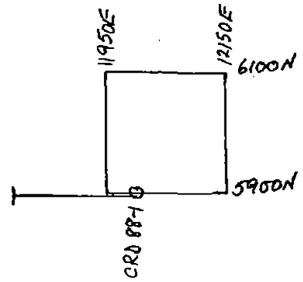
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES	:	5900N	11950E
	:	6100N	12150E
TX LOOP SIZE	:	200 m X 200 m	
TX TURN OFF TIME	:	120 microsecs.	
FIRST GATE TIME	:	88.5 microsecs.	
CURRENT	:	14.2 amps	
FREQUENCY	:	25 Hz.	
INTEGRATION TIME	:	1024 cycles	
SYNC MODE	:		
HORIZONTAL SCALE	:	1:2500	
SURVEYED BY	:	RLSM	
DATE	:	14/06/1989	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

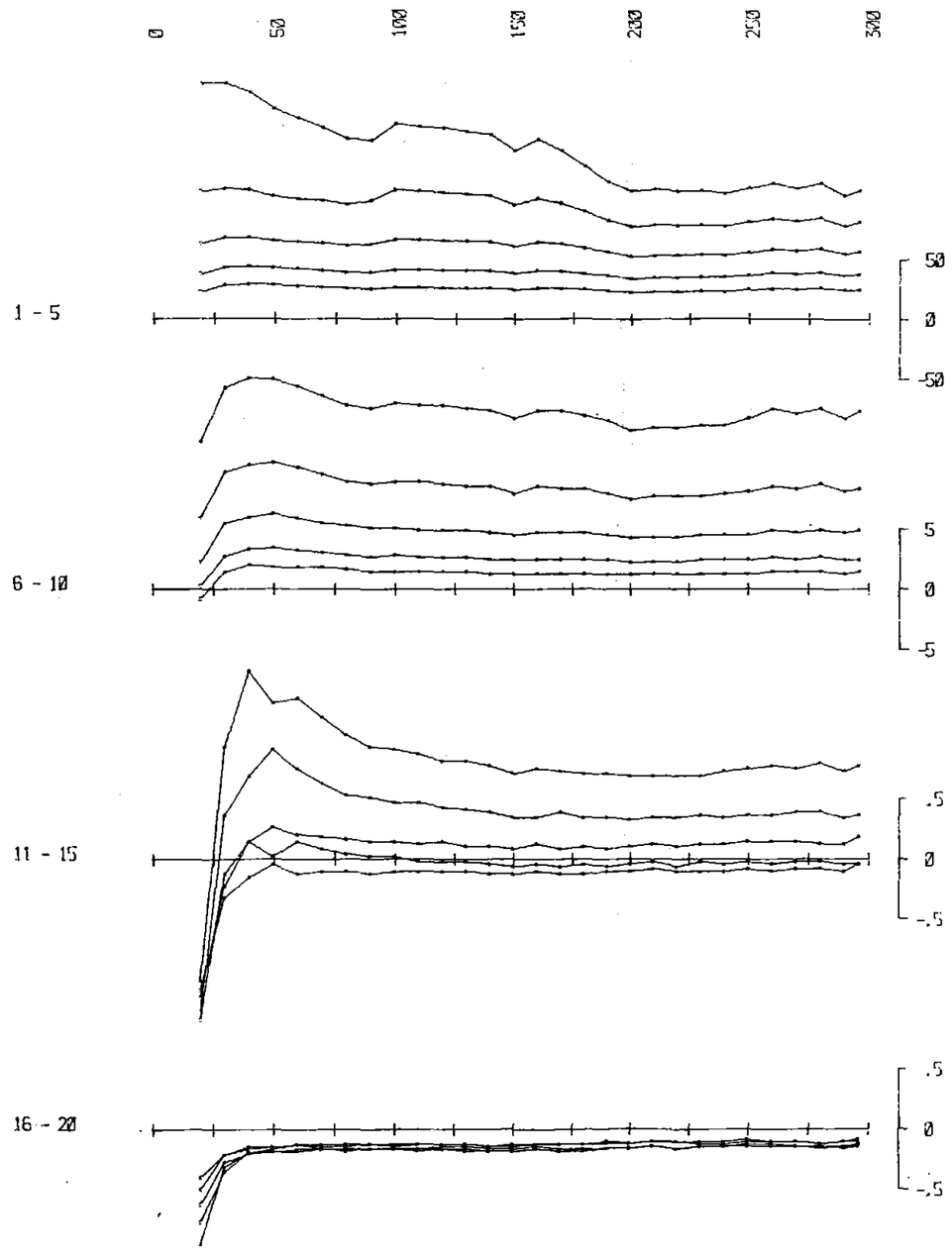
PROJECT NO. 4-109

CLIENT	:	Billiton Aust Ltd
PROJECT	:	Cattley Range
AREA	:	WARATAH TASMANIA
BOREHOLE	:	RD88-1 A
TX LOOP	:	4

520017

9268

AXIAL COMPONENT B (Z)



nanovolts per amp metre squared

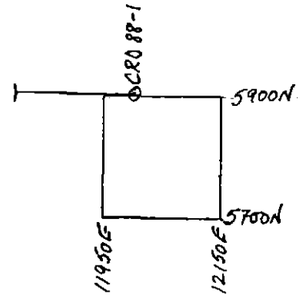
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED B SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



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FIRST GATE TIME	:	88.5 microsecs.
CURRENT	:	14.8 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:2500
SURVEYED BY	:	RLSM
DATE	:	14/06/1989

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

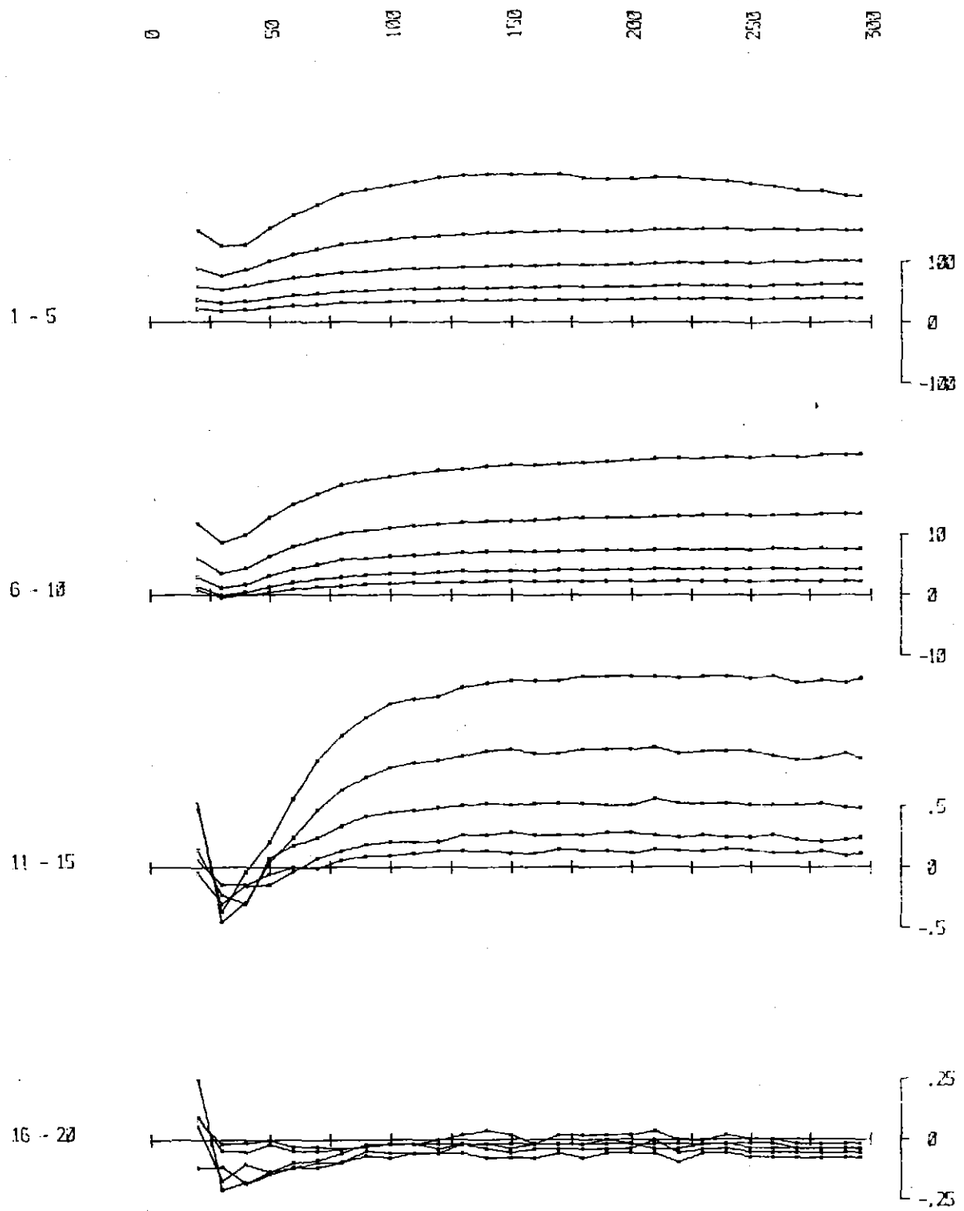
PROJECT N 4-108

CLIENT.	:	Billiton Aust Ltd
PROJECT.	:	Cattley Range
AREA.	:	WARATAH - TASMANIA
BOREHOLE.	:	RD88-1 A
TX LOOP	:	5

520018

9269

AXIAL COMPONENT $\dot{B}$ (Z)



nanovolts per amp metre squared

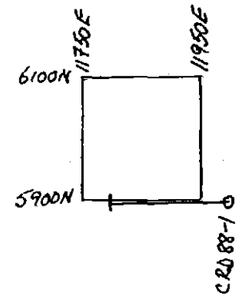
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



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TX TURN OFF TIME	:	130 microsecs.
FIRST GATE TIME	:	93.5 microsecs.
CURRENT	:	16.0 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:2500
SURVEYED BY	:	RLSM
DATE	:	14/06/1999

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

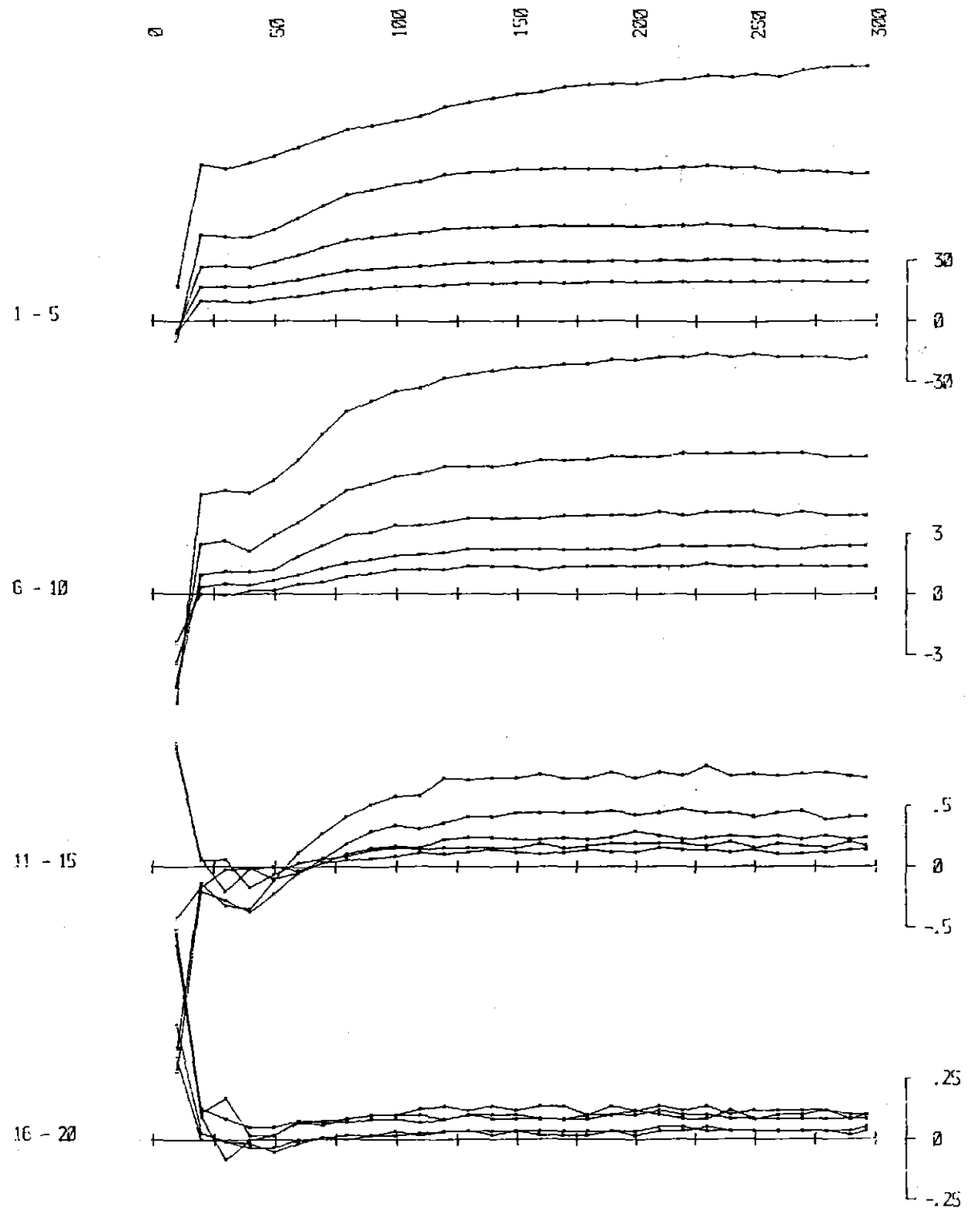
PROJECT NO. 4-100

CLIENT	:	Billiton Aust Ltd
PROJECT	:	Cattley Range
AREA	:	WARATAH TASMANIA
BOREHOLE	:	RD88-1 A
TX LOOP	:	6

520019

9270

AXIAL COMPONENT B (Z)



nanovolts per amp metre squared

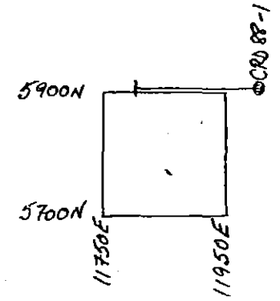
5 cm

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)



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	: 06100N	11950E
TX LOOP SIZE	: 200 m X 200 m	
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FIRST GATE TIME	: 88.5 microsecs.	
CURRENT	: 17.7 amps	
FREQUENCY	: 25 Hz.	
INTEGRATION TIME	: 1024 cycles	
SYNC MODE	:	
HORIZONTAL SCALE	: 1:2500	
SURVEYED BY	: RLSM	
DATE	: 13/06/1989	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-103

CLIENT : Billiton Aust Ltd

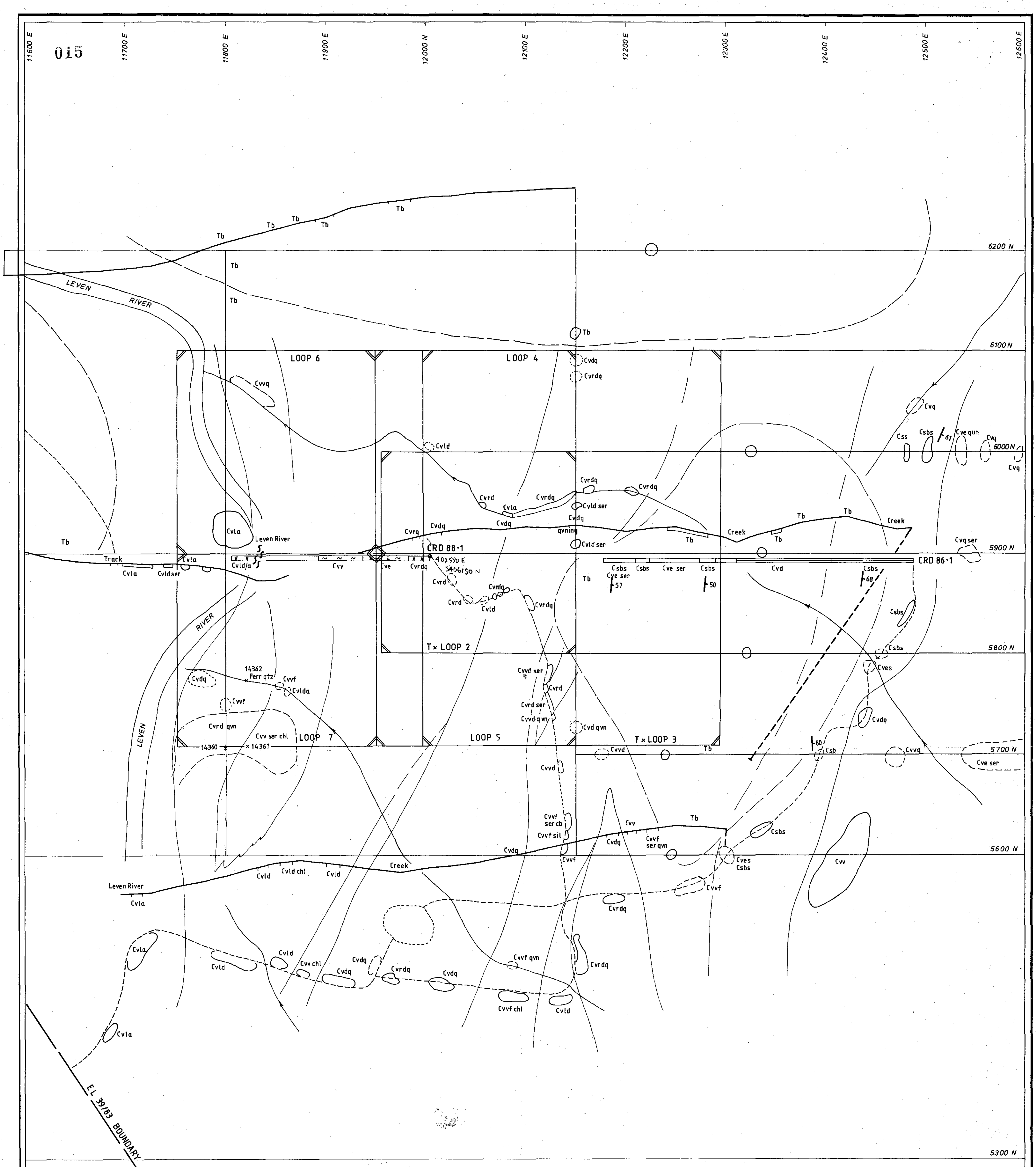
PROJECT : Cattley Range

AREA : WARATAH TASMANIA

BOREHOLE : CRD88-1 A

TX LOOP : 7

015



LEGEND

	Tb	Tertiary basalt
	Cve	Cambrian undiff. epiclastics
	Cvvf	Cambrian feldspar phyric volcaniclastics
	Cvvq	Cambrian quartz phyric volcaniclastics
	Cves	Cambrian arenaceous epiclastic
	Csbs	Cambrian black shale
	Csl	Cambrian fine silts
	Cvq	Cambrian quartz phyric volcanic
	Cvd	Cambrian dacitic volcanic
	Cvdq	Cambrian quartz phyric dacitic lava/intrusive
	Cvrdq	Cambrian quartz phyric rhyodacitic lava intrusive
	Cvla	Cambrian feldspar phyric andesitic lava
	Cvlda	Cambrian feldspar phyric dacite-andesite lava

0 50 100 150 200M

Sirotem anomaly
Grid line profile
Track

N Mag
N AMG

90-3091

520020

5 cm

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

Project	CATTLEY RANGE
Title	DETAILED GEOLOGICAL PLAN OF AREA AROUND DRILL HOLE CRD 86-1

Author J P R	Dept. TAS	Scale 1: 2500	
Drawn O H	Date 6/88	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG No. 1		Drawing No. D / LD 51/037	