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EL 722 AND EL 1065

BILLEROO WEST

PROGRESS REPORTS FOR THE PERIOD 30/6/80 TO 7/11/87

Submitted by

CSR Ltd and Mines Administration Pty Ltd
1987

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PRIMARY INDUSTRIES AND RESOURCES SA

SOUTH AUSTRALIA

DEPARTMENT OF MINES AND ENERGY

OPEN FILE ENVELOPE NO. 6131

EL 722, EL 1065, FROME DOWNS
PROGRESS REPORTS FOR THE PERIOD
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ENVELOPE 6131

TENEMENT: EL 722, EL 1065 - Frome Downs.

TENEMENT HOLDER: CSR Limited; Minad-Teton Australia.

TITLE: Progress reports for the period October 1982 to 7/11/87.

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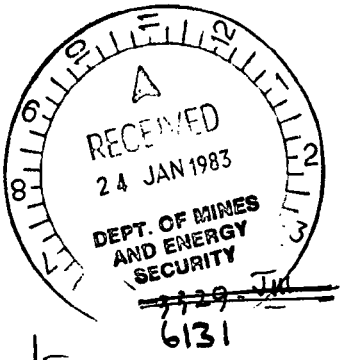
PROTEROZOIC BASEMENT
EXPLORATION 1979-82
EL 722 BILLEROO WEST



J.L. Curtis
M. Moore

October, 1982

ABSTRACT

Surface Geophysical surveys and drilling on Exploration Licence EL 722 Billeroo West, South Australia, has been used to investigate three large magnetic anomalies of which one was drilled to find below 391m of cover rocks, Middle ? Proterozoic volcanics of rhyolitic to trachytic composition which are hydrothermally altered with attendant mobilization of iron and minor base metals, and indicate a substantial potential for polymetallic orebodies may exist at suitable structural and lithological sites within this newly discovered environment.

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1. INTRODUCTION

EL 722 is located in the south westerly part of Frome Embayment to the south of Lake Frome and covers an area of 2,490 square kilometres.

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending of 14.9.84. Under the terms of a joint venture agreement, interest is held at 51% by CSR Limited and 49% by Minad-Teton Australia (MTA). MTA is an independent 50:50 joint venture between Mines Administration Pty. Limited (MINAD) and Teton Exploration Drilling Co. of the U.S.A. Since the joint venture agreement was written Mines Administration Pty. Limited has become a wholly owned subsidiary of CSR Limited through AAR Limited.

Previously exploration in the area has been directed towards shallow Tertiary Palaeochannel uranium deposits. Since the discovery of the major concealed Olympic Dam deposit attention has been directed towards the possibility of similar occurrences in the Frome Embayment.

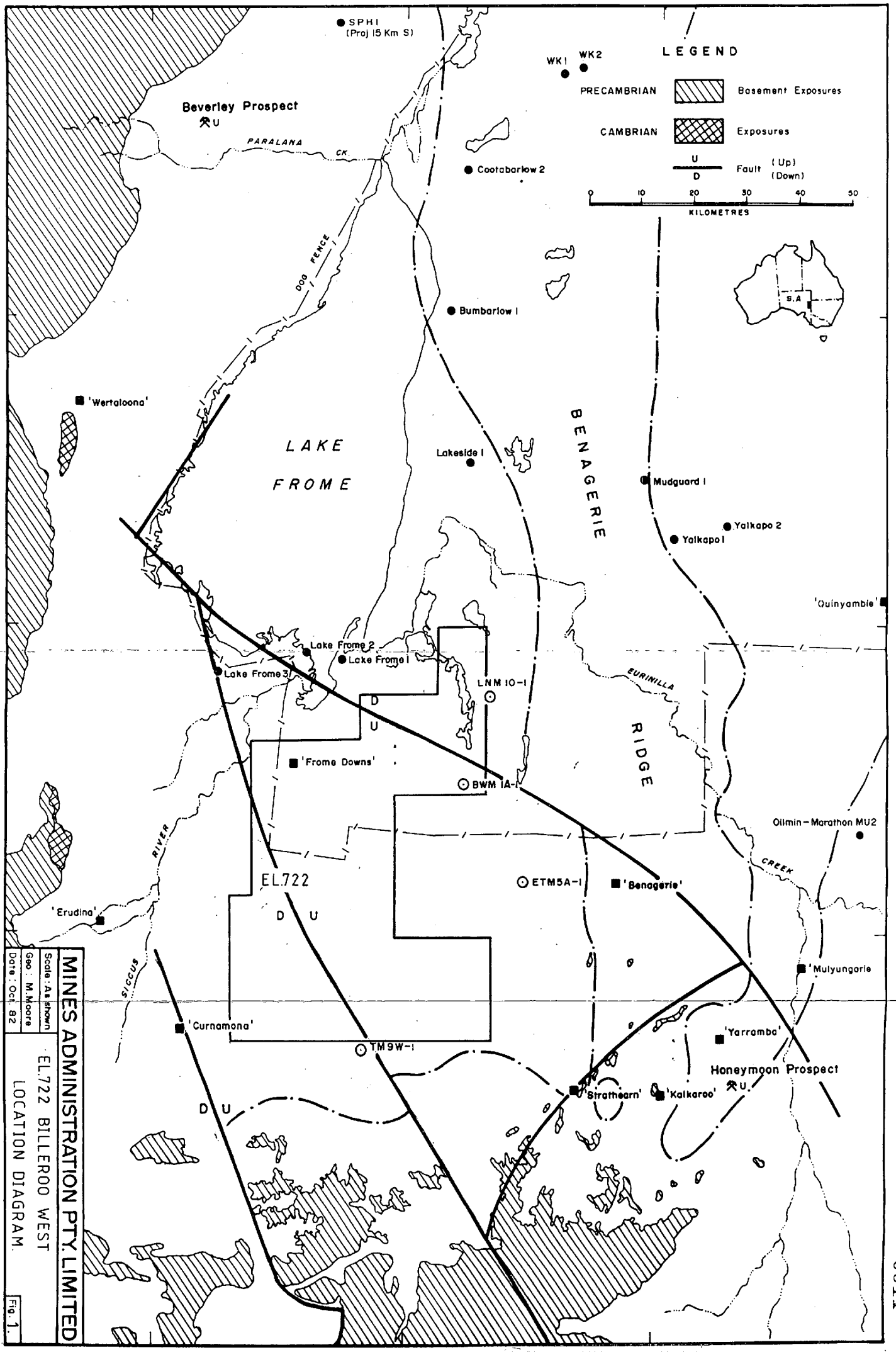
Following a regional appraisal of the Frome Embayment geophysics and geology by J. Ashley in 1978, three magnetic anomalies were selected for surface field surveys. The work commenced in October 1979 and included the drilling of diamond drill hole BWMIA-1 in early 1981.

The major concern of this report is drilling results as geophysical work has been reported independently.

2. GENERAL INFORMATION

2.1 Location

EL 722 is located in the south westerly part of the Frome Embayment just to the south east of Lake Frome. The Frome Embayment is a drainage basin focussed about Lake Frome, a gentle depression bounded in the west, south and east by the Flinders, Olary and Barrier Ranges respectively. The Exploration Licence lies jointly on the Curnamona, Erudina, Frome Downs, Billeroo West and Telechie pastoral leases. (See Figure 1).



MINES ADMINISTRATION PTY. LIMITED

Scale : As shown

Geo : M. Moore

Date : Oct. 82

EL 722 BILLEROO WEST

LOCATION DIAGRAM.

Fig. 1.

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2.2 Access

The main access to the area is from the Barrier Highway along a well formed dirt road from Yunta via Curnamona and Frome Downs. Local access is afforded by numerous graded dry weather station tracks. The areas investigated lie to the east and north east of Curnamona Homestead.

2.3 Physiography and Vegetation

The area is a relatively flat semi-desert landscape consisting of low sand dunes separated by shallow drainage depressions. Salt lakes become common in the extreme north. Saltbush, bluebush and other low shrubs constitute the dominant vegetal cover. Perennial grasses flourish briefly after rain. Trees are very sparsely distributed being restricted to a few species of Casuarinas and Acacias.

3. REGIONAL GEOLOGY

The Frome Embayment, a southern lobe of the Great Artesian Basin, developed on Palaeozoic and Proterozoic rocks during Upper Jurassic and Cretaceous times when shallow marine deposits accumulated. These have been disconformably overlain by Tertiary and Quartenary, fluviatile to lacustrine and terrestrial sediments respectively.

The Frome Embayment is believed to be underlain by a basement cratonic nucleus (The Curnamona Cratonic Nucleus) of Archean and Lower Proterozoic metamorphic rocks beneath a cover of Middle Proterozoic volcanics in the north and flanking Upper Proterozoic Adelaidean Shelf facies to the south. Restricted remnants of the inferred Arrowie Basin of Cambrian age are also present along the periphery of the nucleus in the west and north east.

Exposures of these units are observable in the encircling ranges to the Frome Embayment. In the centre of the region an almost fully concealed basement structure, known as the Benagerie Ridge plunges gently northwards away from the Willyama Inlier. This ridge has influenced Middle Proterozoic vulcanism, Adelaidean and Cambrian sedimentation, and latterly Tertiary Palaeodrainage Systems.

Units of Lower and Middle Proterozoic age have a demonstrated association with base metal and uranium mineralization. Deposits vary from the spectacular Broken Hill lead - zinc ore bodies to geochemically anomalous units in the Willyama Complex and Middle Proterozoic Volcanics of the Benagerie Ridge.

4. REGIONAL GEOPHYSICS

Regional geophysical data from BMR, SADME and company sources is available at 1:250,000 (gravity and magnetic) and 1:100,000 (magnetic) scales is supplemented by scattered drilling through the shallow cover rocks.

Interpretation of the combined data indicates progressive deepening of the 'magnetic basement' to the north, north west and west of the licence. The 'magnetic basement' is believed to reflect the Middle-Upper and/or the Lower-Middle Proterozoic Unconformities.

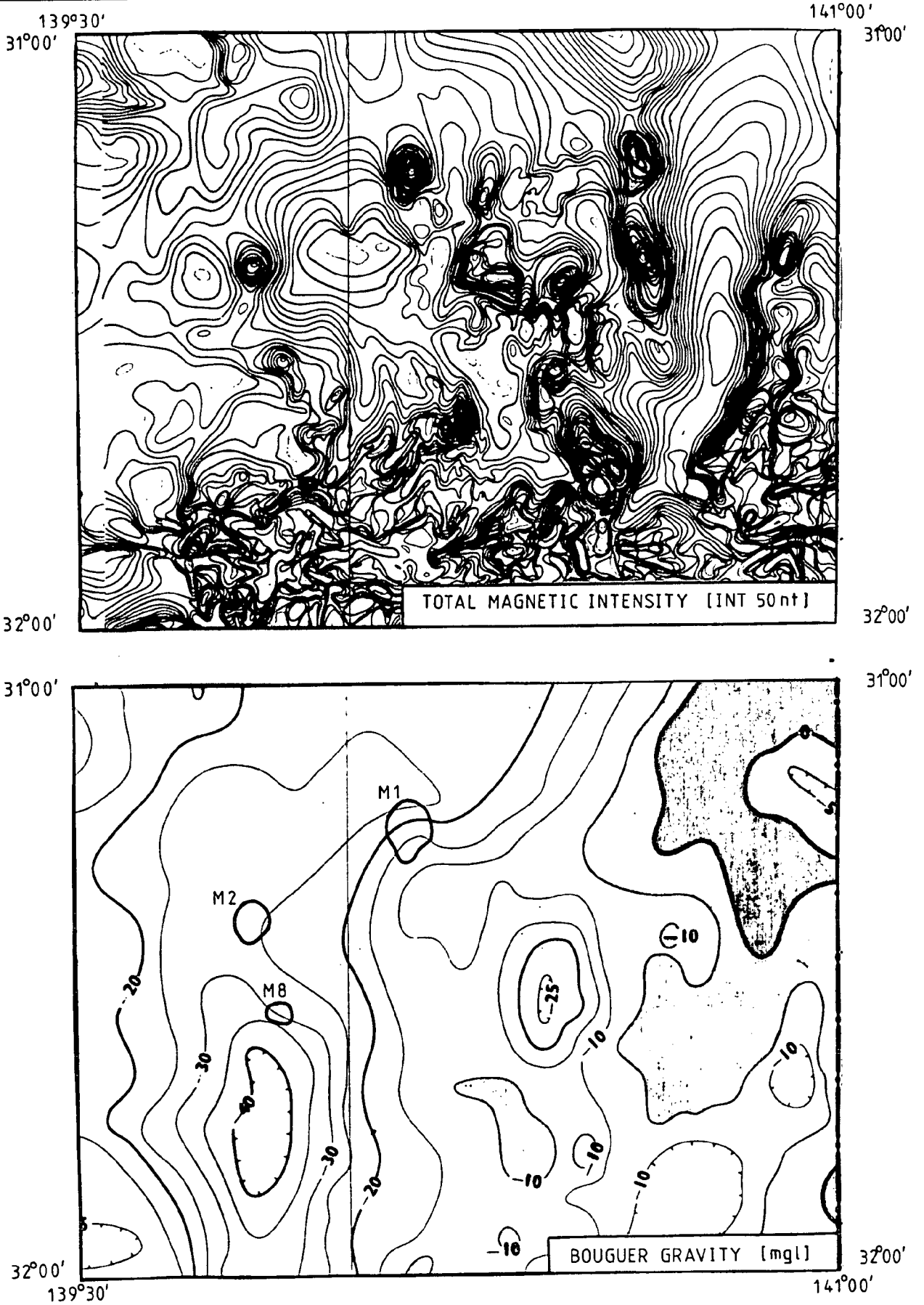
Regional geophysical data suggests that in the western half of the licence the magnetic basement lies at depths of 1000m over a gravity low corresponding to an inferred large granitic body. (See Figure 2).

Three large magnetic anomalies were investigated by ground magnetic and gravity surveys carried out the Geoex Pty. Limited. These anomalies (M1, M2 & M8) occur along the east side of the major gravity low. (See Figure 3).

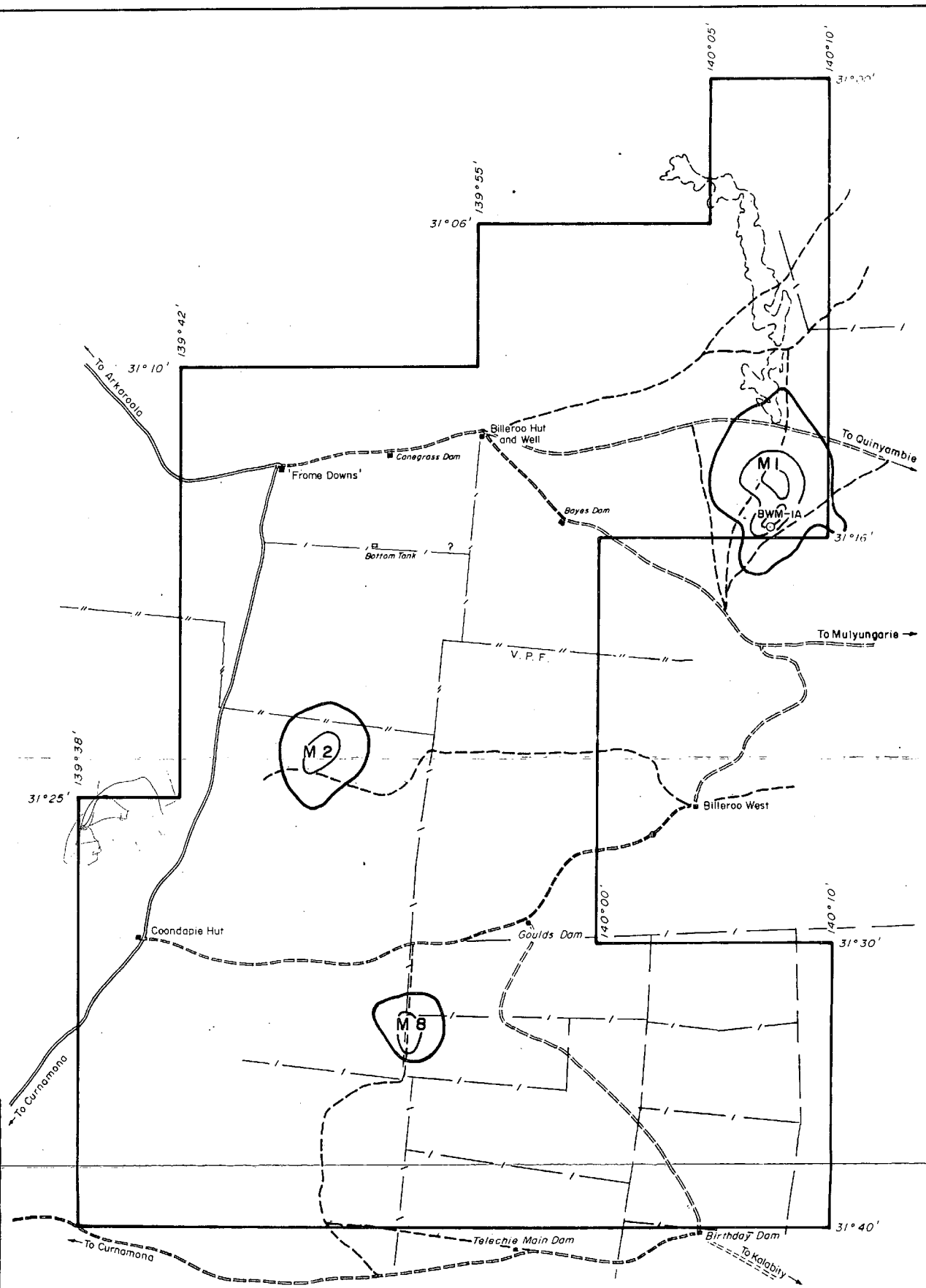
5. ANOMALY M1

5.1 Location & Access

Anomaly M1 is located 20km ENE of the Frome Downs Homestead. Access is gained from a track linking the homestead and Mulyungarie that passes just to south of the anomaly at Box Swamp Dam from where three tracks radiate northward. The drill collar of BWMIA-1 drilled into the IA lobe of the anomaly lies 3km NNE of the Dam. (See Figure 4).



MINES ADMINISTRATION PTY. LIMITED		
Scale: 1:1,000,000	REGIONAL GEOPHYSICS OF THE CURNAMONA 1:250,000 SHEET	Fig. 2
Geo: M.J.M.		
Date: NOV.'82		



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EL. 722 BILLEROO WEST

ANOMALY LOCATION DIAGRAM

Scale: 1:250,000

Geol: M. Moore

Date: Oct 82

Fig: 3

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5.2 Field Surveys

5.2.1 Surveying

Five 1 km spaced 10 km long N-S grid lines were laid out across the central part of the anomaly and supplemented by two 5 km long infill lines in the core area. A total of 60 line km of gridding with optically levelled stations every 200m and intermediate uncontrolled 100m stations for magnetic readings were pegged. This work was carried out by Geoex Pty. Limited (GEOEX).

Since the anomaly lies partly within an adjoining exploration licence EL 911 (614) Lake Namba and common boundary was surveyed geodetically by EDA and marked by a series of clearly tagged star droppers. This work was carried out by P.B. Simmons, registered surveyor of Adelaide. (See Figure 4, Appendix 1).

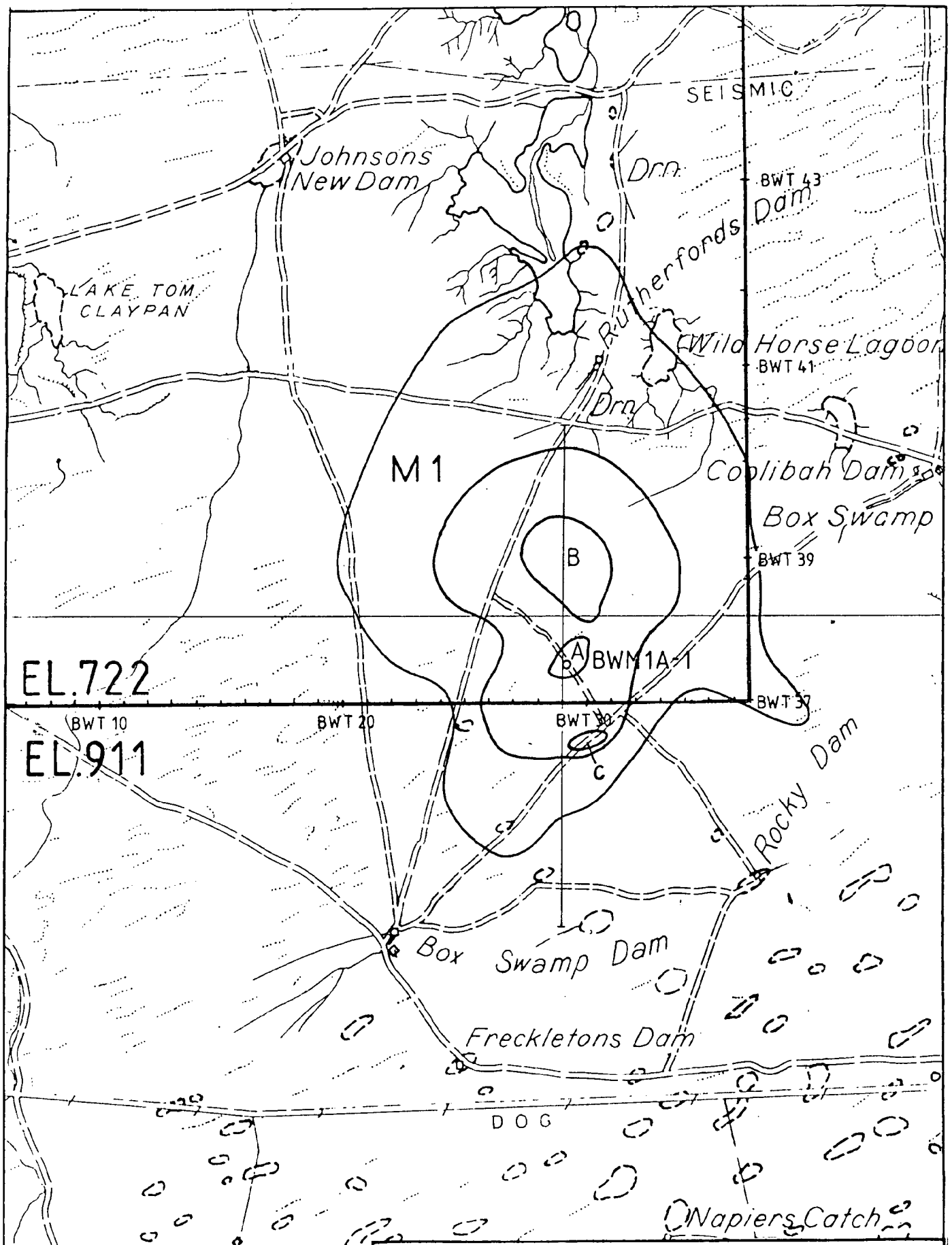
5.2.2. Ground Magnetic Survey

There is good correspondence between the contoured ground magnetic data and the airborne anomaly. The ground survey clearly identifies three major magnetic features which coalesce to form M1. These entities have been designated MIA, MIB & MIC respectively. (See Figure 4 & 5, Plate 1).

Both the IA & IB anomalies peak to about 1,400 nT whereas the IC anomaly peaks to 700 nT. Block modelling and north-south profiles by both GEOEX and Ashley Geophysics (ASHLEY) indicated a composite magnetic source with an upper surface at depths between 700 and 1000m with a shallower portion lying about 300-400m depth below MIA. Susceptability contrasts of 0.005 cgsu for MIA & MIC and 0.006 cgsu for MIB were suggested. (See Plate 3).

5.2.3 Ground Gravity Survey

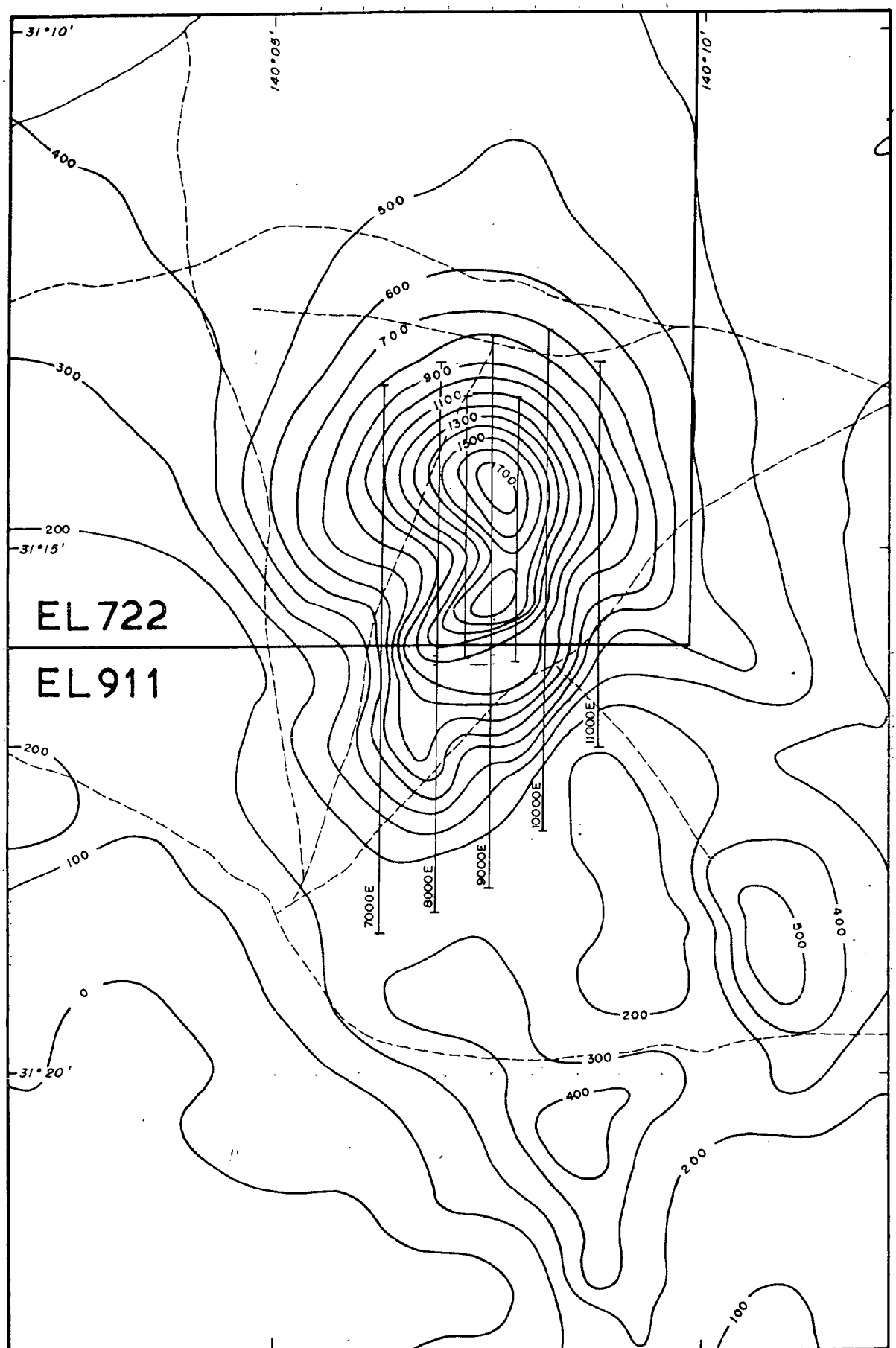
The regional gravity gradient is defined by widely spaced stations. A reasonably strong 2mgal per km gradient off a high to the south east of the anomaly is intensified locally across the anomaly. On the reduction of the field data a marked co-axial bouger gravity ridge is observed just south of the main magnetic anomaly. Unfortunately the regional field is imprecisely defined and can be varied by applying different interpolation schemes, to the broad spaced data. Small variations in the regional field can re-locate the focus



MINES ADMINISTRATION PTY. LIMITED		
Scale: 1:100,000	SURVEY SKETCH OF EL. BOUNDARY. ANOMALY M1.	Fig. 4.
Geo: M.J.M		
Date: OCT.'82		

S 103.8 / 18.6

	LAT ~~Eastings~~	LONG ~~Northing~~
7000E	31° 18' 36"	140° 06' ~~26~~ 13"
8000E	31° 18' 24"	140° 06' 48"
9000E	31° 18' 12"	140° 07' 27"
10 000E	31° 17' 36"	140° 08' 07"
11 000E	31° 16' 51"	140° 08' 43"
8500E	31° 16' 06"	140° 07' 11"
9500E	31° 16' 12"	140° 07' 30"



MINES ADMINISTRATION PTY. LIMITED

Scale 1:100,000
Geo J. L. C.
Date: 18/6/81

ANOMALY M1
AEROMAGNETIC MAP
CURNAMONA / BENAGERIE Fig. 5

of local residual bouguer anomalies making definition of the relationship between magnetic and gravity anomalies unclear.

However, irrespective of these difficulties the main centre of gravity contrast lies to the south of the main magnetic centre with some degree of overlap. (See Plate 2).

The residual bouguer gravity anomaly may be the result of either basement relief or basement density contrasts. The regional gradient is probably due to a gentle deepening of the magnetic basement to the north and northwest coupled with the significant basement density contrast which gives rise to the main regional gravity low. Density information on the lithologies and some knowledge of the regional stratigraphy and structure does not lend support to a topographic origin for the M1 gravity anomaly. The discrete character and co-axial relationship to the magnetic anomaly suggests a common origin.

The gravity data, was therefore modelled on the basis of a common origin by ASHLEY. The resulting model is geometrically similar at an average depth of 700m with a density contrast of 0.06 gm/cc. A shallower zone at about 400m is also predicted. The same data modelled by GEOEX on the basis of a topographic origin gives a relief of differential of about 650m with a density contrast 0.5 gm/cc.

5.3 Drilling Programme

On the basis that the M1 anomaly was a combined gravity and magnetic anomaly pair with a probably common source that could be explained by an extensive high density rock mass at relatively shallow depth a decision was made to drill one hole.

The drill site was recommended by ASHLEY on the basis that the M1A target was shallowest and the gravity anomaly was too imprecise.

5.4 Drilling Statistics

The drilling operations were mainly carried out during the summer of 1980-81 in dry and dusty conditions. Personnel camped at the drill collar and relied on Broken Hill for support. The details of operations are listed below.

GEOLOGICAL SUMMARY - DRILLHOLE - BWMIA-1

TABLE 1.

STRATIGRAPHY			DEPTH (m)	LITHOLOGY	
AGE	GROUP	UNIT		ROCK TYPE	COLOUR
RECENT		EURINELLA FORMATION	0.0 - 2.0	CLAY & SAND	RED-BROWN
TERTIARY		NAMBA FORMATION	2.0 - 71.5	CLAYS	GREY
CRETACEOUS		MAREE FORMATION	71.5 - 80.00	CLAYS	GREY-BROWN
		REGIONAL DISCONFORMITY			
LOWER CAMBRIAN	HAWKER GROUP		80.00-101.35	SANDSTONE	GREY
			101.35-101.95	SILTSTONE	GREY-GREEN
			101.95-107.00	LIMESTONE	GREY
		ORAPARINNA SHALE	107.00-112.00	SILTSTONE	GREY
			112.00-117.54	SHALE	GREY
			117.54-112.06	SANDSTONE	BROWN
			122.06-124.50	SILTSTONE	BROWN-GREY
			124.50-124.60	CONGLOMERATE	RED-BROWN
			124.60-129.90	SHALE	GREY
		WILKAWILLINA LIMESTONE	129.90-145.55	LIMESTONE *	GREY
		REGIONAL DISCONFORMITY			
	WILPENA GROUP		145.55-181.50	SHALE	GREY-GREEN
		BRACHINA FORMATION	181.50-221.60	SHALE	RED
		NUCCALEENA FORMATION	221.60-232.60	DOLOMITE *	BUFF
			232.60-233.90	TILLITE +	RED-BROWN
			233.90-238.00	SHALE	RED
		ELATINA FORMATION	238.00-240.40	SILTSTONE	RED
			240.40-250.77	SANDSTONE	RED
			250.77-254.08	SANDSTONE	WHITE-GREY
UPPER PROTEROZOIC (ADELAIDEAN)		Local Disconformity			
	UMBERATANA GROUP	AMBEROONA FM. / ANGEPENA FM.	254.08-257.00	SILTSTONE	RED
			257.00-299.00	SILTSTONE	RED-GREEN
			299.00-320.50	CALCAREOUS SILTSTONE	GREY
			320.50-320.97	OOLITIC LIMESTONE +	GREY
			320.97-342.55	CALCAREOUS SILTSTONE	GREY
			342.55-343.35	LIMESTONE	GREY
		ETINA FORMATION	343.35-344.27	CALCAREOUS SILTSTONE	GREY
			344.27-345.65	LIMESTONE	GREY
			345.65-358.10	CALCAREOUS SILTSTONE	GREY
			358.10-360.00	SILTSTONE	GREEN
		WILLOCHRA SUBGROUP	360.00-388.90	SANDSTONE	RED
			388.90-391.42	CONGLOMERATE *	RED
		REGIONAL ANGULAR UNCONFORMITY			
MIDDLE PROTEROZOIC (CARPENTARIAN?)		BENAGERIE VOLCANICS	391.42-600.00	TRACHYTE & RHYOLITE	ORANGY-RED

* marker horizons

\+ diagnostic lithologies

5.4.1 Operational History

Bore Name:	BWMIA-1 (Code: - Billeroo West Anomaly MIA-NO.1)	
Location:	Latitude 31° 15' 44.46" S Longitude 140° 07' 32.51" E	
Map Sheet:	1:250,000 Curnamona 1:100,000 Benagerie	
Exploration Licence:	EL 722 Billeroo West	
Total Depth:	600 metres	
	Pre-Collar	Diamond Drilling
Commencement:	4 September 1980	11 December 1980
Completion:	5 September 1980	25 April 1981
Drilling Time Excluding Crew Breaks:	2 Days	42 Days
Work Time/Day	10 Hours Approx.	

5.4.2 Drill Hole Data

Pre-Collar:	Bourne 2000 Rotary	Thompson Drilling Pty. Ltd., Pambula Road, Regency Park S.A.
Core Drillings:	Boyles BBS 45A	Evenand Pty. Ltd., Bourke Street, Girilambone N.S.W.
Casing Details:	4" Steel casing to 83 metres. All H and N casing recovered.	

Bit Record:	Type	Size	Consumed
	Blade Bit	7"	1
	Diamond & Boart	HQ	2
	Diamond & Boart	NQ	6
	Diamond & Boart	BQ	2
	Aus Bit	NQ	1

Abandonment: Open to surface.

Water Supply: Water was drawn from the Goulds Dam bore.

5.5 Drilling Records

5.5.1 Geological Sampling

Pre-Collar

Drill cuttings were retrieved at 2m intervals from surface to 83 metres.

Diamond Drilling

Diamond drill cores were cut continuously from 83 metres to T.D.

HQ	83 m to 92.90m
NQ	92.90 m to 496.60m
BQ	496.6 m to bottom (TD)

Drill cores have been placed in the South Australian Department of Mines and Energy Core Library at Glenside for safe keeping. Cuttings are presently retained by Mines Administration Pty. Limited.

5.5.2 Down Hole Drift Survey

A Drift Survey was run to a depth of 495 metres. A maximum deflection of approximately 1° was recorded at 495 metres (See Appendix 1).

5.5.3 Geological Records

A brief record of the geology from the pre-collar has been summarized from cuttings whereas a comprehensive lithological log has been written from an almost 100% recovered core record. (See Appendix 2).

5.5.4 Geophysical Records

A down hole geophysical log was retrieved by Geoscience Associates Pty. Ltd. of Kilkenny. The logging was carried out on different occassions as the drilling progressed.

Gamma Ray, Neutron, Self Potential, Resistivity, were run from surface to 492m and uncontrolled density from surface to 600m. ? only 496.6m deep

Independent magnetic suceptability and specific gravity measurements were made of core samples. (See Appendix 3). Both geological and geophysical data are summarized on Plate 4.

A test Sirotem Transient EM Survey was conducted down hole and over the surface surrounding BWMIA-1 by GEOEX Pty. Ltd.

Results of these surveys were negative. Consultation with GEOEX since the time of the survey, indicates that the results obtained may be suspect, due to subsequently recognized technical problems.

5.5.5 Analylical & Petrological Sampling

Selected cores were quarter cut and analysed for base metals, and uranium. Several of these samples were further tested for fluorine and immobile elements for geochemical finger-printing (See Appendix 4). Six samples were also subject to petrological study. (See Appendix 5).

5.6 Drilling Results

5.6.1 Geology

The drill hole intersected 80m of Cainozoic, 44m of Lower Cambrian and 245m of Adelaidean sediments before intersecting Middle Proterozoic? volcanics (See Table 1, Plate No. 4).

Cainozoic

The Cainozoic sequence consists of weakly to poorly consolidated sands, silts and limey sediments, typical of the Cretaceous Maree Formation, Tertiary Namba Formation, and the Recent Eurinella Formation.

Cambrian

The Lower Cambrian Sequence corresponds to the middle section of the Hawker Group, namely the Wilkawillina Limestone and overlying Oraparinna Shale. The Wilkawillina Limestone is light grey in colour and partially recrystallized with Archeocyathid fossil zones. The Oraparinna shale is a grey limey siltstone and sandstone unit with minor shale and conglomeratic interbeds.

The sequence lies stratigraphically below the Lake Frome Group rocks intersected in Lake Frome No. 1, 35km to N.E. of the BWMIA-1 collar. Since the bedding is horizontal, the clastic Parara Limestone and Bunker Sandstone equivalents of the Central Flinders Ranges are absent, and the thickness of the section is only 44m it is inferred that the Hawker Group along the western edge of the Benagerie Ridge was deposited in a stable shelf environment along the easterly margin of the Arrowie Basin. Furthermore a post Cambrian tectonic structure lies between BWMIA-1 and Lake Frome No. 1.

Adelaidean

Below the Lower Cambrian Hawker Group lies a 246m thick sequence of Adelaidean Upper Proterozoic sediments. Of the four main Groups which comprise the Adelaidean sequence only the upper Umberatana and Wilpena Groups are present.

The Umberatana Group is represented by a basal Willochra Sub-group unit (31m), the Etina Formation (61m), the Angepena/Amberoona Formation (45m) and the Elatina Formation (22.5m).

The Willochra Subgroup is characterized by reddish sandstone and conglomerate with a local provenance. The Etina Formation is an interbedded sequence of siltstone and limestone with a distinctive oolitic limestone near the top of the unit. The Amberoona/Angepena Formation is a mixed sequence of red and green interdigitated siltstones which are recognized in the Flinders Ranges as separate lateral facies equivalents. The Elatina Formation a sequence of sandstone, siltstone, shale and tillite contrasts with the underlying units. The Tillite contains clasts of porphyritic volcanics indicating a local source.

The abrupt sedimentation style change from the Amberoona/Angepena Formation to the Elatina Formation, the nature of the contact and the presence of disconformable relationships elsewhere at this stratigraphic position indicate that a local disconformity is also present in BWMIA-1 at this level.

The Wilpena Group is represented by the Nuccaleena Formation (11m) at the base and the overlying Brachina Formation (76m). The Nuccaleena Formation is a buff dolomite and the Brachina Formation a shale, red brown at the base transitional to grey towards the top.

The Umberatana Group occupies 137m of the 246m Adelaidean intersection. The units intersected in the Umberatana Group are all mutual lateral facies equivalents with a collective maximum thickness in the order of 1000m.

The flat lying disposition and the very thin Adelaidean succession indicates that the Adelaidean Sediments were deposited in a shelf environment on the western edge of the Benagerie Ridge.

Middle Proterozoic

Below 391.4m a sequence of fine grained orangey pink volcanics was intersected. These rocks show little variation for 200m being banded except where vein-like zones of mottling are present.

Microscopic examination shows a mainly sodic and potassic feldspar with lesser quartz as the main mineralogy with textures indicating pyroclastic to extrusive origins for a former very glassy rock which has undergone a considerable degree of alteration.

The primary cause for the colour is ubiquitous ultra-fine hematite and patchy pervasive magnetite which has followed the lamination. Sulphide-carbonate-fluorite veining at several levels shows classic sequential mineral layering and post dates the introduction of the magnetite. Sulphides are mainly pyrite and marcasite but traces of galena and chalcopyrite were also noted. The nature of the alteration and the relatively undisturbed rock fabric suggest that the rocks have not been affected by regional metamorphism and are entirely the product of igneous activity and magmatic/deuteric alteration.

The volcanics are clearly unconformably overlain by the Adelaidean Sequence and have not been affected by regional metamorphism typical of the Wilyama Complex and are therefore inferred to have a Middle Proterozoic Age.

5.6.2 Geochemistry

A number of sample intervals were selected for quarter coring and analytical work. Each sample was determined for Cu, Pb, Zn and Co by AAS and U, Mo, Sn & W by XRF. Selected samples were determined for Ge, Nb, Y, Zn, F, Au, Fe, Ti, Mo, K, Si & Al by XRF and other methods (See Appendix 4).

Samples were selected from the Cambrian & Adelaidean Sequences at widely spaced intervals representing each of the major lithologies. Slightly enhanced levels of Cu, Pb & Zn were observed in the Oraparinna shale and the Brachina Formation, but at clearly anomalous levels in the Nuccaleena Formation. In the Elatina Formation Cu and the Etina Formation Pb and Zn are distrinctly anomalous.

In the underlying volcanics much denser sampling was carried out but while weakly enhanced levels of base metals are common significant enrichment beyond 200 ppm is rare and all weakly anomalous values are 400 ppm or less.

In contrast, Co, U, Mo, Sn, & W are slightly enriched in the volcanics compared to the overlying sediments but the levels present can only be interpreted as high backgrounds. Uranium at 8 & 6 ppm levels could be regarded as very weakly anomalous, but not untypical of acidic to intermediated middle Proterozoic volcanics.

The statistical parameters of metals in the volcanics were compile, by fitting a normal distribution to the data. By high lighting the values above the mean plus one standard deviation a strong correlation of above average values for Cu, Pb, Zn, Co and Mo between 405 and 406 metres is notably related to sulphide veins observed in the core. Just above and below this zone distinctively elevated U and Mo levels may correspond to wall rock alteration.

TABLE: 2 GEOCHEMICAL STATISTICS OF BWMIA-1

Metal	Cu	Pb	Zn	Co	U	Mo	Sn
$\bar{x}$	60.5	24.2	38.8	8.1	4.3	4.9	20.9
σ	88.5	50.2	24.8	4.8	1.6	2.1	10.3
$\bar{x} + \sigma$	149.0	74.2	63.6	12.9	5.9	6.0	31.2
$\bar{x} + 2\sigma$	237.5	124.8	108.4	17.7	7.5	8.1	41.5

(all values expressed as ppm)

Correlations between U and other metals at anomalous levels are not observed elsewhere. Similarly intercorrelation between the other metals are also sparodic and weak, with Sn showing no relationships at all.

5.6.3 Geophysics

Both specific gravity and magnetic susceptability measurements were carried out on full core samples 10 to 15 cms in length. Statistical parameters were calculated from the data by fitting a normal distribution (See Table 3, Appendix 3).

Magnetic Susceptability

Volumetric magnetic susceptabilities were determined using a Geoinstruments Ky. JH-8 metre (See Appendix 3). The sediments show variable susceptability in the range 10 to 35 x 10^{-6} cgs units, however, rare exceptions of less than 10 and more than 35 were also noted. It is inferred that the susceptability is a reflection of iron content and may in some cases reflect the provenance of the clastic materials. Although there is difference between Cambrian and Adelaidean sediments on a statistical basis the range of values and the small number of Cambrian samples suggest that this difference is more apparent than real.

The volcanics show a markedly enhanced susceptability, varying from high sediment values up to many thousands of 10^{-6}cgs units reflecting the magnetite content. This represents on average five hundred fold contrast with the overlying sediments and is strongly suggestive that magnetite is the cause of the magnetic anomaly.

TABLE 3: GEOPHYSICAL STATISTICS OF VOLCANICS BWMIA-1

STRATIGRAPHIC UNIT	MAGNETIC SUSCEPTABILITY (cgs units x 10^{-6})		SPECIFIC GRAVITY gm/cc	
	$\bar{x}$	σ	$\bar{x}$	σ
Lower Cambrian	12.3	6.0	2.5	0.30
Adelaidean	20.0	12.0	2.7	0.33
Benagerie Volcanics	9384.0	18574.3	2.72	0.30

Specific Gravity

The sediments and volcanics show progressive increases in a specific gravity with depth. The Cambrian sediments are about 0.2gm/cc less dense than the Adelaidean Sediments and which are about 0.02gm/cc less dense than the volcanics.

The specific gravities of the main rock forming volcanic minerals ideally indicated value of about 2.6 gm/cc for a composition of 10% quartz, and equal proportions of sodic & potassic feldspar. However higher values have been observed for palaeozoic rhyolites elsewhere in Australia which generally fall in the range 2.65 - 2.7 gm/cc except at Captains Flat where values in the range 2.77 - 2.97 gm/cc and additional ferro minerals is indicated by significant magnetic susceptabilities (See reference 5).

It is clear that the 2.72 gm/cc mean value for the Bengerie Volcanics is rather high for a simple low quartz rhyolite. On the basis of the petrology it thus concluded that the normal rock density may be much closer to the 2.65 gm/cc value and the observed value of 2.72 gm/cc is due to the presence of magnetite and sulphides. For example a 2.7% magnetite content would be sufficient to explain the increase of 0.05 gm/cc due to its high specific gravity of 5.18 gm/cc. However magnetite is not an adequate explanation because although on inspection there is a tendency for specific gravity to rise and fall with magnetic susceptability, there are almost as many cases where the reverse is true, indicating the pervasive hematite and minor sulphides may also affect rock density.

Irrespective of the detailed character of the specific gravity make up of the volcanics, even at the elevated level of 2.72 gm/cc there is insufficient contrast with the overlying Adelaidean Sediments to explain the residual bouguer gravity anomaly associated with the M1 magnetic anomaly.

6. ANOMALY M2

6.1 Location

Magnetic anomaly M2 is located in the vicinity of Sandyoota and Marshes Dam's on the Erudina Pastoral Lease approximately 17 km NNE of Curnamona Homestead. (See Figure 6).

6.2 Access

The main access to the anomaly is westerly off the Yunta From Downs Road, north of Coondappie Well, on the track to Sandyoota Dam.

6.3 Geophysics

6.3.1 Regional Gravity

The anomaly lies on the east side of a major gravity low which is believed to be a reflection of a major granite terrain in the Proterozoic Basement. Structurally the anomaly is located on the western edge of the Benagerie Ridge where the magnetic (Proterozoic) Basement is believed to lie at depths of 1000m approx.

6.3.2 Regional Magnetics

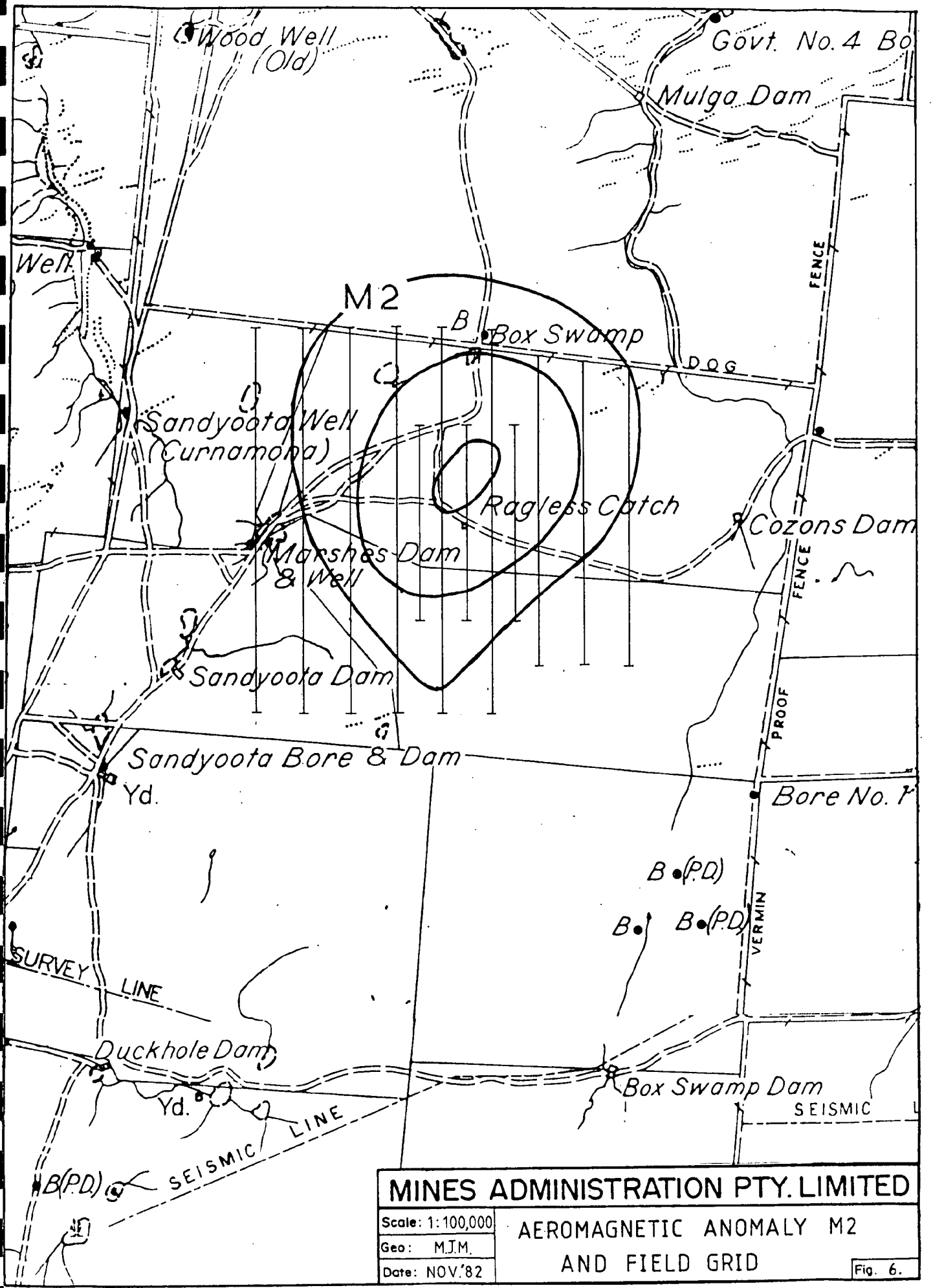
The magnetic anomaly shows a contrast of 550 nT with a gentle gradient over a diameter of 10km being of an almost symmetric bulls eye shape. Preliminary modelling of the airborne magnetic data by Ashley indicated considerable depths of 2000m or more to the source. In spite of the depth and the lack of a significant local gravity anomaly a decision was made to investigate the anomaly on the ground in case a shallow gravity source had hither to been undetected.

6.3.3 Field Surveying

Nine 1km spaced, 5 and 8km long, N-S Grid lines were laid out across the central part of the anomaly and supplemented by three 4km long infill lines in the core area. A total of 70 line km of gridding

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG 0039
549.60	555.70	Minor brecciation, patches and interstitial magnetite.
		Tremolite present as interstitial material throughout.
		Minor irregular patches of sulphide present.
		S.No. 14100 553.00 - 554.00
555.70	556.25	Siliceous brown-red tuff.
556.25	559.20	Banded minor brecciation, magnetite outlining banding
		and as interstitial along with tremolite.
		S.No. 14101 557.00 - 558.00
559.20	559.80	Siliceous brown - red tuff with calcite fracture fill.
		S.No. 14102
559.80	573.75	Banded with minor brecciation. Banding is approximately
		parallel to the core axis. Half the core is generally
		a siliceous tuff and the other mottled with interstitial
		magnetite and tremolite.
		Magnetite also outlines banding.
		S.No. 14103 566.00 - 567.00
573.75	576.25	Siliceous red-brown-grey tuff.
		S.No. 14104 575.00 - 576.00
576.25	582.90	Banded minor brecciation. Banding parallel to core axis
		as for 459.80 - 473.75
		S.No. 14105 579.00 - 580.00
582.90	584.36	Mottled intense brecciation magnetite is patchy and interstitial
		Tremolite present throughout as interstitial material.
		S.No. 14106 583.00 - 584.00
584.36	590.52	Banded red-brown siliceous tuff with minor mottled volcanic.
		Little magnetite calcite fracture fill present. 485.95-486.27.
		S.No. 14107 587.00 - 588.00
590.52	592.65	Rock banded volcanic with interstitial patchy magnetite.
		Calcite fracture fill common containing angular blocks.
		S.No. 14108 591.00 - 592.00

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG 0031
592.65	594.45	Banding minor or little brecciation. Banding is parallel
		to core axis. Half the core is a brown siliceous tuff
		the other half is red mottled volcanic with interstitial
		magnetic. Minor calcite fracture is present.
		S.No. 14109 593.00 - 594.00
594.45	EOH	Banded red mottled volcanic. Banding parallel to core
		axis. Banding outlined by tremolite and magnetite.
		Minor patches of sulphide are present.
		S.No. 14110 597.00 - 598.00



MINES ADMINISTRATION PTY. LIMITED		
Scale: 1:100,000	AEROMAGNETIC ANOMALY M2 AND FIELD GRID	Fig. 6.
Geo: M.J.M.		
Date: NOV.'82		

with optically levelled stations every 200m and intermediate uncontrolled 100m stations for magnetic readings were pegged. This work was carried out by GEOEX Pty. Limited. (GEOEX).

6.3.4 Ground Magnetic Surveys

The contour pattern of anomaly M2 mirrors the airborne survey data very closely. A weakly defined structural feature cuts through the peak area of the anomaly in a north easterly direction parallel to the steeper gradient on the south east side, may indicate minor faulting.

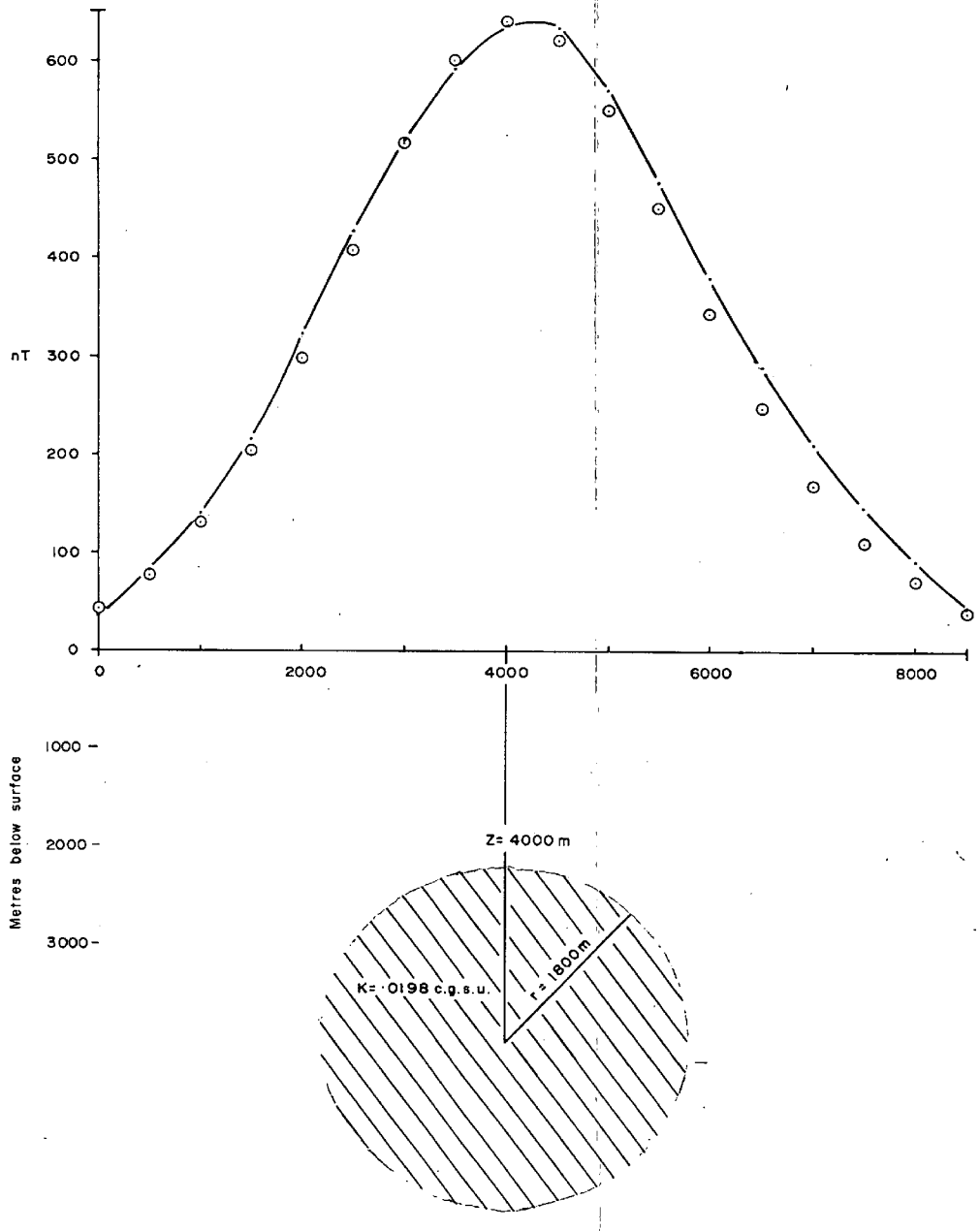
Modelling by GEOEX suggested a broad flat topped source at about 200m depth. Further modelling by A. Mills indicated a maximum depth of about 2500m corresponding to about 0.28 cgsu of magnetic susceptability or alternatively 2,200m corresponding to about 0.02 cgsu of magnetic susceptability. It seems likely that the magnetic source lies in the 2000-2,500m depth range (See Figure 7, Plates 5 & 6).

6.3.5 Ground Gravity Surveys

The gravity data allowing for noise resembles the regionally interpolated field. It is thus concluded that there is no major density contrast within the survey area associated with the magnetic anomaly.

That there is no density contrast at all cannot be certain since the shallower M1 gravity anomaly of about 3-4 mgal has an origin at a depth of about 1km or less and a similar source at 2.0 - 2.5km would be a 1 mgal or less in magnitude. To detect such a weak bouguer residual anomaly is probably on the limits of the accuracy of the survey.

It is thus apparent that any gravity source that may exist is at similar depths to the magnetic source. (See plate 7 & 8).



⊙ Calculated data

——— Field data

Depth to top of body = Z − r = 2200m

0034

MINES ADMINISTRATION PTY. LIMITED		
Scale: As shown	E.L. 722 BILLEROO WEST	
Geo: A. Mills	MAGNETIC PROFILE	
Date: Jan. 1982	ANOMALY M 2	Fig. 7

7. ANOMALY M8

7.1 Location

The anomaly is located just south east of North Ashby Bore on the Telchie Pastoral Lease about 20km ENE of the Curnamona Homestead. (See Figure 8).

7.2 Access

Access to the magnetic anomaly may be gained from the Curnamona - Telechie - Birthday Track via Lake Constance to the south or alternatively from the Coodappie Well - Billeroo West (Leslies Dam) Track to the north.

7.3 Geophysics

7.3.1 Regional Gravity

Like anomaly M2, M8 lies on the east side of the same major gravity low on the western edge of the Benagerie Ridge.

7.3.2 Regional Magnetites

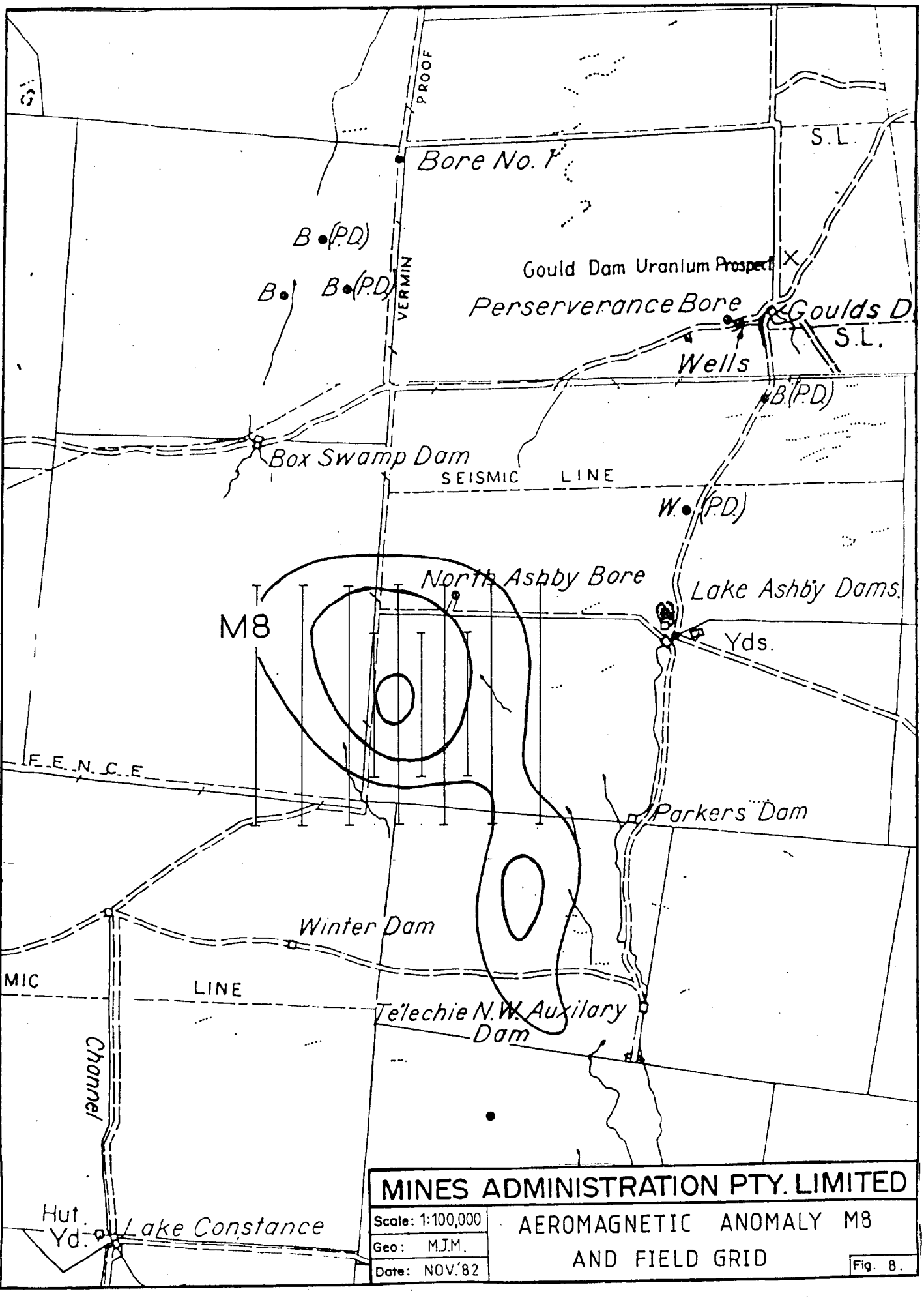
The magnetic anomaly has a contrast of 550 nT with gentle asymmetric gradients. Preliminary modelling of the aero magnetic data suggested depths of about 900m with similar characteristics to M2 in all other respects. Because of the shallower depth and the possibility of a local gravity anomaly being present but undetected a decision was made to carry out a ground survey.

7.3.3 Field Surveys

Seven 1 km spaced 5 km long N-S grid lines were laid out across the anomaly and supplemented by three 3km long in fill lines in the core area. A total of 43 line km of gridding with optically levelled stations every 200m and intermediate uncontrolled 100m stations for magnetic readings were pegged. This work was carried out by GEOEX Pty. Limited (GEOEX).

7.3.4 Ground Magnetic Surveys

The magnetic anomaly mirrors the airborne data quite closely but shows a clearly asymmetric profile. Modelling by GEOEX indicated a depth of about 1350m whereas A. Mills considered that the anomaly


PROOF
VERMIN
Bore No. 1
B (P.D)
B
B (P.D)
Gould Dam Uranium Prospect
Perserverance Bore
Goulds D
S.L.
S.L.
Wells
B (P.D)
Box Swamp Dam
SEISMIC LINE
W (P.D)
North Ashby Bore
Lake Ashby Dams
M8
Yds.
F.E.N.C.E
Parkers Dam
Winter Dam
MIC
LINE
Te'lechie N.W. Auxilary Dam
Channel
Hut Yd.
Lake Constance
MINES ADMINISTRATION PTY. LIMITED
Scale: 1:100,000
Geo: M.J.M.
Date: NOV.'82
AEROMAGNETIC ANOMALY M8
AND FIELD GRID
Fig. 8.

lay between 1500 and 2,500 m depth. Various model sources were used in the exercise and if a magnetic susceptability similar to that proposed for Anomaly M2 is used a depth of 2,500m is preferred whereas if a improbable lower magnetic susceptability of 0.005 cgsu is used then a depth of 1300m is indicated as predicted by GEOEX (See Figure 9, Plate 9).

7.3.5 Ground Gravity Surveys

Field surveys were conducted in stages and during compilation some difficulties were experienced in collating the data sets. While the overall match of the debugged information seems satisfactory A. Mills detected two weak enlongate gravity residual bouguer anomalies of 0.35 and 0.5 mgal.

These anomalies were investigated on the chance that they were real and could be important. They were initially modelled on the basis that they were caused by gravity contrasts in the sediments above the magnetic anomaly source. It was found that a small density contrast of 0.25 gm/cc at 100m as relief at the base of the Tertiary Cover rocks was an adequate explanation. (See Figure 10, Page 10).

An alternative origin of higher density material similar to massive sulphides at depth was also modelled. Small bodies with a crossectional area of 100 x 100 sq.m. or less at 550m & 600m, well above any magnetic sources where found to fit the data.

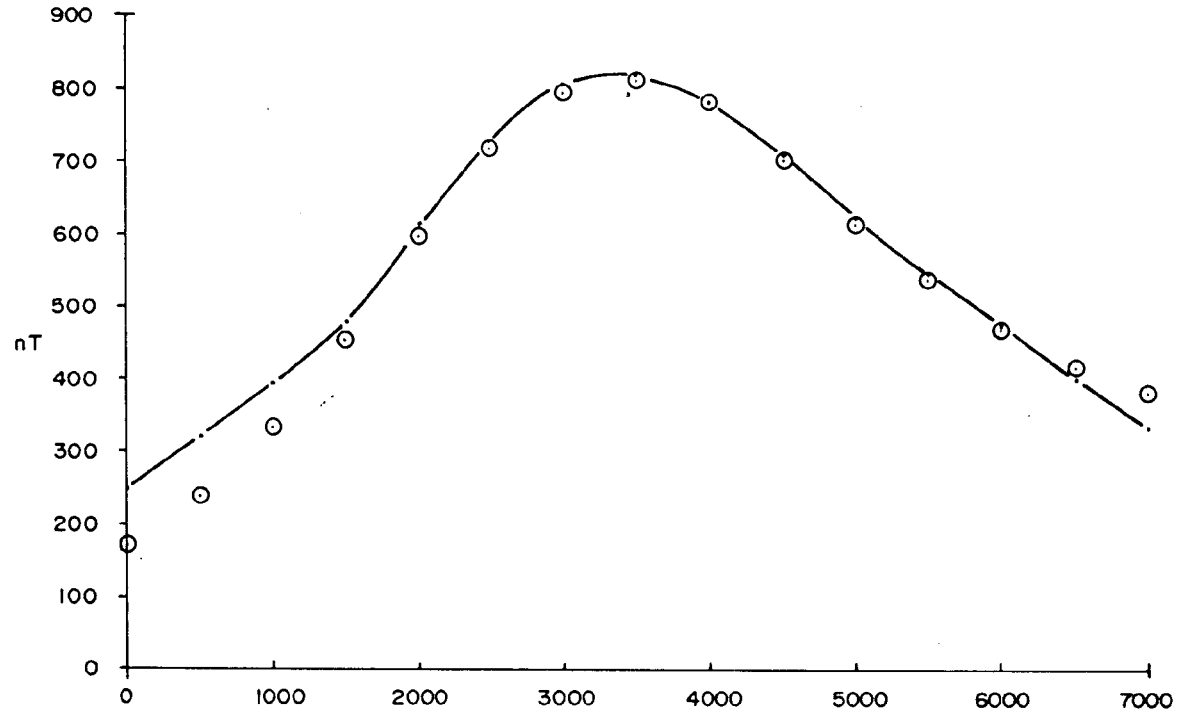
8. CONCLUSIONS

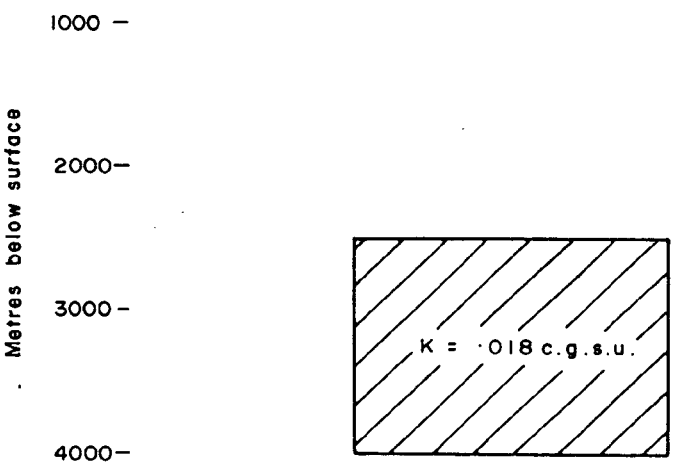
8.1 Anomaly M1

(1) Drilling has intersected rhyolitic to trachytic volcanic which have undergone hydrothermal alteration with evidence of mobilized metals.

(2) Patchy pervasive magnetite is probably the cause of the MIA magnetic anomaly.

(3) Drilling data does not provide an adequate explanation for the gravity anomaly at M1.





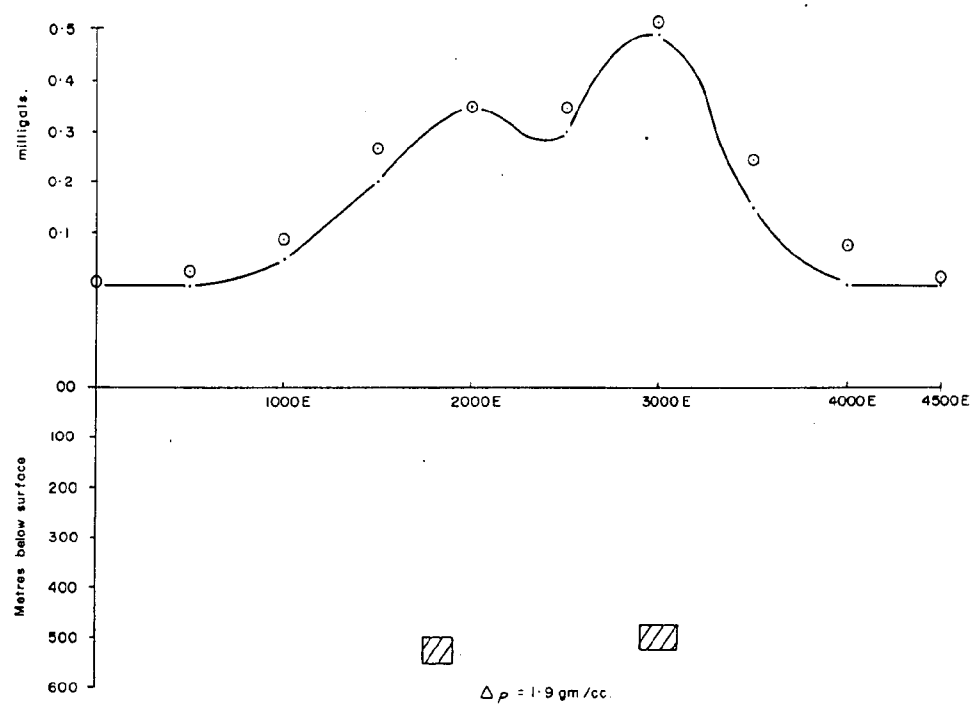
⊙ Calculated data

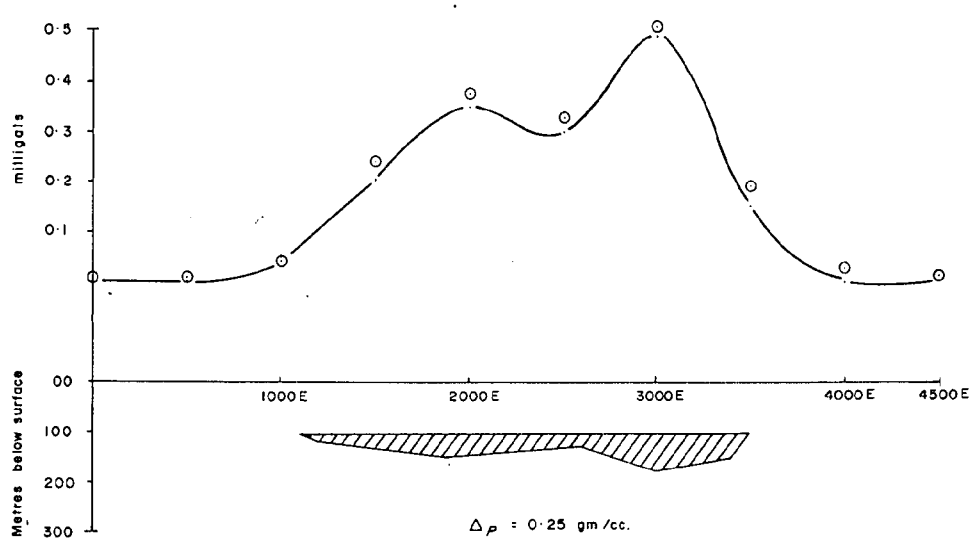
Field data

MINES ADMINISTRATION PTY. LIMITED

Scale: As shown	E.L. 722 BILLEROO WEST
Geo: A. Mills	MAGNETIC PROFILE
Date: Jan. 1982	ANOMALY M8

Fig. 9





Residual anomaly

⊙ Calculated anomaly

MINES ADMINISTRATION PTY. LIMITED		
Scale: As shown	E.L. 722 BILLEROO WEST	
Geo: A. MILLS	MODELLING RESIDUAL GRAVITY	
Date: 22/9/81	ANOMALY M 8	Fig. 10

(4) The possibility of major polymetallic ore bodies has not been eliminated.

8.2 Anomaly M2

(5) Both the magnetic source and any undetected gravity anomaly associated with polymetallic mineralization lies at depths in excess of 2000m beyond scope of present day economics.

8.3 Anomaly M8

(6) The magnetic source lies at depths of 1500m or more and the gravity anomaly sources, if they are real, are too deep to be within the scope of present day economics of polymetallic orebodies.

9. RECOMMENDATIONS

9.1 Anomaly M1

(1) Further studies of the data be undertaken.

(2) Serious consideration be given to extending the drill hole BWMIA-1.

9.2 Anomalies M2 & M8

(3) No further work on these anomalies is warranted at present.

9.3 General

(4) Further appraisal of the geophysics & geology of the Licence should be undertaken.

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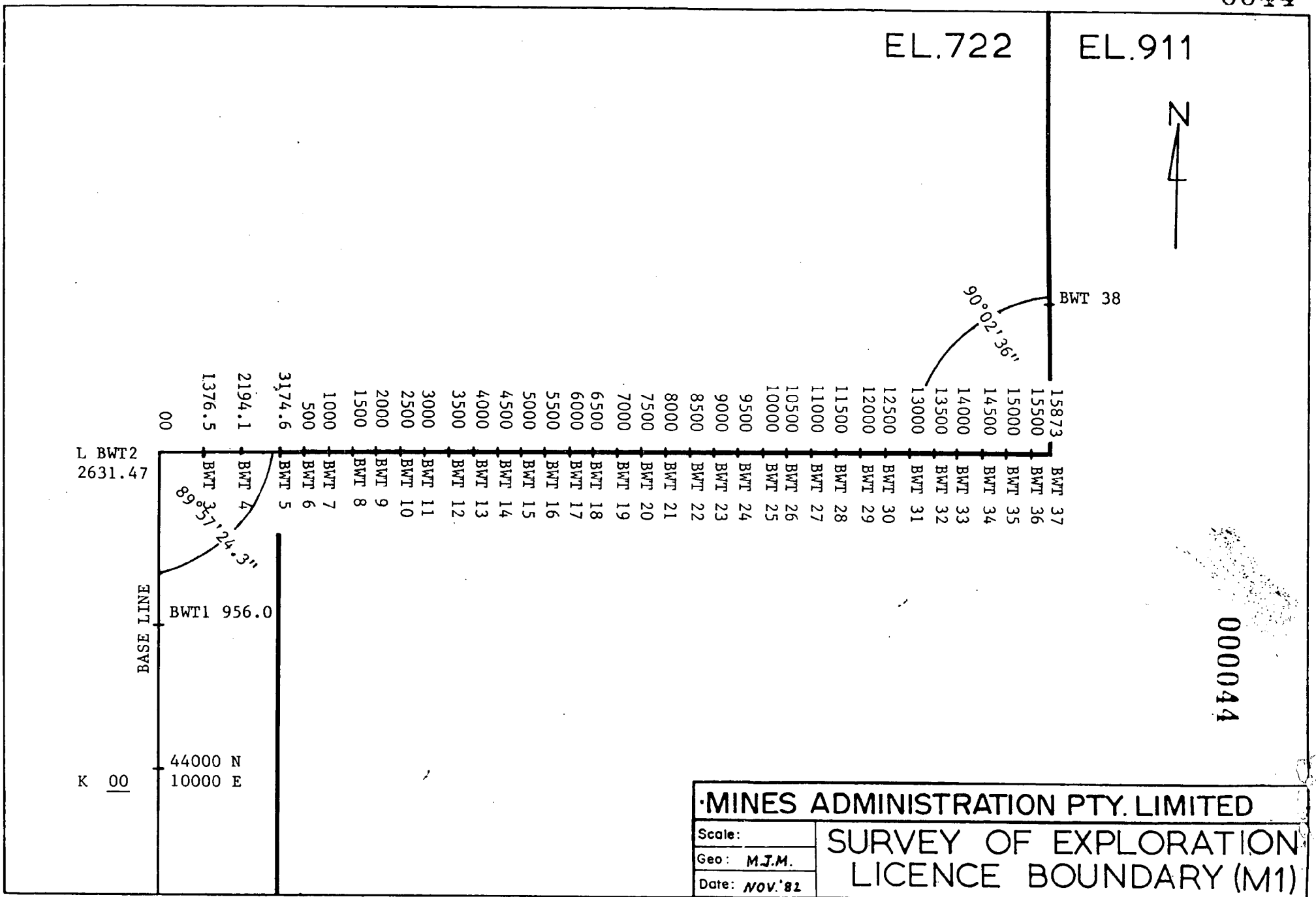
APPENDIX 1

SURVEY OF EXPLORATION LICENCE BOUNDARY AND DRIFT SURVEY



MINES ADMINISTRATION PTY. LIMITED	
Scale:	SURVEY OF EXPLORATION LICENCE BOUNDARY (M1)
Geo: M.J.M.	
Date: NOV.'82	

North PAGE 1 OF 3 East ..... Elev. .....

DRIFT SURVEY

Geoscience Associates (Australia) Pty. Ltd.

2-4 GRAY STREET, KILKENNY S.A. 5009
Telephone: 268 2898

Company MINAD - TETON - HOST Hole No. BLMIA-1

Location BILLEROO WEST

Date 5-4-81 Unit # AL-4 Operator AHMER

Shot No	Measured Depth	Drift Direction N/S Degrees	E/W	Drift Angle Deg.	Min.
1	FLU				
2	ORIENTATION				
3					
4					
5					
6					
7	495	105		0	50
8	495	105		0	50
9	475	110		0	40
10	475	110		0	40
11	455	77		0	20
12	455	77		0	20
13	435	65		0	10
14	435	65		0	10
15	415	85		0	20
16	415	85		0	20
17	395	80		0	10
18	395	80		0	10
19	375	87		0	20
20	375	87		0	20
21	355	92		0	20
22	355	92		0	20

* POSSIBLY INFLUENCED BY MAGNETITE CONTENT IN VOLCANICS.

Depths to be evaluated .....

North PAGE 2 of 3 East ..... Elev. .....

DRIFT SURVEY

Geoscience Associates (Australia) Pty. Ltd.

2-4 GRAY STREET, KILKENNY S.A. 5009
Telephone: 268 2898

Company MINAD - TETON - HOST Hole No. BLMIA-1

Location BILLEROO WEST

Date 5-4-81 Unit # AL-4 Operator AHMER

Shot No.	Measured Depth	Drift Direction N/S Degrees	E/W	Drift Angle Deg.	Min.
23	~~3~~35	97		0	30
24	335	97		0	30
25	315	100		0	20
26	315	100		0	20
27	295	110		0	30
28	295	110		0	30
29	275	135		0	40
30	275	135		0	40
31	255	130		1	00
32	255	130		1	00
33	235	130		1	00
34	235	130		1	00
35	215	135		1	10
36	215	135		1	10
37	195	145		2	00
38	195	145		2	00
39	175	162		2	20
40	175	162		2	20
41	155	165		2	40
42	155	165		2	40
43	135	~~170~~ 165		2	50
44	135	~~170~~ 165		2	50

Depths to be evaluated .....

Page 3 of 3 East ..... Elev. .....

DRIFT SURVEY

Geoscience Associates (Australia) Pty. Ltd

2-4 GRAY STREET, KILKENNY S.A. 5009
Telephone: 268 2898

Company MINAD - TETON - HOST Hole No. BLMIA-1

Location BILLEROO WEST

Date 5-4-81 Unit # AL-4 Operator AHMER

Shot No	Measured Depth	Drift Direction N/S Degrees	E/W	Drift Angle Deg.	Min.
45	115	168		2	00
46	115	168		2	00
47	95	295		3	00
48	95	295		3	00
49	95	295		3	00
50	95	295		3	00

NO SURVEY WAS RUN ABOVE 95 METRES AS THE SURVEY TOOL IS MAGNETIC & THE HOLE IS STEEL CASED ABOVE THIS. ALSO IN THE LOWER PART OF THE HOLE THE CORE REVEALED MAGNETIC PROPERTIES.

Depths to be evaluated .....

APPENDIX 2

GEOLOGICAL LOG

MINES ADMINISTRATION PTY. LIMITED

0047

GEOLOGICAL DRILLING LOG

PROJECT FROME EMBAYMENT BASEMENT TARGETS AREA BILLEROO WEST

COORDINATES 31°15'44" 140°07'32" DRILL HOLE BWMIA-1 PRECOLLAR

ELEVATION _____ DATE 4.9/80

CONTRACTOR : THOMPSON DRILLING PTY. LTD. LOGGED BY : J.L. CURTIS

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
0	2.0	Red brown sand.
2.0	6.0	Ditto but with 20% Gypsum.
6.0	8.0	As above but transitional to off white limey clays.
8.0	10.0	Buff to off white limey clay and light olive greenish grey clay.
10.0	12.0	Buff to light brownish grey clays, some yellow limonite
		stain, minor fine sand.
12.0	20.0	As above, sandier 14.0 - 16.0m, siltier 18.0-20.0.
20.0	24.0	Dark grey clays with minor yellow limonite stain.
24.0	32.0	Dark grey clays with only a trace of yellow limonite stain.
32.0	36.0	Light grey kaolinitic clays, slightly silty minor yellow
		limonite stain, some brown humic clays.
36.0	42.0	Transitional from above to dark grey clays.
42.0	50.0	Loss of circulation due to clay collars-hole cleanings of
		dark grey clays and minor silty sand.
50.0	56.0	Dark grey clay minor yellow limonite stain.
56.0	64.0	Medium grey clays, with dark brown humic clays and minor
		yellow limonite stain.
64.0	70.0	Light grey kaolinitic clays with minor yellow limonite staining.
70.0	72.0	As above but mixed with a minor amount of medium grained
		angular quartz sand (lost circulation).

FORM U6

DRILL HOLE BWMIA-1 PAGE No. 2

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
72.0	74.0	Dark greenish to grey clays with black fine grained pyrite.
74.0	76.0	As above but with black humic clays.
76.0	78.0	As above but transitional to dark blue grey clays.
78.0	80.0	Dark red - "hematitic" brown weathered micaceous siltstone
		or phyllite.
80.0	83.0	(No samples) - Presumed cutting to fine.
		TROPARI SURVEY
		40M Azimuth 8.75° Dip 1°
		82M Azimuth 15.7° Dip 3°

MINES ADMINISTRATION PTY. LIMITED

GEOLOGICAL DRILLING LOG

PROJECT FROME EMBAYMENT BASEMENT TARGETS AREA BILLEROO WEST

COORDINATES 31°15'44" 140°07'32" DRILL HOLE BWMIA-1

ELEVATION _____ DATE 17.1.81

CONTRACTOR : EVENAND P/L LOGGED BY : A. TELFER

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	DEPTH	TD B.Gd
0.00	82.90	PRECOLLAR		
82.90		CEMENT		
83.20	101.95	GENERAL DESCRIPTION		
		VERY FINE SANDSTONE, CLAY, FINE SANDSTONE		
		VERY FINE SANDSTONE: dark grey to occasionally light		
		brown, predominantly quartz & mica, carbonaceous		
		(hence dark colour). Uniform grain size. Laminae		
		from<1 to 280mm. CLAY: olive to dark green, non-		
		carbonaceous. Laminae from 1 to 80mm. FINE SANDSTONE:		
		mottled black, grey & white, predominantly quartz		
		with abundant carbonaceous material. Laminae up		
		to 100 mm. Commonly contains ovoid clay pebbles		
		up to 20x5mm, some inclined to bedding.		
		STRUCTURE: Contacts generally sharp, lithologies		
		interbedded. Ripple masks common. Wet sediment		
		structures (eg. load casts) and contorted bedding		
		visible. Bedding approx. horizontal.		

FORM 05

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	DEPTH	T✗ B.Gd
83.20	85.15	As per 83.20 to 101.95	83.50	13/10
85.15	85.28	Clay Pebble Conglomerate: olive to light green clay pebbles 20x5mm in cross section, within the Fine Sandstone of 83.20 – 101.95. Clay non-carbonaceous. Some pebbles inclined up to 20° to horizontal. Conglomerate open framework. Some clay pebbles also occur in underlying Very Fine Sandstone within 30mm of Clay Pebble Conglomerate.		
85.28	85.50	As per 83.20–101.95		
85.50	85.56	As per 85.15 – 85.28 although coarser grained with some matrix grains up to 1.5mm		
85.56	87.20	As per 83.20–101.95. Sample 14001		
87.20	90.10	As per 83.20–101.95 but clay has almost dissapeared.		
Sample	14001	The fine sandstone & very fine sandstone still occur,		
86.93	87.00	although finer grained (eg. very fine sandstone now a siltstone) Contorted bedding very prominent, low		
Sample 88.83	14002 88.93	amplitude ripple marks also occur. Sample 14002.	89.50	12/10
90.10	101.35	Fine siltstone, fine sandstone		
		Fine siltstone; dark grey-green, only slightly carbonaceous with occasional thin shale lenses		
		Fine Sandstone: as per 83.20 101.95 without clay pebbles. Generally occuring as thin (10mm) lenses within Fine Siltstone. Shale flecks are sometimes apparent.		
		Abundant ripple marks, occasional contorted bedding		
Sample	14003	Fine Siltstone occasionally contains sedimentary		
97.27	97.33	pyrite. Sample 14003.	95.50	12/10
			100.50	13/10

DRILL HOLE BWMIA-1 PAGE No. 3

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	TX B. Gd
101.35	101.95	As per 90.10 - 101.95 lithologically		
		Alteration: thin horizontal calcite veins		
		Pale lime green dendritic colouration, originating		
		from calcite bands.		
101.95	107.00	GENERAL DESCRIPTION		
		Limestone: light to dark grey; cryptocrystalline,		
		fractured subhorizontally and subvertically		
		Alteration:discontinuous opaque calcite veins & blebs.		
		Stylolites are common, often hosting pyrite in		
		fractures.		
101.95	102.18	Silty Limestone: grey to yellow brown. Possibly		
		transition between clastic & limestone lithologies.		
		Yellow flecks apparent.		
102.18	107.00	As per 101.95 - 107.00	106.50	15/10
		Alteration: Green colouration similar to that in		
		101.35 - 101.95 in blebs & ?veins, yellow flecks		
sample	14005	limonite at 106.90 - 107.00, blebs pyrite		
103.16	103.23	106.2 - 106.3. Sample 14005.		
107.00	107.70	GENERAL DESCRIPTION		
		Clay: light green with abundant calcite viens.		
107.70	107.70	GENERAL DESCRIPTION		
		Very Fine Siltstone: Tan to light grey & red.		
		Abundant white (quartz calcite) laminae. Occasional		
		black flecks elogate parallel to bedding.		
		Micaceous, carbonaceous, ripple marked.		
		Alteration: Apparent limonite staining.		
		STRUCTURE: tectonic conglomerates (ie. rock fragments		
Sample	14006	in clay matrix) up to 70mm wide parallel to bedding		
108.37	108.46	Sample 14006.		

DRILL HOLE BWMIA-1 PAGE No. 4

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	DEPTH	T8 B. Gd
112.10	128.90	GENERAL DESCRIPTION		
		Shale: grey to light grey and tan. Grades to silt-		
		stone and sometimes sandstone. Composed of quartzs,		
		some mica in a very fine grained matrix (clay?).		
		Pyritic in places.		
		STRUCTURE: abundant wet sediment structures,		
		contorted bedding. Graded bedding in places.		
112.10	112.50	As per 112.10 - 128.90. Downward penetration through		
		laminae 112.15.		
112.50	113.60	As per 112.10 - 128.90 but rock appears to have been		
		fractured and disturbed, generally horizontally.		
		Contains abundant euhedral pyrite, crystals up to		
		1mm, generally in subhorizontal partings.		
		Fine grain agal structures 113.3 - 113.4	112.50	12/10
113.60	116.75	As per 112.10 - 128.90. Clay breccia at 114.50		
		containing pyrite flecks. Spongy texture at 116.00		
116.75	116.80	Unconsolidated green sandstone (arkose?)		
116.80	117.07	Shale: brown & grey, contorted bedding. Shows slight		
		upward thinning - may be algal structures at base.		
117.07	117.50	As per 112.10 - 128.90 but generally tan coloured		
		black flecks.		
117.50	117.54	Sandstone: brown, quartzose		
117.54	121.96	As per 112.10 - 128.90		
Sample	14007	STRUCTURE: faulting - probably during diagenesis		
120.8	120.91	(eg. 120.30m) Sample 14007	118.50	11/10
121.96	122.06	Sandstone: brown & grey quartzose, mottled, grey		
		shale interbeds. Contains holes up to 2mm diameter.		
		(Possibly caused by removal of clays)		
122.06	124.50	Shale, siltstone: Shale as per 112.10 - 128.90		
		Siltstone: brown, composed quartz & mica mainly		
		pyrite common. Shale & Siltstone interbedded Laminae		
		1 - 2mm thick.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T & Bgd.
		STRUCTURE: Contorted bedding, soft sediment structure		
		and minor fracturing. Bedding inclined 05°.		
124.50	124.60	Intraformational Conglomerate: Red brown elongate		
		avoid shale clasts in Shale (112.10 - 128.90). Could		
		be boudinage effect. Clasts up to 10x4mm elongate		
		parallel to bedding.	124.5	14/10
124.60	125.30	As per 112.10 - 128.90		
125.30	125.60	As per 124.50 - 124.60 however avoid clasts reach		
		40x20mm and bedding dips up to 30°.		
125.60	126.30	Shale, Sandstone: Shale as per 112.5 - 128.90		
		Sandstone, as per 121.96 - 122.06. Shale laminae up		
		to 30mm, Sandstone up to 10mm.		
126.30	127.75	As per 112.10 - 128.90		
127.75	127.90	As per 125.30 - 125.60		
127.90	128.90	As per 112.10 - 128.90 however Shale becoming more		
		calcic.		
128.90	145.45	GENERAL DESCRIPTION		
		Limestone: mottled pinkish grey to dark grey,		
		crystalline & oolitic (recrystallised to marble,		
		biotitic blebs & blotches up to 20mm diam).	130.5	13/10
		Occasional pyritic blebs. Fossiliferous (Archeocyathea).		
Sample	14008	Alteration: Black styolites & olive green	137.0	15/10
		irregular viens.		
Sample	14009	Fossils: Generally circular in cross-section	142.5	10/10
		with a central hole. Radial to radial network.		
		Archaeocyathas limestone.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T.C. Bgd.
Sample	14013	pattern around central hole. Longitudinally horn		
132.30	132.35	shaped. Occur predominantly in crystalline limestone		
Sample	14014	(marble). Archeocyathea samples 14008, 14009		
138.35	138.40	14014, 14013 (full core)		
144.58	145.55	As per 128.90 - 145.55 however with generally		
		horizontal biotitic flecks up to 3x0.5mm. Very		
Sample	14010	small bright green flecks also visable. Sample		
145.30	145.37	14010.		
		Base of Cambrian.		
145.55	181.50	GENERAL DESCRIPTION		
		Pyritic Shale: Dark & light grey to pale green,		
		banded (20 - 100mm), non-carbonaceous. Pyrite		
		common (1-2%) in nodules up to 8mm and laminae		
		parallel to bedding (syngenetic pyrite)		
		Laminae generally parallel, some contorted.		
		Occasional ripple marks. Bedding inclined up to 5°		
		from horizontal.		
		Alteration: Veins & blebs of calcite parallel to		
		bedding & in fractures generally perpendicular to		
		bedding. Veins up to 5mm wide.		
		STRUCTURE: Micro fractures common - in some places		
Sample	14011	brecciated form. Cleavage parallel to bedding		
151.63	155.08	dipping 60° or steeper to vertical. Pyrite in		
		vertical cleavages		
145.55	155.00	As per 145.55 - 181.50 Sample 14011	148.5	15/10
155.00	156.00	As per 145.55 - 181.50	154.5	15/10
		STRUCTURE: Extensive fracturing with movements		
		20mm indicated. Bedding consistantly tilted to		
		40°. Relatively sharp contacts above and below		
		Sample 14012		
156.00	157.10	As per 145.55 - 181.50		
157.10	157.15	Intraformational Conglomerate: Generally		
Sample	14012	avoid clasts up to 8mm, sequence timing		
155.60	155.66	upward to tan shale.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	TX Bgd.
157.15	181.50	As per 145.55 - 181.50	160.5	11/10
			166.5	10/10
181.50	221.60	GENERAL DESCRIPTION	172.5	11/10
		Maroon Shale: Red to grey green shale, interbedded,	178.5	12/10
		gradational contacts, bedding laminae 1mm wide,		
		grey interbeds to 100mm, red to 1m. Non carbonaceous.		
		Bedding horizontal to 3°. Probably same unit as		
Sample	14015	Pyritic Shale in oxidising conditions. Sample 14015		
196.70	196.80	STRUCTURE: Clearage horizontal (bedding Plane) 45°		
		and vertical.		
		Alteration: red shale altered to pale green	184.5	10/10
		around fissures	190.5	9/10
181.50	199.50	As per 181.5 - 221.60	196.5	11/10
199.50	212.43	As per 181.5 - 221.60 however grey green shale	202.5	10/10
		occurs only rarely.	208.5	11/10
212.43	213.30	Shale: green grey at top grading to red		
		STRUCTURE: Micro fracturing (similar to that described		
		in Pyritic Sahle). Composed of insitu materials		
		disturbed.		
213.30	221.60	As per 181.50 - 221.60 however green-grey shale	214.5	9/10
		replaced by buff carbonaceous siltstone, centicular	220.5	10/10
Sample	14016	Bedding shows ripple marks. Siltstone up to 30mm		
220.80	220.85	thick. Sample 14016.		
221.60		GENERAL DESCRIPTION		
		Silty Limestone: buff with green shale into beds		
		Laminae 1-5 mm thick. Bedding horizontal to 5°		
		Shale non carbonaceous. Shale present in vertical		
		and subvertical fissures. Laminae 5 - 50mm apart.		
		Pyritic in places - commonly in breccia.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tx Bgd.
Sample	14017	STRUCTURE: bedding plane and subhorizontal cleavage.		
224.30	224.35	Brecciated in places. Contacts gradational		
221.60	225.70	As per 221.60 - 232.60. Sample 14017.		
225.70	225.75	Breccia: Subrounded, angular clasts of silty limestone		
		up to 20mm long in green shale? Formed along cleavage		
		plane.		
225.75	227.75	As per 221.60 - 232.60	226.5	
227.75	228.20	Pyritic Breccia: pyritic subvertical? cleavage planes		
		Pyrite anhedral. Breccia fragments from 1mm to 40mm.		
		Larger fragments show minimal movement.		
Sample	14018	Pyrite hosted in shale in interstices between		
228.10	228.16	fragments. Pyrite - 5%. Sample 14018.		
228.20	232.60	As per 221.60 - 232.60 however suite becoming	232.5	
		more pelitic grading to sandstone (fine). Composed		
		of quartz, lithic fragments. Light grey brown.		
		Interbedded with shale. Laminae 3 - 50 mm apart.		
		Bedding - 3°.		
232.60	238.00	GENERAL DESCRIPTION		
		Conglomeratic Shale: Red brown shale grading in		
		places to fine sandstone. Sub-rounded porphyritic		
		clasts 1mm - 170mm diam. Open framework.		
		Clasts contain quartz, feldspar porphroblasts in		
		fine grained brick red groundmass. Some pyrite in		
		the granite. Shale slightly carbonaceous.		
		STRUCTURE: Interbedded shale and conglomeratic shale.		
		Clasts randomly oriented-subrounded to angular.		
		Bedding to 4°.		
		Alteration: pale green shale either side of fissures		
		and around some acid volcanic clasts.		

DRILL HOLE BWMIA-1

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T δ BGd.
232.60	233.90	Shale, sandstone. Shale: red brown to grey green,		
Sample	14019	non conglomeratic. Occasional Sandstone interbeds,		
234.30	234.44	light grey to cream, quartzitic and slightly micaceous		
Sample	14020	Sandstone laminae 5 - 20mm thick,		
233.88	233.96	5 - 100mm apart.		
233.90	234.75	As per 232.60 - Sample 14019, 14020		
234.75	238.00	Shale: red brown with occasional rhyolitic pebbles,		
Sample	14021	generally clustered. Sample 14021		
236.40	236.50		238	24/22

MINES ADMINISTRATION PTY. LIMITED

GEOLOGICAL DRILLING LOG

PROJECT _____ AREA BILLEROO WEST

COORDINATES _____ DRILL HOLE BWMIA-1

ELEVATION _____ DATE 22.2.81

CONTRACTOR : EVENHAND DRILLING P/L LOGGED BY : M. MOORE

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
238.00	240.40	GENERAL DESCRIPTION
		Fine grained siltstone. Moroon to grey in colour, has mottled
		appearance.
		Grain size is consistent over length.
		Mottled appearance suggests laminations, small clay seams
		are present and are white in colour with pyrite occuring
		on the contact of clay and siltstone.Towards 240.40 the
		rock is predominatly grey - green in colour and displays
		no mottled appearance or evidence of laminations.
		STRUCTURE:
		Clay seam boundaries are sharp.
		Mottled appearance in some sections gives appearance of
		contorted laminae.
		No suggestion of bedding is evident.
		ALTERATION:
		Maroon in colour becoming mottled and becomes grey-green
		towards 240.40.

FORM U6

DRILL HOLE BWMIA-1 PAGE No. 10

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T.D Bgd
238.00	238.40	Maroon - grey mottled siltstone with white clay		
		seams up to 5cm across. Clay seams contain pyrite		
		on interface with siltstone.		
		Mottled appearance suggests contorted laminations.		
239.40	240.40	Grey to green siltstone with no suggestion		
Sample	14022	of laminations		
247.90	248.00			
240.40	250.27	GENERAL DESCRIPTION		
		Medium grained sandstone, white in colour with some		
		small contorted patches of grey material, probably		
		carbonaceous, some irregular carbonaceous veins are		
		present. The sandstone is predominantly even grained		
		and well sorted except for small rounded grains of		
		quartz and feldspar up to 1mm in diameter. These		
		small grains are red to pink in colour (porphyritic		
		rhyolite) clusters of pyrite are present on some		
		fracture surfaces.		
		STRUCTURE:		
		Bedding is not indicated, small rounded grains of		
		quartz and feldspar display some grading, to indicate		
		bedding i.e. 241.60. At 241.60 grading occurs as small		
		graded beds indicating a dip of approx 10°.		
240.40	250.27	As per general description.		
		i.e. continuous section of sandstone with poorly		
		sorted beds of graded medium size quartz and		
		feldspar grains	250	22/20

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T? Bgd
250.77	254.08	GENERAL DESCRIPTION		
		Poorly sorted sandstone, almost conglomeratic ie.		
		similar to 240.80 - 250.77 but with larger grains		
		and coarser beds. These coarser beds are conglomeratic		
		containing well rounded poorly sorted pebbles of quartz		
		and feldspar. Beds of fine grained grey siltstone are		
		present up to 50 cm in length, they appear phyllitic		
		on fracture surfaces.		
		STRUCTURE:		
		Bedding is indicated by conglomerating beds and by		
		contorted laminae of grey siltstone on contact with		
		these conglomeratic beds.		
		ALTERATION:		
		The rock is generally white-grey in colour except for		
		grey siltstone beds and appears to become red		
		towards 253.33.		
250.77	250.97	Fine grained grey siltstone.		
250.97	251.50	Well sorted white sandstone with some conglomeratic		
		beds.		
251.50	251.90	Fine grained grey siltstone.		
251.90	252.40	As per 250.90 - 251.50 with conglomeratic material		
		as 752.40 at boundary with grey		
Sample 252.40	14023 252.70	siltstone		
252.50	252.70	grey siltstone.		
252.70	253.33	As per 250.90 - 251.50 but becoming red in colour.		
253.33	254.08	Asper 200.90 - 251.50 with small coarse beds indicating		
		of horizontal bedding.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T& Bgd
254.08	289.80	GENERAL DESCRIPTION	259.50	25/25
Sample	14024	Well sorted fine grained red siltstone	265.50	25/25
263.35	263.48	The rock is predominantly red in colour with small	274.50	25/25
		bands of grey green colouration.	280.50	25/25
Sample	14025	Laminations increase with depth and are very fine	286.50	25/25
283.00	283.10	ie. 1mm. Some laminations appear crossed. The silt-		
Sample	14026	stone contains fine coarser grained laminae (white in colour).		
288.05	288.15	Minor sulphides occur on some fractures in mottled		
		zones.		
		STRUCTURE		
		Fine laminations indicate bedding is horizontal		
		Green chloritic alteration on fracture particular		
		267.60.		
		ALTERATION:		
		The rock is predominantly red with patches of grey		
		alteration. The red siltstone has a mottled appearance		
		in short sections ie. ribbon stone appearance.		
		The above description is consistent throughout the		
		interval 254.08 - 289.80.		
		The green grey colour of the siltstone becomes more		
		common 286.50 - 288.30.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	DEPTH	TX BGd.
289.80	290.89	GENERAL DESCRIPTION		
		Fine grained red siltstone with small bands of		
		calcareous material up to 7cm in length.		
		The contract of the calcareous beds are irregular and		
		display contorted laminations. A coarser grained		
		material is also present on the siltstone-calcareous		
		interface.		
		Narrow (2cm) white sandy lenses are present.		
		Fine sandy laminae are present with the siltstone.		
		STRUCTURE:		
		Laminations suggest bedding is horizontal.		
289.80	289.87	Calcareous interbed with contorted laminae on		
		contact with siltstone.	290	22/20
289.80	290.12	Red siltstone with fine sandy laminae		
290.12	290.17	Narrow calcareous bed.		
290.17	290.50	Red siltstone with fine sandy laminae		
290.50	290.53	Calcareous interbed.		
290.53	290.89	Red silstone with sandy interbeds.		
290.89	298.30	GENERAL DESCRIPTION		
		Grey fine grained siltstone calcareous in parts,		
		particularly 290.89 - 292.10.		
		Contains fine lamination of coarser grained sand. Some		
		coarser laminae contains small poorly sorted grains		
		of quartz and feldspar.		
		STRUCTURE:		
		Fine lamination of coarser sandy material		
		indicates bedding is horizontal.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T δ BGd.
		ALTERATION:		
		The rock over the section is predominantly grey in		
		colour, compared with red from 289.89 up the		
		hole.		
		The above description is consistent throughout the		
		section.	295	25/22
298.30	304.30	GENERAL DESCRIPTION		
		Fine grained grey siltstone with interlaminated		
		coarser sandy laminae. These coarser sandy laminae		
		contain rounded poorly sorted quartz and feldspar		
		grains.		
		Section of contorted carbonaceous material, containing		
Sample	14027	disseminated chalcopyrite and pyrite. Some		
299.89	300.00	veins of sulphide up to 4mm in diameter.		
		Intervals of vuggy calcite are associated with contorted		
		black laminae and sulphide. The black carbonaceous		
		material and sulphide form styolitic patterns.		
		STRUCTURE:		
		Laminae indicates bedding is horizontal.		
298.30	299.50	Grey siltstone with interbedded sandy layers		
299.50	300.09	contorted laminated siltstone with carbonaceious		
		material and fine sulphide accumulations in laminae.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T & BGd.
300.09	300.84	Areas of vuggycalcite within a calcareous grey		
		siltstone.Styolites developed.		
		This interval of contorted black laminae		
		300.77 - 300.80		
300.84	301.98	Grey siltstone with fine sandy laminae and a small		
		interval (1 cm) of sulphide.		
301.98	304.30	Section of contorted calcareous siltstone, predominantly		
		coarser grained. Some areas of vuggy and veined		
		calcite. Disseminated sulphide is present along		
		with black styolitic structures.	301	22/20
304.30	310.45	GENERAL DESCRIPTION		
		Grey laminated siltstone with interbedded sandy		
		layers. Contorted styolitic pattern structures.		
		Sections of sulphide veins and sulphide disseminations		
		in the more sandy interbeds.		
		Sulphides appear to be associated with the dark		
		finely contorted laminae. The sandy interbeds are		
		general calcareous.		
		STRUCTURE		
		Laminations indicated bedding is horizontal.		

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DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T Bgd
304.30	305.21	Coarse grained poorly sorted calcareous rock. Contains		
		rounded grains of quartz and feldspar up to 2mm		
Sample	14028	in diameter. Bands of dark carbonaceous material		
303.80	303.87	up to 1cm in diameter are present.		
305.21	305.26	Grey calcareous siltstone with wavy bands of fine		
		grained siltstone and coarser bands of sandy		
		calcareous rock. Disseminated pyrite occur in some		
		white coloured, sandy calcareous bands. At 308.20		
		there is a narrow vein (1cm) of pyrite.		
308.26	308.40	Fractured zone of calcareous siltstone.		
308.40	310.45	Grey calcareous siltstone. This interval is coarser		
		grained. Possibly better described as a calcareous		
		sandstone with wavy bands of black carbonaceous material.		
		Styolitic structures are also present. Small		
		accumulation of pyrite are present within bedding		
		planes and also present as disseminations	304.50	18/18
			307.50	18/18
310.45	312.75	GENERAL DESCRIPTION		
		Grey calcareous siltstone with wavy siltstone bands		
		becoming more common towards 312.45.		
		Calcite filled farctures developed with chalcopyrite		
		disseminated throughout the fracture fill.		
		STRUCTURE		
		Wavy laminations indicated bedding is horizontal.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T Bdg
310.45	312.75	The above description is consistent over the		
		interval.		
Sample	14029	Fracture fill fissures are up to 0.5cm in diameter		
312.50	312.55	and containing calcite with disseminated		
		chalcopyrite	310.50	19.18
312.75	320.50	Grey calcareous siltstone some sections were calcareous		
		than others. More calcareous at 320.50.		
		Calcareous bands are white and coarser grained		
		than the siltstone bands. Siltstone occurs as wavy		
		laminations. Disseminated sulphide occur in calcareous		
		bands.		
		STRUCTURE		
		Bedding is horizontal.		
		The above description is consistent throughout the		
		interval.	313.50	22/20
			319.50	22/20
320.50	328.55	GENERAL DESCRIPTION		
		Same as above interval, more clacareous around		
		320.50 and decreasing down the hole.		
		STRUCTURE		
		Bedding is horizontal.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T& Bdg
320.50	320.97	Grey silty oolitic limestone. Contains oolites and		
Sample	14030	onkalites. Oolites up to 1mm in diameter. Styolitic		
320.50	320.67	structures are also present.		
320.97	328.55	Predominantly a grey calcareous siltstone with wavy		
		laminae of siltstone within a coarser grained lighter		
		coloured calcareous rock. Styolitic structures are		
		developed and some small fractures fills of calcite.		
Sample	14031	Small coarse grained poorly sorted bands are		
323.33	323.43	developed within the siltstone ie 323.05m 1cm in		
		diameter		
		Sulphides are developed on some fracture surfaces.		
		Calcareous material content appears to decrease		
		down the hole	322.50	25/20
			326.50	22/20
			328.50	22/20
328.55	333.75	GENERAL DESCRIPTION		
		Very finely laminated grey calcareous siltstone		
		calcareous material occurs as very fine white (· 1mm)		
		laminae. The calcareous content varies throughout the		
		interval.		
		Fine disseminated sulphides are present, pyrite		
		predominantly with minor chalcopyrite. Small		
		interval of poorly sorted clastics are present ie		
		333.44 - 333.50. This interval contains poorly		
		sorted rounded pink quartz grains with fine laminae of		
		siltstone.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T δ Bgd
		Small aggregates of disseminated pyrite and		
		chalcopyrite are also present (up to 1mm in diameter)		
		STRUCTURE		
		Fine laminations indicate bedding is horizontal.		
		The general description above is consistent over the		
		whole interval.		
333.75	345.65	GENERAL DESCRIPTION		
		Grey calcareous siltstone and grey limestone the		
		interval consists of finely laminated calcareous		
		siltstone. Calcareous content varies from minor in		
		the siltstone to limestones. Brecciation is common		
		throughout the interval indicated by displaced silt		
		laminae and small angular siltstone fragments (up to		
		1cm), is filled with calcite fracture fill, this is		
		common throughout the interval. Fractures are up to 3cms		
		in diameter. Styolites are developed within the		
		more clacareous siltstones. Disseminated sulphides		
		(pyrite and chalcopyrite) occur within the calcareous		
		laminae within the siltstone. Sulphides are also		
		present as fracture filling and as aggregates on		
		fracture surfaces, along with calcite crystals.		
		Small beds of coarser clastic material is also present		
		up to 2cm across.		

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DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	TX Bgd
		STRUCTURE		
		Laminae in siltstone indicate bedding is horizontal.		
		Brecciation and fracture filling suggest fracturing		
		is perpendicular to bedding.		
333.75	336.40	Grey calcareous siltstone with solution cavities and		
		calcite fracture fill zones.		
		Laminae are contorted and truncated by fracturing.		
		Calcite and sulphides are developed as fracture		
		fillings up to 1cm in diameter styolites are		
		developed in more silty sections.		
336.46	337.28	Grey calcareous siltstone, more calcareous laminae		
		are white in colour.		
		A small fractured bed of poorly sorted rounded quartz		
		pebbles is present at 336.50		
		Calcite fracture filling with sulphide aggregates		
		are also present, as in interval 337.75 - 336.46		
337.28	342.78	Grey calcareous siltstone with fracture fill calcite		
		and sulphides. Sulphides also present as disseminations.		
		Brecciation and fracturing indicated by truncated		
		laminae.		
342.55	343.35	Grey crystalline limestone with minor siltstone		
		laminae. Fracture full calcite, with brecciation in		
		fractures. Disseminated sulphides. Styolites also		
		present.		
343.35	344.27	Grey calcareous siltstone with fracture fill calcite,		
		brecciated siltstone present within calcite.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tδ Bgd
		Siltstone is grey in colour with calcareoius beds		
		white in colour.		
		Styolites are also developed		
344.27	345.65	Grey silty limestone, styolites are developed.	331.50	15/15
		Disseminated sulphides are also present.	334.50	15/15
345.65	355.60	GENERAL DESCRIPTION		
		Grey calcareous siltstone becoming less calcareous with		
		depths.		
		Calcareous beds are white in colour compared with		
		grey siltstone laminae. Styolites are developed.		
		Siltstone laminae are wavy in habit.		
		Disseminated sulphides are present in white coloured		
		beds.		
		Small beds of coarser clastics are present		
Sample	14032	ie 252.63 & 352.80., Consists of poorly sorted pink		
252.75	352.80	and white quartz grains up to 2mm in diameter, grains		
		are well rounded.		
		STRUCTURE		
		Laminae indicte bedding is horizontal.		
		The above description is consistent over the		
		interval 345.65 - 355.60	355.50	16/15
			352.50	16/15
			349.50	16/15

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T & Bgd
355.60	358.10	GENERAL DESCRIPTION		
		(As for previous interval)		
		Grey calcareous siltstone becoming less calcareous		
		with depth. Siltstone occurs as grey-green fine		
		laminae interlayered with fine grained calcareous		
		material. Rock is becoming greener in colour with		
		depth. Small rounded isolated quartz pebbles are		
		present at 358.05.		
		Up to 2mm in diameter.		
		STRUCTURE		
		Fine laminae indicate bedding is horizontal.		
		ALTERATION		
		Siltstone becoming greener in colour with depth		
		Above description is consistent over above interval.		
358.10	361.50	GENERAL DESCRIPTION		
		Pale green coloured siltstone which is finely		
		laminated and appears wavy and contorted in some		
		areas. This green siltstone is interbedded with poorly		
		sorted coarser grained beds of quartz (pink and white		
		in colour) and fragments of green volcanics? These		
		coarser interbeds are more clacareous than the		
		siltstone.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tr / Bgd
		These coarser intervals appear bedded. The green		
		siltstone appears silicified ie has a vitreous lusture.		
		It is interbedded with the coarser intervals as		
		mentioned plus some quartzose beds.		
		The coarser infillings suggest perhaps the rock is		
		a volcanic? ie a green coloured tuff interbedded with		
		a medium grained agglomerate.		
		For 358.10 - 358.32 the coarser material is cross cutting		
		and gives the appearance of facture filling.		
		The coarser material is calcareous.		
Sample	14033	2.63 from boundary with underlying red volcanic?		
358.88	358.94			
		STRUCTURE		
		Bedding appears horizontal.		
		ALTERATION		
		Predominantly green in colour.		
		The above description is consistent over the interval	358.00	20/18
			361.00	20.18

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tγ Bgd
361.50	388.90	GENERAL DESCRIPTION		
		Maroon - red siltstone with fine laminae which		
		are often contorted. Possibly a varve sequence.		
		The boundary of this rock type and that above is		
		relatively sharp. Slightly gradational in colour.		
		The rock is predominantly maroon in colour, very		
		fine grained and finely laminated.		
		Within this red siltstone, are irregular (parallel		
		to bedding) intervals of coarser poorly sorted,		
		angular to rounded fragments of quartz, feldspar		
		and a green mineral (chlorite)?		
		These fragments are up to 1cm in diameter and		
		irregular in shape. The coarser intervals are generally		
		less than 5cm in length and occuring frequently,		
		increasing in occurence with depth?		
		These intervals are generally pink to white in		
		colour and are calcareous compared with the none		
		calcareous red siltstone.		
		The core tends to be unbroken with only minor		
		fractures, generally in coarser intervals with the		
		green altered patches fractures are coated with		
		sulphide and green coloured chloritic material.		
		STRUCTURE		
		It appears bedding is horizontal.		
		ALTERATION		
		The rock is predominantly red in colour with minor		
		patches of pale green alteration.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tγ/Bgd
		The above description is consistent over the		
		interval.		
		Intervals of larger fragments occur towards 387.64 -		
		387.84 ie up to 2cm in diameter	363.00	23/22
			366.00	24/22
			369.00	22/22
			372.00	22/22
			375.00	23/22
			378.00	22/22
			381.00	24/22
			384.00	22/22
			387.00	24/22
SAMPLE	14034	Representative of above description		
376.28	376.20	14.70 metres from overlying lithology.		
388.90	391.42	GENERAL DESCRIPTION		
		Open frame work conglomerate, with angular		
		pebbles increasing in size with depth.		
		ie from 1cm diameter up to 10cm in diameter		
		Pebbles and cobbles are composed bedded quartzites		
		siltstones and rhyolitic pebbles.		
		The matrix is coarse grained composed of sand and other		
		smaller rock fragments. The matrix is also		
		calcareous in patches.		
		Continue Page 26..		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	Tx Bgd
		chalcopyrite and pyrite is present as small blebby		
		accumulations and on fracture surfaces.		
		STRUCTURE		
		This conglomerate is a basal conglomerate derived from		
		the underlying rock type. It is suggested that the		
		sequence is horizontal.		
Sample	14035	Representative sample of interval 90cms from the		
		underlying rock type.		
		ALTERATION		
		The rock is predominantly a red-maroon colour.		
		The above description is consistent over the interval.	390.00	25.24
391.42	EOH 600.00	GENERAL DESCRIPTION	393.00	22/22
		Red Rhyo-Dacite, volcanic rock.	396.00	24/22
		The rock is a strongly altered very fine grained acid	399.00	24.22
Sample	14902	to dacitic pink volcanic with complex	402.00	25.22
391.98		structures.	405.00	22/22
Sample	14903	The rock is predominantly a massive red-pink	408.00	22/22
398.24	398.55	volcanic with intervals of red and white mottled	411.00	25/22
Sample	14904	rock. The white material is interstitual to the red	414.00	25/22
413.24	413.35	siliceous rock, it is also calcareous.	417.00	25/22
Sample	14905	The contacts of the massive and mottled rock	420.00	22/22
414.90	415.10	are irregular.	423.00	22/22
Sample	14096	Fracture fill calcite is present throughout varying	426.00	25/22
419.75	419.83	from fine hair line fractures to 3cms in diameter.	429.00	22/22
Sample	14907	Fracture fill sulphides are also present, predominantly	432.00	20/19
429.15	429.36	pyrite with minor chalcopyrite.	435.00	20/19
		Magnetite is common within the rock. Predominantly	438.00	19/19
		associated with the more massive red volcanic, occurring		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG	Depth	T Bgd
		as blebs and fine black laminae, giving the rock a banded		
		appearance. The magnetite is also present as secondary	441.00	22/19
		accumulations as irregular fracture veins.	444.00	22/19
			447.00	20/19
		Red-pink Volcanic:	450.00	20/19
		This rock type is predominantly a massive red volcanic,	453.00	20/19
		banding is present in some of these intervals and is	456.00	20/19
		probably caused by the remobilization of magnetite	459.00	19/19
		along the bedded tuffs. Magnetite is also present as	462.00	22/19
		small blebs. Fracture fill calcite and sulphides are	465.00	24/19
		common and appear to be predominantly parallel to core	468.00	22/22
		axis.	471.00	22/22
			474.00	23/22
		Red and White mottled Volcanic:	477.00	22/22
		This rock type occurs as irregular patches within the	480.00	22/22
		predominantly brecciated red volcanic. The mottled	483.00	24/22
Sample	14036	rock has a botryoidal appearance with intersitual	486.00	22/22
412.60	412.69	fine grained white calcareous material. This white	489.00	25/22
		calcareous material decreases with depth and the	492.00	25/22
		interstitial material becomes a pale green mineral,	495.00	22/22
		possibly tremolite. Tremolite becomes more pervasive		
		with depth.		
		Sulphides:		
		Sulphides mainly pyrite and minor chalcopyrite occurs		
		as fracture fill. Sulphides are most prominent from		
		392.00 - 399.00m.		
		Sulphides are present as fracture fill on its own		
		(parallel to core axis) and also rimming fracture fill		
		calcite.		
		Sulphides also increase again towards 430.00 metres.		
		Overall the sulphide content in the rock appears to		
		decrease with depth.		

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
		Magnetite:
		Black magnetite occurs as two forms i.e. small blebs
		and accumulations within the massive red volcanic
		and as fine black laminae giving the rock a banded
		appearance in some intervals. It is also present as
		secondary irregular veins.
		Fracture fill calcite:
		Fracture fill calcite is common, different from the
		absence of calcite above 391 metres. It is vuggy
		in habit and is often rimmed by sulphides. From 405.45
		- 406.00m occurs a large calcite filled fracture up
		to 3cm in diameter rimmed by pyrite and with blue-
		purplish fluorite developed down the centre of the
		fracture.
		Large calcite fracture fill appears to decrease with
		depth.
		Structure:
		Banding of magnetite indicates bedding is not horizontal
		compared with the overlying lithologies. But is perhaps
		a sequence of complexly bedded tuffs and lava breccias.
		Fractures appear to be predominantly paralled to the core
		axis.
		Alteration:
		The rock is predominantly a red-pink colour.
		Hydrothermal activity is indicated subsequent to
		deposition, the rocks have been severly altered by
		the introduction of magnetite along bedding planes
		of the tuff and pervasively throughout to ranging
		degrees accompanied by carbonate minerals.
		Lithologies intersected below 391 metres have been

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DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
		positively identified as complexly related bedded tuffs,
		lava breccias with extrusive and intrusive phases of
		very fine grain size and high k-feldspar content.
		Subsequent to deposition the rock has been altered
		by the introduction of magnetite accompanied by carbonate
		minerals.

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
		DETAILED LOG OF VOLCANICS
391.42	393.32	Banded red volcanic consisting predominantly of
		mottled borrioydal volcanic and more massive tuff.
		Sample no. 14051 391.42 - 391.98
392.32	392.61	Calcite and sulphide veining within massive red
		banded tuff.
		Sample no. 14052 392.32 - 393.00
392.61	394.30	Mottled pink and white volcanic within a more
		massive red volcanic. The mottled material
		is irregular. Blebby accumulation and vein sulphides
		are present.
		Sample no. 14053 393.00 - 394.00
394.30	394.95	Ditto, with larger sulphide veining up to 1cm
		in diameter.
		Sample no. 14054 394.30 - 395.00
394.95	395.40	Mottled volcanic.
395.40	395.55	Ditto plus sulphide veining.
395.55	396.65	Mottled pink volcanic with calcite fracture fill with
		small accumulations of sulphides developed in
		fractures.
		Sample no. 14055 395.50 - 396.00
396.65	397.45	Mottled volcanic with large calcite fracture infilling
		with sulphides and magnetite present.
		Sample no. 14056 396.05 - 397.00 Sample no. 14057 397.00 - 398.00
397.95	398.20	More massive tuffaceous volcanic with sulphide and
		magnetite veining.
398.20	398.80	Mottled volcanic with calcite and sulphide fracture
		infilling up to 2cms in diameter. The calcite forms the
		core of the fracture with pyrite rimming the fracture.

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
		Sample no. 14058 398.20 - 399.00
398.80	399.68	Mottled volcanic with remnant banding, with magnetite
		and sulphide developed in veins.
399.68	399.9	Banded massive volcanic
		Sample no. 14059 399.68 - 400.00
399.9	405.40	Mottled red volcanic with minor remnants of banding,
		with fine magnetite veining.
		Sample no. 14060 400 - 401.00 Sample no. 14061 405.30 - 406.00
405.40	406.30	Mottled volcanic with large calcite fracture infilling
		up to 3cms in diameter. Flourite is developed down the
		core of the fracture with sulphides rimming the calcite
		infilling
		Sample no. 14062 406.00 - 406.30
406.30	417.65	Mottled red volcanic with remnants of banding.
		Brecciation is evident over the interval. Fine
		magnetite veining is common with minor sulphide
		accumulations. The mottled rock contains calcite which
		is commonly replaced with tremolite.
		Sample no. 14063 410.00 - 411.00
417.65	417.80	Massive banded red volcanic with calcite fracture fill.
417.80	419.50	Mottled banded volcanic with calcite fracture fill.
		Sample no. 14064 417.65 - 418.00
419.50	420.45	Massive red banded volcanic with magnetite developed
		in banding. Calcite fracture fill is also present.
		Minor brecciation is also present.
		Sample no. 14065 419.50 - 420.00
420.45	424.50	Mottled volcanic with intervals of more massive
		banding. Magnetite is present in banding and as
		blebby accumulations.

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
		Magnetite also appears more pervasive over this interval
		resulting in a darker coloured rock.
424.50	426.60	Mottled pink volcanic with remnants of banding
		Magnetite is developed in banding and as blebby
		accumulations.
		S. No. 14066 424.00 - 425.00
426.60	427.70	Ditto, plus calcite fracture fill
427.20	428.05	Mottled pink volcanic with blebby magnetite present
		in more mottled intervals.
		S. No. 14067 427.20 - 428.00
428.05	428.75	More siliceous mottled volcanic, brecciated with fracture
		fill calcite with magnetite present in fractures and
		as blebby accumulations.
		S. No. 14068 428.00 - 429.00
428.75	430.92	Banded volcanic with minor intervals of mottled volcanic
		Magnetite is present within the banding.
		S/No. 14069 429.00 - 430.00
430.92	431.20	Mottled and banded volcanic with green tremolite present
		with the mottled areas.
		S. No. 14070 430.92-431.00
431.20	441.42	Predominantly banded red volcanic with minor mottled
		intervals and calcite fracture fill. Magnetite is not
		as common.
		S. No. 14071 435.00-436.00
441.42	442.40	Mottled volcanic with brecciated calcite fracture fill.
		S. No. 14072 441.42 - 442.00
442.40	444.17	Banded more siliceous tuff, minor brecciation. Banding
		outlined by magnetite, irregular patches of tremolite.
		S/No. 14073 443.00-444.00

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
444.17	446.45	Brecciated volcanic. Irregular batches of green tremolite
		(chlorite). Minor calcite fracture fill.
		S.No. 14074 445.00 - 446.00
446.45	447.30	Mottled volcanic with irregular calcite, tremolite and
		minor magnetite
		S/No. 14075 446.47 - 447.00
447.30	451.60	Banded volcanic, banding outlined by magnetite. Minor
		brecciation.
		S.No. 14076 449.20 - 450.00
451.60	453.27	Mottled volcanic, more intense brecciation with calcite
		fracture fill.
		S.No. 14077 452.45 - 453.00
453.27	453.70	Orange-pink volcanic, intense brecciation, brecciation
		outlined by magnetite.
		S.No. 14078 453.27 - 453.70
453.70	454.35	Banded volcanic with brecciation and patchy magnetite
		present.
454.25	454.70	Orange-pink volcanic, intense brecciation, brecciation outlined
		by magnetite
454.70	456.25	Banded, banding outlined by magnetite, minor brecciation.
456.25	456.63	More siliceous banded volcanic.
456.63	462.23	Mottled volcanic, minor intervals of banding. More
		intense brecciation, with brecciation outlined by
		magnetite. Magnetite also appears patchy.
		Minor patches of sulphide.
		S.No. 14079 460.00 - 461.00 S.No. 14081 457.00-457.35
462.23	463.05	Remnant banding with minor brecciation, banding outlined
		by tremolite. Sharp decrease in magnetite
		S.No. 14080 462.50 - 463.00

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DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
463.05	467.40	Siliceouspink volcanic, minor presence of banding.
		No magnetite, amydules of calcite and irregular patchy
		green tremolite.
		S.No. 14082 465.00 - 466.00
462.40	469.40	Banded red volcanic, banding outlined by magnetite.
		Minor brecciation with irregular minor patches of sulphide.
		S.No. 14083 468.00 - 469.00
469.40	470.03	Intense brecciation, outlined by magnetite, minor intervals
		of dark banding. Patches of sulphide.
470.03	471.25	More siliceous dark banded tuff with intervals of minor
		brecciation. Increase in magnetite content but not visible ie. no high mag sus
		S.No. 14084 470.50 - 471.00
471.25	493.45	Intensely brecciated red volcanic with intervals of banding
		less than 10cm in length. The rock has a high content
		of magnetite. Magnetite generally outlines brecciation
		plus small veins of magnetite. Tremolite is present throughout
		as irregular vein structure with some veins up to 20cms
		ie 485.55 - 485.70.
		Minor calcite fracture fill is present throughout.
		Minor patchy aggregates of sulphide is present.
		S.No. 14085 480.00 - 481.00
493.45	494.93	Orange mottled volcanic with remnant banding. Calcite
		fracture fill present throughout with minor purple flourite.
		Minor banding is displayed by magnetite.
		S.No. 14086 493.50 - 494.00
494.93	497.78	Banded minor brecciation, banding outlined by magnetite
		Small patchy sulphide present associated with magnetite.
		S.No. 14087 495.30 - 496.00

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
497.78	502.40	Brecciated, white brecciated blocks outlined by magnetite,
		Magnetite is also present as patchy veins. Fracture fill
		calcite is also present.
		S.No. 14088 499.00 - 500.00
402.40	502.80	Banded with banding outlined by magnetite with magnetite
		also present as patchy aggregates.
502.80	504.10	Mottled volcanic with evidence of banding. Little or
		no magnetite present. Mottled appearance is given by
		intersticial calcite within the botryoidal fabric of the
		rock.
		S.No. 14089 503.50 - 504.00
504.10	508.45	Brecciated with minor magnetite outlining banding within
		brecciated blocks. Patchy irregular tremolite is present
		throughout.
		S.No. 14090 506.00 - 507.00
508.45	509.55	Banded volcanic with minor brecciation. Banding outlined
		by magnetite.
		S.No. 14091 508.50 - 509.00
509.55	510.26	Brecciated with interstitial calcite.
510.26	510.65	Ditto plus calcite fracture fill.
		S.No. 14092 510.26 - 510.60
510.65	519.82	Brecciated volcanic with magnetite outlining brecciated
		blocks. Interstitial calcite present. Random patches of
		sulphide present throughout.
		S.No. 14093 514.50 - 515.00
519.82	521.32	More siliceous banded volcanic, minor brecciation
		Banding outlined by darker bands. Patches of irregular
		vein like tremolite.
		S.No. 14094 520.50 - 521.00

DEPTH FROM	DEPTH TO	GEOLOGICAL LOG
521.32	524.50	More intensely brecciated. Magnetite is minor and outlines
		banding within brecciated blocks and as small patchy
		accumulations. Botryoidal texture is present and contains
		intenstitial magnetite, calcite and tremolite.
524.50	540.45	Intensely brecciated, magnetite common throughout as
		interstitial aggregates and outlining banding within
		brecciated blocks. Interstitial calcite is common with
		minor tremolite. Calcite is also present as fracture
		fill.
		S.No. 14095 531.00 - 532.00
540.45	542.69	Brecciated volcanic with large calcite fracture fill.
		Calcite fracture fill contain angular blocks of volcanic
		and minor flourite.Interstitial tremolite and magnetite
		is present along with patchy aggregates of magnetite.
		S.No. 14096 541.00 - 542.00
542.64	544.00	Siliceous brown-grey volcanic with fine fracture fill
		calcite.
		S.No. 14097 543.00 - 544.00
544.00	545.10	Banded with calcite fracture fill with small angular
		fragments of volcanic. Magnetite is present throughout
		as fine dissemination and outlining banding.
		S.No. 14098 544.00 - 545.00
545.10	549.12	Banded, half core siliceous tuff, the other mottled with
		interstitial calcite and tremolite with patchy interstitial
		magnetite and magnetite outlining banding.
		S.No. 14099 546.00 - 547.00
549.12	549.60	Mottled volcanic with large calcite fracture fill up
		to 1cm in diameter.

APPENDIX 3

GEOPHYSICAL MEASUREMENTS

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWMIA-1..... AREA .BILLEROO WEST.....

OPERATOR ...M. MOORE..... DATE .8/4/81.....

Sample Depth (m)	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
85	1	12	2	$\frac{12\times2}{1.26}$	19.0	687.77	414.5	2.52
90	1	6	2	$\frac{6\times2}{1.26}$	9.5	655.17	397.20	2.53
95	1	13	2	$\frac{13\times2}{1.26}$	20.6	355.50	217.04	2.56
100	1	14	2	$\frac{14\times2}{1.26}$	22.2	397.21	239.70	2.52
105	1	6	2	$\frac{6\times2}{1.26}$	9.5	948.39	600.80	2.72
110	1	7	2	$\frac{7\times2}{1.26}$	11.1	263.16	152.20	2.37
115	1	9	2	$\frac{9\times2}{1.26}$	14.2	923.47	589.60	2.76
120	1	8	2	$\frac{8\times2}{1.26}$	12.7	760.30	283.20	1.59
125	1	8	2	$\frac{8\times2}{1.26}$	12.7	1261.57	785.50	2.65
130	1	1	2	$\frac{1\times2}{1.26}$	1.6	1735.55	1095.30	2.71
135	1	2	2	$\frac{2\times2}{1.26}$	3.2	583.35	367.75	2.70
140	1	7	2	$\frac{7\times2}{1.26}$	11.1	630.08	397.70	2.71
145	1	0	2	$\frac{0\times2}{1.26}$	0	1632.27	1031.56	2.71
150	1	10	2	$\frac{10\times2}{1.26}$	15.9	476.00	301.42	2.73
155	1	12	2	$\frac{12\times2}{1.26}$	19.0	633.91	403.50	2.75
160	1	11	2	$\frac{11\times2}{1.26}$	17.4	380.89	242.90	2.76
165	1	6	2	$\frac{6\times2}{1.26}$	9.5	272.27	173.83	2.76
170	1	10	2	$\frac{10\times2}{1.26}$	15.9	223.17	142.35	2.76
175	1	10	2	$\frac{10\times2}{1.26}$	15.9	301.14	191.50	2.75
180	1	16	2	$\frac{16\times2}{1.26}$	25.4	501.10	319.67	2.76
185	1	19	2	$\frac{19\times2}{1.26}$	30.2	595.46	348.80	2.77
190	1	22	2	$\frac{22\times2}{1.26}$	34.9	492.35	314.50	2.76
195	1	13	2	$\frac{13\times2}{1.26}$	20.6	754.28	481.60	2.76
200	1	17	2	$\frac{17\times2}{1.26}$	27.0	444.47	284.05	2.77

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ..RWM1A-1..... AREA ...BIGGENDEN WEST.....

OPERATOR ...M. MOORE..... DATE ...8/4/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = $\frac{\text{S.I. meters} \times \text{Vol Cor}}{1.26}$	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
205	1	14	2	$\frac{14\times2}{1.26}$	22.2	262.80	167.25	2.75
210	1	21	2	$\frac{\times2}{1.26}$	33.3	607.86	389.75	2.78
215	1	16	2	$\frac{16\times2}{1.26}$	25.4	462.70	295.90	2.76
220	1	15	2	$\frac{15\times2}{1.26}$	23.8	364.81	232.20	2.76
225	1	10	2	$\frac{10\times2}{1.26}$	15.9	317.77	206.50	2.85
230	1	9	2	$\frac{9\times2}{1.26}$	14.2	559.80	359.34	1.80
235	1	12	2	$\frac{12\times2}{1.26}$	19.0	859.81	544.67	2.72
240	1	12	2	$\frac{12\times2}{1.26}$	19.0	518.51	328.78	2.73
245	1	5	2	$\frac{5\times2}{1.26}$	7.9	1579.56	972.01.	2.60
250	1	10	2	$\frac{10\times2}{1.26}$	15.9	786.69	490.97	2.65
252.60						172.28	108.69	2.70
255	1	14	2	$\frac{14\times2}{1.26}$	22.2	1002.50	637.90	2.75
260	1	13	2	$\frac{13\times2}{1.26}$	20.6	605.07	392.58	2.84
265	1	13	2	$\frac{13\times2}{1.26}$	20.6	511.08	327.55	2.78
270	1	15	2	$\frac{15\times2}{1.26}$	23.8	550.30	352.22	2.79
275	1	19	2	$\frac{14\times2}{1.26}$	22.2	414.98	265.35	2.78
280	1	15	2	$\frac{15\times2}{1.26}$	23.8	780.85	498.98	2.77
285	1	15	2	$\frac{15\times2}{1.26}$	23.8	468.09	298.68	2.76
286	1	15	2	$\frac{15\times2}{1.26}$	23.8	397.93	253.72	2.76
287	1	7	2	$\frac{7\times2}{1.28}$	11.1	335.29	211.83	2.72
288	1	13	2	$\frac{13\times2}{1.26}$	20.6	330.67	210.23	2.75
289	1	10	2	$\frac{10\times2}{1.26}$	15.9	537.35	342.70	2.76
290	1	14	2	$\frac{14\times2}{1.26}$	22.2	769.97	491.55	2.76
291	1	21	2	$\frac{21\times2}{1.26}$	33.3	752.90	492.12	2.89
292	1	21	2	$\frac{21\times2}{1.26}$	33.3	555.47	356.21	2.79

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWMIA-1.... AREA .....BILLEROO WEST....

OPERATOR ....M. MOORE..... DATE ..8/4/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
293	1	20	2	$\frac{20\times2}{1.26}$	31.7	335.88	215.21	2.78.
294	1	14	2	$\frac{14\times2}{1.26}$	22.2	570.17	263.61	1.86
295	1	17	2	$\frac{17\times2}{1.26}$	26.9	550.16	351.28	2.77
296	1	18	2	$\frac{18\times2}{1.26}$	28.5	559.52	355.10	2.78
297	1	14	2	$\frac{14\times2}{1.26}$	22.2	603.33	386.85	2.78
298	1	9	2	$\frac{9\times2}{1.26}$	14.2	785.36	496.89	2.72
299	1	5	2	$\frac{5\times2}{1.26}$	7.9	1041.71	706.56	3.10
300	1	5	2	$\frac{5\times2}{1.26}$	7.9	659.89	429.10	2.85
301	1	5	2	$\frac{5\times2}{1.26}$	7.9	742.26	471.72	2.74
302	1	5	2	$\frac{5\times2}{1.26}$	7.9	758.25	479.20	2.72
303	1	23	2	$\frac{23\times2}{1.26}$	36.5	1053.97	988.31	16.05?
304	1	22	2	$\frac{22\times2}{1.26}$	34.9	669.01	438.24	2.90
305	1	4	2	$\frac{4\times2}{1.26}$	6.3	1393.91	879.35	2.71
306	1	9	2	$\frac{9\times2}{1.26}$	14.2	758.20	479.56	2.71
307	1	10	2	$\frac{10\times2}{1.26}$	15.9	447.20	286.12	2.77
308	1	9	2	$\frac{9\times2}{1.26}$	14.2	438.62	279.88	2.76
309	1	8	2	$\frac{8\times2}{1.26}$	12.7	601.79	362.95	2.51
310	1	2	2	$\frac{2\times2}{1.26}$	3.2	1204.86	719.47	2.45
311	1	4	2	$\frac{4\times2}{1.26}$	6.3	1454.84	870.97	2.49
312	1	10	2	$\frac{10\times2}{1.26}$	15.9	512.45	317.18	2.62
313	1	10	2	$\frac{10\times2}{1.26}$	15.9	1311.18	827.25	2.71
314	1	11	2	$\frac{11\times2}{1.26}$	17.4	388.00	246.28	2.73
315	1	16	2	$\frac{16\times2}{1.26}$	25.3	372.69	238.40	2.77
316	1	14	2	$\frac{14\times2}{1.26}$	22.2	349.99	220.57	2.72
317	1	19	2	$\frac{19\times2}{1.26}$	30.2	770.49	493.25	2.78

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ... BMM14:1 ....

AREA .... BILLEROO WEST .....

OPERATOR ... M. MOORE .....

DATE .. 8/9/81 .....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter x table / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
318	1	14	2	$\frac{14\times2}{1.26}$	22.2	490.65	312.50	2.25
319	1	9	2	$\frac{9\times2}{1.26}$	14.2	505.19	321.32	2.75
320	1	10	2	$\frac{10\times2}{1.26}$	15.9	877.29	559.10	2.76
320.40						525.89	349.53	2.90
321	1	4	2	$\frac{4\times2}{1.26}$	6.3	908.60	259.23	2.74
322	1	2	2	$\frac{2\times2}{1.26}$	3.17	428.11	276.87	2.83
323	1	4	2	$\frac{4\times2}{1.26}$	6.3	446.70	282.91	2.73
324	1	5	2	$\frac{5\times2}{1.26}$	7.9	428.39	271.18	2.72
325	1	9	2	$\frac{9\times2}{1.26}$	14.2	499.96	317.79	2.74
326	1	11	2	$\frac{11\times2}{1.26}$	17.4	478.92	309.58	2.75
327	1	9	2	$\frac{9\times2}{1.26}$	14.2	425.49	301.35	2.73
328	1	19	2	$\frac{19\times2}{1.26}$	30.2	455.58	290.22	2.76
329	1	11	2	$\frac{11\times2}{1.26}$	17.4	350.25	222.15	2.73
330	1	10	2	$\frac{10\times2}{1.26}$	15.9	295.31	188.10	2.75
331	1	19	2	$\frac{19\times2}{1.26}$	30.2	489.23	312.05	2.76
332	1	10	2	$\frac{10\times2}{1.26}$	15.9	369.56	238.22	2.72
333	1	10	2	$\frac{10\times2}{1.26}$	15.9	632.06	392.22	2.70
334	1	10	2	$\frac{10\times2}{1.26}$	15.9	227.95	462.23	2.74
335	1	20	2	$\frac{20\times2}{1.26}$	31.7	1522.67	1008.79	2.79
336	1	10	2	$\frac{10\times2}{1.26}$	15.9	605.30	392.96	2.85
332	1	18	2	$\frac{18\times2}{1.26}$	28.5	962.71	603.54	2.68
338	1	22	2	$\frac{22\times2}{1.26}$	34.9	620.13	392.93	2.79
339	1	9	2	$\frac{9\times2}{1.26}$	14.2	1068.75	683.45	2.77
340	1	50	2	$\frac{50\times2}{1.26}$	79.4	649.40	436.25	2.97
341	1	10	2	$\frac{10\times2}{1.26}$	15.9	1585.28	1001.85	2.72

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ....RWMIA-1.... AREA .....RIVERNOO WEST...

OPERATOR .....M. MOORE..... DATE ..8/9/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading x10⁶	Volume Correction	Conversion cgs x10⁶ = S.I. meter reading / 1.26	True K (cgs x10⁶)	Mass Dry	Mass in Water	Specific Gravity
342	1	23	2	23x2/1.26	36.5	1610.72	1099.90	2.87
343	1	36	2	36x2/1.26	57.1	1438.05	936.57	2.87
344	1	42	2	42x2/1.26	66.7	1432.42	939.29	2.88
345	1	4	2	4x2/1.26	6.3	1283.46	805.51	2.69
346	1	1	2	1x2/1.26	1.6	349.88	220.99	2.70
347	1	4	2	4x2/1.26	6.3	676.53	428.36	2.73
348	1	2	2	2x2/1.26	3.2	613.63	387.98	2.72
349	1	1	2	1x2/1.26	1.6	535.89	338.59	2.72
350	1	2	2	2x2/1.26	3.2	1588.97	1005.38	2.73
351	1	2	2	2x2/1.26	3.2	343.96	217.91	2.72
352	1	0	2	0x2/1.26	-	1275.80	808.24	2.73
353	1	6	2	6x2/1.26	9.5	499.83	318.21	2.75
354	1	9	2	9x2/1.26	14.2	890.09	562.25	2.76
355	1	10	2	10x2/1.26	15.9	519.11	330.71	2.76
356	1	11	2	11x2/1.26	17.4	590.51	372.17	2.77
357	1	12	2	12x2/1.26	19.0	467.15	294.25	2.79
358	1	6	2	6x2/1.26	9.5	528.23	331.83	2.69
359	1	20	2	20x2/1.26	31.7	659.30	421.09	2.77
360	1	16	2	16x2/1.26	25.4	620.24	393.69	2.79
361	1	19	2	19x2/1.26	30.2	1188.14	752.21	2.73
362	1	17	2	17x2/1.26	27.0	1198.01	756.21	2.71
363	1	15	2	15x2/1.26	23.8	796.15	504.23	2.73
369	1	15	2	15x2/1.26	23.8	709.59	495.61	2.22
365	1	14	2	14x2/1.26	22.2	1103.62	675.30	2.58
366	1	9	2	9x2/1.26	14.2	701.19	403.03	2.35

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ..BWM1A:1.... AREA ....BIGLEROO..WEST....

OPERATOR ....M.MOORE..... DATE .....8/4/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter x Volcor / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
367	1	13	2	$\frac{13\times2}{1.26}$	20.6	782.82	493.39	2.70
368	1	15	2	$\frac{15\times2}{1.26}$	23.8	961.31	607.47	2.72
369	1	9	2	$\frac{9\times2}{1.26}$	14.3	1214.70	765.37	2.70
370	1	15	2	$\frac{15\times2}{1.26}$	23.8	1532.89	968.38	2.72
371	1	5	2	$\frac{5\times2}{1.26}$	7.9	822.70	520.19	2.72
372	1	9	2	$\frac{9\times2}{1.26}$	14.3	1052.96	664.74	2.71
373	1	8	2	$\frac{8\times2}{1.26}$	12.7	1499.10	949.37	2.70
374	1	16	2	$\frac{16\times2}{1.26}$	25.4	1625.51	1025.88	2.71
375	1	20	2	$\frac{20\times2}{1.26}$	31.7	400.95	252.86	2.71
376	1	11	2	$\frac{11\times2}{1.26}$	17.5	826.67	424.15	2.05
377	1	7	2	$\frac{7\times2}{1.26}$	11.1	880.85	556.01	2.71
378	1	10	2	$\frac{10\times2}{1.26}$	15.9	339.92	214.89	2.72
379	1	10	2	$\frac{10\times2}{1.26}$	15.9	408.74	257.69	2.71
380	1	11	2	$\frac{11\times2}{1.26}$	17.5	767.78	485.16	2.72
381	1	10	2	$\frac{10\times2}{1.26}$	15.9	349.27	220.75	2.72
382	1	10	2	$\frac{10\times2}{1.26}$	15.9	525.99	362.08	2.69
383	1	11	2	$\frac{11\times2}{1.26}$	17.5	1228.30	774.85	2.71
389	1	14	2	$\frac{14\times2}{1.26}$	22.2	1157.70	729.03	2.70
385	1	10	2	$\frac{10\times2}{1.26}$	15.9	472.38	297.42	2.70
386	1	7	2	$\frac{7\times2}{1.26}$	11.1	971.97	601.95	2.63
387	1	10	2	$\frac{10\times2}{1.26}$	15.9	730.36	457.17	2.67
388	1	15	2	$\frac{15\times2}{1.26}$	23.8	968.92	606.09	2.67
389	1	20	2	$\frac{20\times2}{1.26}$	31.7	584.05	367.18	2.69
390	1	26	2	$\frac{26\times2}{1.26}$	41.3	719.55	452.35	2.73
391	1	40	2	$\frac{40\times2}{1.26}$	63.5	306.96	243.89	4.92

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ....BWM1A-1.... AREA ....BIGGENDEN WEST....

OPERATOR ....M.MOORE.... DATE ....8/9/81....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
392	1	27	2	$\frac{27\times 2}{1.26}$	42.9	966.52	603.13	2.66
393	1	40	2	$\frac{40\times 2}{1.26}$	63.5	1109.56	702.39	2.73
394	4	20000	2	$\frac{20000\times 2}{1.26}$	31746.0	505.50	328.56	2.86
395	1	45	2	$\frac{45\times 2}{1.26}$	71.4	466.85	293.99	2.70
396	1	23	2	$\frac{23\times 2}{1.26}$	36.5	410.69	257.22	2.68
397	2	490	2	$\frac{490\times 2}{1.26}$	777.8	440.65	225.15	2.66
398	2	430	2	$\frac{430\times 2}{1.26}$	682.5	608.10	379.13	2.66
398.50						877.49	599.67	3.16
399	3	1700	2	$\frac{1700\times 2}{1.26}$	2698.4	1501.89	958.63	2.76
400	3	6700	2	$\frac{6700\times 2}{1.26}$	10634.9	695.32	403.99	2.67
401	3	2500	2	$\frac{2500\times 2}{1.26}$	3968.2	1097.87	656.30	2.68
402	3	1500	2	$\frac{1500\times 2}{1.26}$	2380.9	306.17	196.29	2.79
403	3	2500	2	$\frac{2500\times 2}{1.26}$	3968.3	424.23	267.56	2.71
404	3	6000	2	$\frac{6000\times 2}{1.26}$	9523.8	1403.99	897.03	2.77
405	2	800	2	$\frac{800\times 2}{1.26}$	1269.8	1317.86	823.15	2.69
406	3	6000	2	$\frac{600\times 2}{1.26}$	952.4	609.12	391.21	2.89
407	3	1600	2	$\frac{1600\times 2}{1.26}$	2539.7	530.93	334.65	2.71
408	3	2100	2	$\frac{2100\times 2}{1.26}$	3333.3	496.16	319.33	2.81
409	3	5600	2	$\frac{5600\times 2}{1.26}$	8888.8	677.20	428.99	2.73
410	3	4000	2	$\frac{4000\times 2}{1.26}$	6349.2	1390.99	877.33	2.71
411	3	1800	2	$\frac{1800\times 2}{1.26}$	2857.1	1090.50	653.88	2.69
412	2	660	2	$\frac{660\times 2}{1.26}$	1047.6	703.54	438.88	2.68
413	2	230	2	$\frac{230\times 2}{1.26}$	365.1	929.38	594.72	2.78
414	4	15000	2	$\frac{15000\times 2}{1.26}$	23809.5	637.17	409.93	2.80
415	4	15000	2	$\frac{15000\times 2}{1.26}$	23809.5	810.22	512.99	2.73

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWMIA:1.... AREA .... BILLEROO WEST .....

OPERATOR ...M.MOORE..... DATE ...8/9/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading Volume Correction / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
416	4	13000	2	$\frac{13000\times2}{1.26}$	20634.9	1789.91	1129.58	2.70
417	3	7100	2	$\frac{7100\times2}{1.26}$	11269.8	721.53	455.26	2.71
418	3	2900	2	$\frac{2900\times2}{1.26}$	4603.2	567.57	356.59	2.69
419	1	29	2	$\frac{29\times2}{1.26}$	46.0	1002.41	629.92	2.69
420	4	28000	2	$\frac{28000\times2}{1.26}$	44444.4	605.75	392.68	2.84
421	4	10000	2	$\frac{10000\times2}{1.26}$	15873.0	966.22	624.12	2.82
422	3	4600	2	$\frac{4600\times2}{1.26}$	7301.6	1319.82	835.85	2.75
423	4	32000	2	$\frac{32000\times2}{1.26}$	50793.6	1279.12	818.97	2.80
424	4	57000	2	$\frac{57000\times2}{1.26}$	90476.2	886.51	585.09	2.94
425	3	7500	2	$\frac{7500\times2}{1.26}$	11904.8	393.33	256.37	2.87
426	1	60	2	$\frac{60\times2}{1.26}$	95.2	427.87	270.25	2.71
427	2	320	2	$\frac{320\times2}{1.26}$	507.9	935.29	283.45	2.87
428	1	77	2	$\frac{77\times2}{1.26}$	122.2	751.96	476.67	2.73
429	2	530	2	$\frac{530\times2}{1.26}$	841.3	934.94	579.52	2.80
430	3	2200	2	$\frac{2200\times2}{1.26}$	3492.1	983.99	617.25	2.69
431	2	640	2	$\frac{640\times2}{1.26}$	1015.9	291.05	181.87	2.67
432	2	820	2	$\frac{820\times2}{1.26}$	1301.6			
433	1	25	2	$\frac{25\times2}{1.26}$	39.7	735.49	463.27	2.70
434	1	62	2	$\frac{62\times2}{1.26}$	98.4	441.65	278.18	2.70
435	1	74	2	$\frac{74\times2}{1.26}$	117.5	781.37	493.70	2.72
436	2	200	2	$\frac{200\times2}{1.26}$	317.5	1416.23	886.70	2.67
437	1	90	2	$\frac{90\times2}{1.26}$	142.9	379.77	239.12	2.70
438	1	72	2	$\frac{72\times2}{1.26}$	114.3	865.49	547.75	2.72
439	1	35	2	$\frac{35\times2}{1.26}$	55.6	335.09	210.38	2.69
440	3	1200	2	$\frac{1200\times2}{1.26}$	1904.8	871.76	545.21	2.67

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWMIA-1... AREA ...BILLENOO WEST.....

OPERATOR ....M. MOORE..... DATE ...8/8/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
441	3	8100	2	$\frac{8100 \times 2}{1.26}$	12857.1	1277.99	809.43	2.73
442	3	6500	2	$\frac{6500 \times 2}{1.26}$	10317.5	1156.79	736.95	2.75
443	3	9800	2	$\frac{9800 \times 2}{1.26}$	15555.6	621.78	388.26	2.66
444	3	6600	2	$\frac{6600 \times 2}{1.26}$	10476.2	1594.89	972.26	2.56
445	4	15000	2	$\frac{15000 \times 2}{1.26}$	23809.5	1097.88	687.38	2.67
446	3	8200	2	$\frac{8200 \times 2}{1.26}$	13015.9	812.55	511.86	2.70
447	3	3700	2	$\frac{3700 \times 2}{1.26}$	5873.0	908.63	569.25	2.68
448	4	30000	2	$\frac{30000 \times 2}{1.26}$	47619.0	449.97	286.35	2.75
449	4	9000	2	$\frac{9000 \times 2}{1.26}$	14285.7	551.47	349.44	2.73
450	4	21000	2	$\frac{21000 \times 2}{1.26}$	33333.3	1073.18	693.68	2.83
451								
452	2	820	2	$\frac{820 \times 2}{1.26}$	1301.6	928.56	594.73	2.78
453								
454	2	300	2	$\frac{300 \times 2}{1.26}$	476.2	903.19	577.37	2.77
455	4	37000	2	$\frac{37000 \times 2}{1.26}$	29365.1	595.52	382.48	2.80
456	4	40000	2	$\frac{40000 \times 2}{1.26}$	63492.1	393.98	257.86	2.89
457	4	30000	2	$\frac{30000 \times 2}{1.26}$	47619.0	494.56	389.19	4.67
458	3	9500	2	$\frac{9500 \times 2}{1.26}$	7539.7	375.38	235.45	2.68
459	4	40000	2	$\frac{40000 \times 2}{1.26}$	63492.1	715.81	469.62	2.91
460	4	25000	2	$\frac{25000 \times 2}{1.26}$	39682.5	1692.00	1089.79	2.81
461	3	7600	2	$\frac{7600 \times 2}{1.26}$	12063.5	1169.38	337.35	1.41
462	4	10000	2	$\frac{10 \times 2}{1.26}$	15873.0	289.50	183.12	2.72
463	1	66	2	$\frac{66 \times 2}{1.26}$	104.8	358.77	224.14	2.66
464	1	60	2	$\frac{60 \times 2}{1.26}$	95.2	431.00	263.25	2.58
465	1	39	2	$\frac{39 \times 2}{1.26}$	61.9	594.53	365.84	2.60

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWMIA-1.... AREA ..BICLETOO WEST.....

OPERATOR ...M.MOORE..... DATE ...8/9/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
466	1	25	2	$\frac{25\times2}{1.26}$	39.7	805.48	490.35	2.61
467	1	57	2	$\frac{57\times2}{1.26}$	90.5	574.39	359.13	2.61
468	4	30000	2	$\frac{30000\times2}{1.26}$	47619.0	1238.34	806.78	2.87
469	4	48000	2	$\frac{48000\times2}{1.26}$	76190.4	1164.04	750.28	2.81
470	4	22000	2	$\frac{22000\times2}{1.26}$	34920.6	516.13	329.93	2.70
471	4	15000	2	$\frac{15000\times2}{1.26}$	23809.5	648.84	411.35	2.73
472	3	1600	2	$\frac{1600\times2}{1.26}$	2539.7	596.83	374.63	2.69
473	4	20000	2	$\frac{20000\times2}{1.26}$	31746.0	1350.99	989.22	2.76
474	4	10000	2	$\frac{10000\times2}{1.26}$	15873.0	1038.24	680.27	2.71
475	4	16000	2	$\frac{16000\times2}{1.26}$	25396.8	1594.95	1016.43	2.76
476	3	5400	2	$\frac{5400\times2}{1.26}$	8571.4	988.88	624.46	2.71
477	4	37000	2	$\frac{37000\times2}{1.26}$	58730.2	939.00	609.43	2.85
478	4	25000	2	$\frac{25000\times2}{1.26}$	34682.5	1813.77	1159.23	2.75
479	3	3400	2	$\frac{3400\times2}{1.26}$	5396.8	1347.92	462.17	1.52
480	3	3000	2	$\frac{3000\times2}{1.26}$	4761.9	998.06	634.77	2.75
481	4	19000	2	$\frac{19000\times2}{1.26}$	15079.3	825.21	556.79	2.75
482	4	21000	2	$\frac{21000\times2}{1.25}$	33333.3	1796.86	1148.59	2.77
483	4	46000	2	$\frac{46000\times2}{1.26}$	73015.9	662.62	429.86	2.85
484	4	35000	2	$\frac{35000\times2}{1.26}$	55555.6	380.89	245.37	2.71
485	4	67000	2	$\frac{67000\times2}{1.26}$	106349.2	1095.02	731.73	3.01
486	4	56000	2	$\frac{56000\times2}{1.26}$	88888.9	1092.43	707.25	2.89
487	4	30000	2	$\frac{30000\times2}{1.26}$	47619.0	817.53	541.18	2.96
488	2	120	2	$\frac{120\times2}{1.26}$	190.5	770.15	487.23	2.72
489	4	10000	2	$\frac{10000\times2}{1.26}$	15873.0	1565.29	1016.20	2.85
490	4	15000	2	$\frac{15000\times2}{1.26}$	23809.5	1565.61	995.47	2.75

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...RWM1A-1.... AREA ...BIGGENDEN WEST.....

OPERATOR ...M.MOORE..... DATE ..8/9/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
491	4	21000	2	$\frac{21000\times 2}{1.26}$	33333.3	1147.98	736.52	2.79
492	4	11000	2	$\frac{11000\times 2}{1.26}$	17460.3	1859.98	1090.53	2.42
493	4	39000	2	$\frac{39000\times 2}{1.26}$	61904.8	767.96	500.53	2.87
494	3	1000	2	$\frac{1000\times 2}{1.26}$	1587.3	1201.89	749.93	2.66
495	2	290	2	$\frac{290\times 2}{1.26}$	460.3	490.17	309.45	2.64
496	3	1900	2	$\frac{1900\times 2}{1.26}$	3015.9	982.89	617.29	2.69
497	1	60	BQ. 2.1	$\frac{60\times 2.1}{1.26}$	100	759.79	485.18	2.76
498	1	52	2.1	$\frac{52\times 2.1}{1.26}$	86.6	659.50	425.95	2.82
499	1	34	2.1	$\frac{34\times 2.1}{1.26}$	56.6	313.71	195.85	2.66
500	1	36	2.1	$\frac{36\times 2.1}{1.26}$	59.9	928.91	583.30	2.68
501	2	480	2.1	$\frac{440\times 2.1}{1.26}$	799.9	894.91	433.82	2.05
502	2	330	2.1	$\frac{330\times 2.1}{1.26}$	549.9	932.15	585.46	2.68
503	1	21	2.1	$\frac{21\times 2.1}{1.26}$	34.9	601.99	377.69	2.68
504	1	49	2.1	$\frac{49\times 2.1}{1.26}$	81.6	497.51	316.55	2.74
505	2	830	2.1	$\frac{830\times 2.1}{1.26}$	138.3	681.23	430.90	2.72
506	1	57	2.1	$\frac{57\times 2.1}{1.26}$	94.9	910.62	458.21	2.01
507	2	160	2.1	$\frac{160\times 2.1}{1.26}$	266.6	404.76	252.10	2.65
508	3	1900	2.1	$\frac{1900\times 2.1}{1.26}$	316.6	780.81	499.26	2.77
509	4	15000	2.1	$\frac{15000\times 2.1}{1.26}$	24999.9	637.03	412.81	2.84
510	1	54	2.1	$\frac{54\times 2.1}{1.26}$	89.9	659.43	420.15	2.75
511	1	42	2.1	$\frac{42\times 2.1}{1.26}$	69.9	803.85	504.91	2.68
512	1	46	2.1	$\frac{46\times 2.1}{1.26}$	76.6	341.83	211.84	2.63
513	1	71	2.1	$\frac{74\times 2.1}{1.26}$	123.3	888.75	556.13	2.67
514	3	1500	2.1	$\frac{1500\times 2.1}{1.26}$	2499.9	729.12	468.99	2.80
515	1	63	21	$\frac{63\times 2.1}{1.26}$	104.9	295.62	156.83	2.76

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWM1A-1..... AREA ...BIGLEROO WEST.....

OPERATOR ...M.MOORE..... DATE ...20/5/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
516	1	60	2.1	$\frac{60\times2.1}{1.26}$	99.9	457.41	291.03	2.75
517	1	67	2.1	$\frac{67\times2.1}{1.26}$	111.6	826.42	525.56	2.75
518	1	61	2.1	$\frac{61\times2.1}{1.26}$	101.6	683.00	371.36	2.19
519	1	75	2.1	$\frac{75\times2.1}{1.26}$	124.9	878.33	552.20	2.69
520	1	30	2.1	$\frac{30\times2.1}{1.26}$	49.9	484.95	302.73	2.66
521	1	73	2.1	$\frac{73\times2.1}{1.26}$	121.1	664.38	415.77	2.67
522	1	38	2.1	$\frac{38\times2.1}{1.26}$	63.1	385.41	240.85	2.67
523	1	20	2.1	$\frac{20\times2.1}{1.26}$	33.2	668.19	331.21	1.92
524	2	200	2.1	$\frac{200\times2.1}{1.26}$	332	474.35	301.83	2.75
525	3	3000	2.1	$\frac{3000\times2.1}{1.26}$	4980	706.72	457.36	2.83
526	3	2500	2.1	$\frac{2500\times2.1}{1.26}$	4150	877.58	565.07	2.81
527	3	2700	2.1	$\frac{2700\times2.1}{1.26}$	4482	1037.78	665.13	2.78
528	3	1100	2.1	$\frac{1100\times2.1}{1.26}$	1826	1078.61	690.85	2.78
529	3	1100	2.1	$\frac{1100\times2.1}{1.26}$	1826	479.53	301.97	2.70
530	3	1500	2.1	$\frac{1500\times2.1}{1.26}$	2490	681.15	432.93	2.74
531	2	560	2.1	$\frac{560\times2.1}{1.26}$	929.6	668.06	425.69	2.75
532	3	1300	2.1	$\frac{1300\times2.1}{1.26}$	2159	973.52	612.93	2.70
533	2	440	2.1	$\frac{440\times2.1}{1.26}$	730.4	618.16	392.67	2.74
534	3	1500	2.1	$\frac{1500\times2.1}{1.26}$	2490	606.82	361.55	2.48
535	2	800	2.1	$\frac{800\times2.1}{1.26}$	1328	600.70	352.85	2.42
536	1	72	2.1	$\frac{72\times2.1}{1.26}$	119.5	882.15	557.99	2.72
537	2	190	2.1	$\frac{190\times2.1}{1.26}$	315.4	585.46	370.61	2.72
538	2	370	2.1	$\frac{370\times2.1}{1.26}$	6142	631.57	397.96	2.70
539	2	450	2.1	$\frac{450\times2.1}{1.26}$	747	453.94	286.18	2.70
540	3	2600	2.1	$\frac{2600\times2.1}{1.26}$	4316	246.31	154.29	2.68

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...RWMIA-1.... AREA ...BIGGE100..WEST.....

OPERATOR ....M.MOORE..... DATE ..29/5/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading $\times 10^6$	Volume Correction	Conversion cgs $\times 10^6$ = S.I. meter reading $\times$ Vol Cor / 1.26	True K (cgs $\times 10^6$)	Mass Dry	Mass in Water	Specific Gravity
541	2	480	2.1	$\frac{480 \times 2.1}{1.26}$	796.8	812.96	423.62	2.09
542	2	250	2.1	$\frac{250 \times 2.1}{1.26}$	415	400.86	251.47	2.68
543	1	95	2.1	$\frac{95 \times 2.1}{1.26}$	747	421.43	261.46	2.63
544	1	84	2.1	$\frac{84 \times 2.1}{1.26}$	139.9	393.36	214.26	2.66
545	1	60	2.1	$\frac{60 \times 2.1}{1.26}$	99.6	357.09	230.25	2.82
546	1	64	2.1	$\frac{64 \times 2.1}{1.26}$	106.2	486.32	309.48	2.75
547	1	70	2.1	$\frac{70 \times 2.1}{1.26}$	116.2	575.28	369.89	2.80
548	1	67	2.1	$\frac{67 \times 2.1}{1.26}$	111.2	435.28	279.81	2.80
549	3	1500	2.1	$\frac{1500 \times 2.1}{1.26}$	2490	351.53	220.88	2.69
550	1	72	2.1	$\frac{72 \times 2.1}{1.26}$	119.5	340.60	217.19	2.76
551	1	60	2.1	$\frac{60 \times 2.1}{1.26}$	99.6	277.90	180.73	2.86
552	3	2800	2.1	$\frac{2800 \times 2.1}{1.26}$	4648	346.52	219.73	2.73
553	1	62	2.1	$\frac{62 \times 2.1}{1.26}$	102.92	712.84	455.56	2.77
554	1	60	2.1	$\frac{60 \times 2.1}{1.26}$	946	797.90	513.36	2.80
555	1	60	2.1	$\frac{60 \times 2.1}{1.26}$	99.6	826.87	543.86	2.92
556	1	82	2.1	$\frac{82 \times 2.1}{1.26}$	136.12	593.73	375.15	2.72
557	1	56	2.1	$\frac{56 \times 2.1}{1.26}$	92.9	498.73	328.24	2.93
558	1	63	2.1	$\frac{63 \times 2.1}{1.26}$	104.5	538.25	345.08	2.79
559	1	62	2.1	$\frac{62 \times 2.1}{1.26}$	102.9	589.63	380.34	2.50
560	1	56	2.1	$\frac{56 \times 2.1}{1.26}$	92.9	540.57	353.73	2.89
561	3	2500	2.1	$\frac{2500 \times 2.1}{1.26}$	4150	724.47	49729	2.79
562	1	60	2.1	$\frac{60 \times 2.1}{1.26}$	99.6	673.90	436.88	2.89
563	1	72	2.1	$\frac{72 \times 2.1}{1.26}$	119.52	932.01	473.54	2.03
564	1	98	2.1	$\frac{98 \times 2.1}{1.26}$	162.7	611.35	385.72	2.71
565	1	31	2.1	$\frac{31 \times 2.1}{1.26}$	51.5	286.82	180.10	2.69

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ....RWH1A-1.... AREA ..BILLEROO WEST.....

OPERATOR ....M. MOORE..... DATE ..20/5/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading x10⁶	Volume Correction	Conversion cgs x10⁶ = S.I. meter reading / 1.26	True K (cgs x10⁶)	Mass Dry	Mass in Water	Specific Gravity
566	1	71	2.1	71x2.1 / 1.26	117.8	501.93	318.78	2.74
567	1	66	2.1	66x2.1 / 1.26	109.5	451.42	290.49	2.81
568	1	67	2.1	67x2.1 / 1.26	111.2	486.06	313.18	2.81
569	3	1100	2.1	1100x2.1 / 1.26	1826	731.16	552.31	4.21
570	1	90	2.1	90x2.1 / 1.26	149.4	931.59	464.91	2.01
571	1	80	2.1	80x2.1 / 1.26	132.8	306.28	193.91	2.73
572	1	96	2.1	96x2.1 / 1.26	159.4	401.92	249.85	2.56
573	2	440	2.1	440x2.1 / 1.26	730.4	847.09	523.67	2.62
574	3	1500	2.1	1500x2.1 / 1.26	2490	492.25	306.70	2.65
575	3	2200	2.1	2200x2.1 / 1.26	3652	330.96	206.85	2.67
576	1	94	2.1	94x2.1 / 1.26	156.0	269.39	169.39	2.69
577	2	270	2.1	270x2.1 / 1.26	448.2	261.18	161.21	2.61
578	3	3000	2.1	3000x2.1 / 1.26	4980	383.99	239.53	2.66
579	2	830	2.1	830x2.1 / 1.26	13778	492.79	306.11	2.64
580	1	78	2.1	78x2.1 / 1.26	129.5	368.99	229.08	2.64
581	1	77	2.1	77x2.1 / 1.26	127.8	602.95	382.34	2.73
582	1	70	2.1	70x2.1 / 1.26	116.2	514.64	328.78	2.77
583	1	64	2.1	64x2.1 / 1.26	106.2	289.41	183.17	2.81
584	3	1100	2.1	1100x2.1 / 1.26	1826	320.09	210.99	2.93
585	1	95	2.1	95x2.1 / 1.26	1577	478.87	297.14	2.69
586	3	3200	2.1	3200x2.1 / 1.26	5312	669.05	523.45	4.60
587	1	82	2.1	82x2.1 / 1.26	136.1	315.49	199.17	2.71
588	1	80	2.1	80x2.1 / 1.26	132.8	617.40	385.70	2.66
589	1	89	2.1	89x2.1 / 1.26	147.7	590.31	371.56	2.70
590	1	81	2.1	81x2.1 / 1.26	134.9	686.27	435.40	2.74

MAGNETIC SUSCEPTIBILITY AND S.G.

BORE NO. ...BWM1A-1..... AREA ...BIGGERA WEST...

OPERATOR ....M. MOORE..... DATE ...20/5/81.....

Sample Depth	Range 1: 0-100 2: 0-1000 3: 0-10000 4: 0-100000	K (S.I. Units) meter reading x10⁶	Volume Correction	Conversion cgs x10⁶ = S.I. meter reading / 1.26	True K (cgs x10⁶)	Mass Dry	Mass in Water	Specific Gravity
591	1	64	2.1	64x2.1 / 1.26	106.2	502.15	326.86	2.86
592	2	200	2.1	200x2.1 / 1.26	332	960.51	620.65	2.83
593	1	80	2.1	80x2.1 / 1.26	132.8	453.22	286.33	2.72
594	1	80	2.1	80x2.1 / 1.26	132.8	906.39	256.50	2.71
595	3	2300	2.1	2300x2.1 / 1.26	3818	372.78	233.02	2.56
596	1	73	2.1	73x2.1 / 1.26	121.1	568.08	361.30	2.75
597	1	64	2.1	64x2.1 / 1.26	106.2	763.92	497.41	2.87
598	1	67	2.1	67x2.1 / 1.26	111.2	699.23	445.17	2.75
599	3	1100	2.1	1100x2.1 / 1.26	1826	340.21	211.76	2.65
600	1	65	2.1	65x2.1 / 1.26	107.9	784.85	506.53	2.82

APPENDIX 4

ANALYTICAL DATA

STRATIGRAPHY	LITHOLOGY	FROM METRES	TO METRES	SAMPLE NO.	Cu	Pb	Zn	Co	U	Mo	Sn	W	Ce	Nb	Y	Zr	Au	%F	%Fe	%Ti	%Na	%K	%Si	%Al
Oraparina	Shale	123.00	124.00	14111	6	<4	22	10	4	<4	6	<10												
Shale	Shale	126.00	127.00	14112	20	24	100	10	<4	4	<4	<10												
Wilkawallina Lst.	Limestone	134.00	135.00	14113	<4	6	16	<4	<4	<4	<4	<10												
Brachina	Shale	163.00	164.00	14114	55	65	55	14	<4	4	4	10												
Formation	Shale	200.00	201.00	14115	4	12	38	12	<4	4	4	<10												
Nuccaleena Fm.	Limestone	227.00	228.50	14116	190	570	380	14	<4	4	<4	<10												
Elatina	Siltstone	239.00	240.00	14117	<4	4	50	8	<4	<4	4	<10												
Formation	Sandstone	247.00	248.00	14118	1250	6	75	8	<4	10	<4	<10												
Amb/Ang. Fm.	Siltstone	280.00	281.00	14119	6	<4	28	8	4	<4	6	<10												
Etina	Siltstone	331.00	332.00	14120	55	540	1000	4	<4	4	<4	10												
Formation	Siltstone	359.00	360.00	14121	75	<4	22	6	4	<4	4	10												
Willochra Sub.Gp.	Siltstone	370.00	371.00	14112	<4	6	18	6	<4	4	4	10												
		391.42	391.98	14051	130	28	22	8	6	4	18	<10												
		392.32	393.00	14052	320	50	20	14	<4	6	16	10					<0.05	0.01						
		393.00	394.00	14053	38	<4	24	12	6	<4	20	<10					0.05	0.03						
		394.30	395.00	14054	125	34	26	12	4	6	8	<10					0.05	0.03						
		395.50	396.00	14055	340	130	18	20	<4	8	18	<10					0.05	0.02						
		396.85	397.00	14056	48	8	26	20	4	6	14	15					<0.05	0.03						
		397.00	398.00	14057	95	4	16	16	<4	4	6	<10												
		398.20	399.00	14058	75	60	26	10	4	4	16	15					<0.05	0.08						
Benagerie	Trachyte &	399.00	400.00	14059	150	4	16	4	10	8	20	<10												
Volcanics	Rhyolite	400.00	401.00	14060	75	18	100	12	4	6	18	<10												
		405.30	406.00	14061	400	105	65	16	<4	12	10	<10												
		406.00	406.30	14062	340	65	170	18	<4	12	12	10					<0.05	0.42						
		410.00	411.00	14063	28	<4	14	<4	8	8	16	10					<0.05	0.06						
		417.65	418.00	14064	180	38	40	6	6	8	36	<10												
		419.50	420.00	14065	28	<4	28	6	<4	4	42	<10												
		424.00	425.00	14066	10	<4	16	<4	<4	4	26	<10												
		427.20	428.00	14067	14	<4	14	<4	<4	<4	16	<10												
		428.00	429.00	14068	40	<4	18	<4	-4	4	18	<10												
		429.00	430.00	14069	160	14	28	12	4	<4	24	15												
		430.92	431.00	14070	34	<4	16	4	<4	6	24	<10												
		435.00	436.00	14071	20	<4	26	<4	<4	<4	22	<10												

ANOMALOUS VALUES

42 > $\bar{X}+2\sigma$, anomalous

30 > $\bar{X}+\sigma$, weakly anomalous

STRATIGRAPHY	LITHOLOGY	FROM METRES	TO METRES	SAMPLE NO.	Cu	Pb	Zn	Co	U	Mo	Sn	W	Ce	Nb	Y	Zr	Au	F	%Fe	%Ti	%Na	%K	%Si	%Al
		441.42	442.00	14072	46	4	36	<4	4	8	20	<10												
		443.00	444.00	14073	26	<4	50	6	4	8	48	<10												
		445.00	446.00	14074	22	<4	95	8	6	4	24	<10												
		446.57	447.00	14075	16	<4	55	4	<4	4	28	<10												
		449.20	450.00	14076	24	<4	55	6	<4	6	24	<10												
		452.45	453.00	14077	<4	14	40	6	4	<4	26	15												
		453.27	453.70	14078	36	8	38	4	6	4	28	<10												
		460.00	461.00	14079	12	<4	30	6	<4	4	14	10												
		462.50	463.00	14080	14	<4	80	8	6	4	20	<10												
		457.00	457.35	14081	42	28	48	20	4	<4	30	10												
		465.00	466.00	14082	4	14	14	4	6	8	12	<10	20	16	14	145			0.89	0.33	2.82	6.70	27.8	8.47
		468.00	469.00	14083	16	<4	24	6	<4	6	8	<10	30	14	10	135			11.5	0.29	2.50	4,91	24.1	6.83
		470.50	471.00	14084	120	<4	12	8	6	4	14	<10												
		480.00	481.00	14085	26	<4	55	8	<4	4	16	<10												
		493.50	494.00	14086	90	24	10	18	6	6	22	<10					<0.05	0.09						
		495.30	496.00	14087	44	6	8	4	4	4	16	<10												
		499.00	500.00	14088	4	<4	8	8	4	4	16	<10												
Benagerie Volcanics	Trachyte & Rhyolite	503.50	504.00	14089	<4	70	16	10	<4	<4	14	20												
		506.00	507.00	14090	<4	8	55	10	4	<4	24	<10												
		508.50	509.00	14091	36	40	44	6	4	4	26	<10												
		510.26	510.60	14092	50	350	90	6	<4	6	22	10												
		514.50	515.00	14093	100	55	46	12	6	6	16	<10												
		520.50	521.00	14094	<4	<4	42	4	4	4	10	<10												
		531.00	532.00	14095	10	<4	20	4	6	<4	24	<10												
		541.00	542.00	14096	65	<4	22	4	6	4	12	<10					<0.05	0.43						
		543.00	544.00	14097	8	10	32	6	4	6	12	<10												
		544.00	545.00	14098	18	<4	14	4	<4	6	28	10												
		546.00	547.00	14099	14	6	28	8	<4	<4	26	<10												
		553.00	554.00	14100	22	34	24	12	8	<4	38	<10												
		557.00	558.00	14101	24	90	48	8	4	6	32	10												
		559.20	559.80	14102	8	14	85	8	4	<4	10	<10	70	18	26	150			3.01	0.41	3.54	5.41	27.2	8.84
		566.00	567.00	14103	8	<4	22	4	<4	6	22	<10							7.38	0.30	2.84	5.45	25.7	7.36
		575.00	576.00	14104	<4	<4	65	12	6	<4	4	<10	50	22	20	135			3.73	0.44	1.21	8.44	25.9	9.42
		579.00	580.00	14105	4	8	75	12	4	<4	12	10	120	14	20	125			3.76	0.34	2.79	5.95	26.9	8.57
		583.00	584.00	14106	32	22	36	4	<4	6	24	<10												
		587.00	588.00	14107	<4	<4	60	6	<4	4	24	<10												
		591.00	592.00	14108	8	8	40	4	6	<4	32	10												
		593.00	594.00	14109	4	<4	50	4	<4	<4	12	<10												
		597.00	598.00	14110	10	<4	32	4	6	4	65	15												

METHOD OF ANALYSIS	AAS1	XPF1	XRF1	AAS5A	SIE2/3	ICP H5

APPENDIX 5

PETROLOGICAL REPORT

Central Mineralogical Services

39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. J.L. Curtis
Senior Project Geologist
Mines Administration Pty. Ltd.
P.O. Box 261
GLENSIDE / S.A. 5065

22nd April, 1981

REPORT CMS 81/3/43

YOUR REFERENCE:	Verbal request
DATE RECEIVED:	24th March, 1981
SAMPLE NOS.:	14902 - 14907
SUBMITTED BY:	J.L. Curtis
WORK REQUESTED:	Petrology

H.W. Fander, M. Sc.

REPORT CMS 81/3/43

D.D. Core Samples 14902 - 14907

At the request of Mr. J.L. Curtis, core samples were selected (at the SADME Core Library) for petrographic study, and the results are reported below. Tbin-sections (and one polished section) were prepared, and the sawn cores were subjected to potash stain tests, which yielded particularly helpful results.

Petrology, Mineralogy

The rocks are quite similar and are clearly closely related, and can thus be described as a group.

They consist of a series of sodic and potassic volcanics, ranging from trachytes to rhyolites, and showing complex interrelationships; in some intersections, there are clearly-defined alternating sodic and potassic bands - probably representing individual flows. In others, one rock type has intruded the other, probably prior to consolidation; others contain xenoliths of one type in the other. There are scoriaceous/vesicular structures, lava breccias and quite probably tuffaceous varieites, i.e. a complete series from coarse and fine pyroclastics to lava flows and perhaps shallow intrusives.

The rocks are non-porphyritic and are thoroughly crystallized, implying that they were originally largely glassy or felsitic. Flow-banding is surprisingly rare (or poorly preserved), which is unusual; however, the "bedded" magnetite-rich rocks probably owe their present fabric to inherited flow-banding.

Apart from dominant Na/K feldspars, quartz is the only significant primary component, but apatite is a relatively conspicuous accessory. So-called "magmatic reddening", caused by pervasive ultrafine hematite pigmentation, is ubiquitous.

Introduced minerals in-clude patches of sideritic carbonate, sporadic tremolite, fine euhedral magnetite, and various types of veins; these comprise carbonate-fluorite, carbonate-sulphides. The tremolite (largely replaced by carbonate) must be regarded as a metasomatic mineral and occurs in 14905.

Sulphides (especially in 14903) are mainly pyrite with intergrown marcasite (showing relict colloform-banded textures) and associated traces of galena and chalcopyrite.

The magnetite is clearly post-crystallization, i.e.introduced, probably pre-dating quartz/carbonate/fluorite/sulphide veins, perhaps a late magmatic/deuteric phenomenon.

Thus, the history of these volcanics is quite complex, more so than that of the Gawler Range Volcanics, though there are many similarities with that group.

H.W. Fander, M. Sc.

REPORT ON A MAGNETIC FIELD AND GRAVITATION FIELD SURVEY, LAKE FROME, S.A.

for

MINES ADMINISTRATION PTY. LIMITED

from

GEOEX PTY. LTD.

6131

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8.	GENERAL CONCLUSIONS	8

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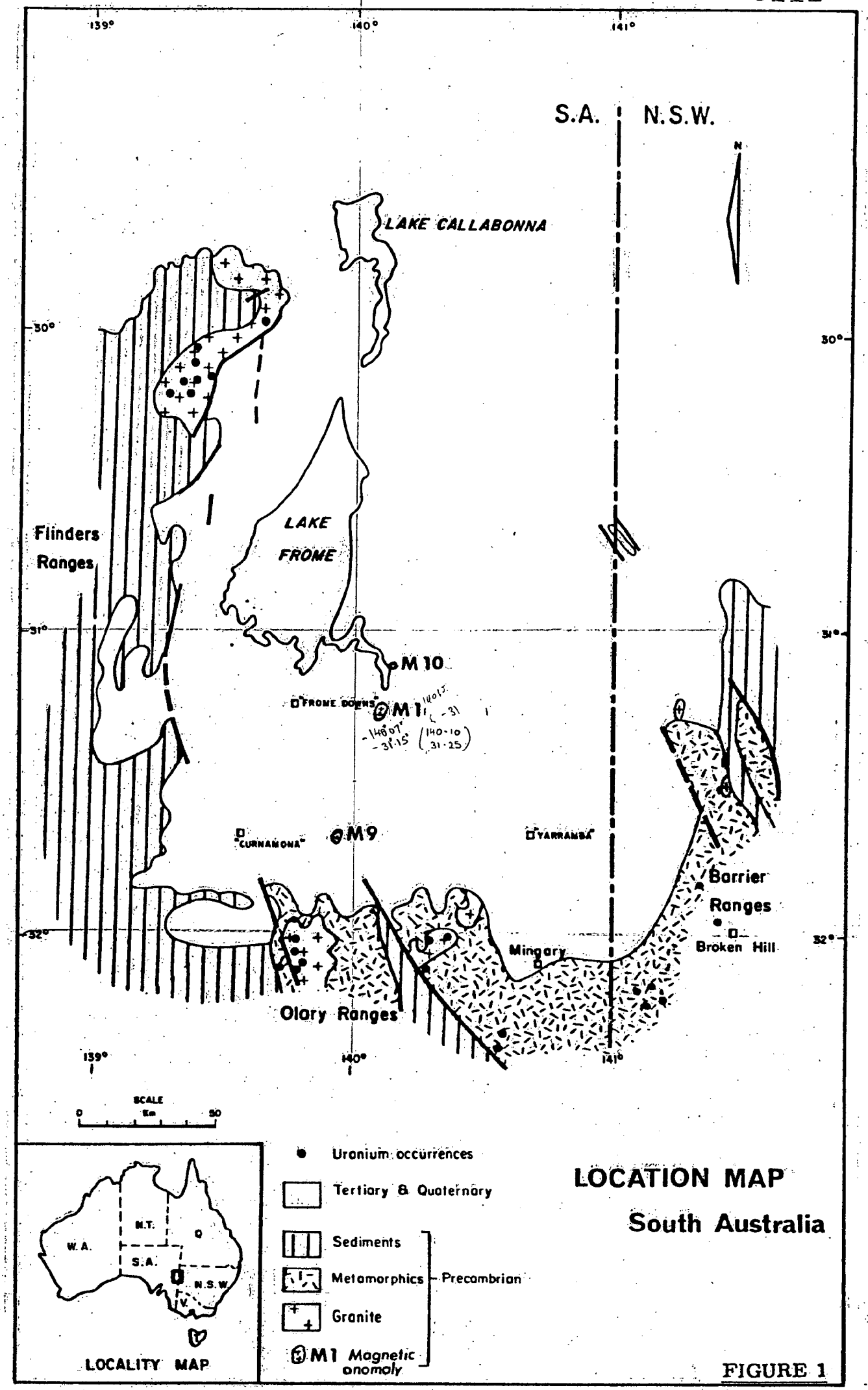
2. DRIFT CORRECTION PROCEDURE

APPENDIX

TABULATION OF GRAVITY SURVEY RESULTS

ACCOMPANYING CONTOUR MAPS

		In Map Pocket
Sheet 1.	Anomaly M1 - Total Magnetic Intensity.	
Sheet 2.	Anomaly M1 - Bouguer Gravity Anomaly	
Sheet 7.	Anomaly M9 - Total Magnetic Intensity	
Sheet 8.	Anomaly M9 - Bouguer Gravity Anomaly	
Sheet 9.	Anomaly M10 - Total Magnetic Intensity	
Sheet 10.	Anomaly M10 - Bouguer Gravity Anomaly.	


139°
140°
141°
S.A.
N.S.W.
N
LAKE CALLABONNA
30°
Flinders Ranges
LAKE FROME
31°
M 10
FROME DOWNS
M 1
"CURNAMONA"
M 9
YARRAMBA
Barrier Ranges
Broken Hill
32°
Mingary
Olary Ranges
SCALE
0
50
Km
W.A.
N.T.
Q
S.A.
N.S.W.
V.
LOCALITY MAP
Uranium occurrences
Tertiary & Quaternary
Sediments
Metamorphics
Granite
Precambrian
M1 Magnetic anomaly
LOCATION MAP
South Australia
FIGURE 1

1. INTRODUCTION

During the period from August 18th to October 25th, 1979, a combined level, gravity and total magentic field survey was conducted over three areas situated in the Lake Frome Area, some 150 km north of Yunta, S.A. The locations are shown on the accompanying map (Figure 1).

2. SURVEY PERSONNEL

The survey crew was led at various times by P. MacSkimming, M. O'Callaghan and G. Mackee. Two field assistants were employed. Changes in personnel resulted from interruptions to the survey caused by heavy rain, which made the area inaccessible for several weeks.

3. EQUIPMENT

(a) Surveying - Theodolite and E.D.M. (Electronic distance measuring) device.

(b) Gravity - Lacoste and Romberg geodetic gravimeter model G37, with sensitivity of ±0.01 mgals.

(c) Magnetic - Barringer Model GM0122 Proton Precession magnetometer, with sensitivity of ±1 nT.

4. SURVEY PROCEDURES

4.1 Grid Survey

Each grid was positioned according to the client's instructions, the direction of the baseline being taken as grid north or grid east. Since the survey objective was to gain further information on airborne magnetic anomalies, ground magnetic measurements were taken immediately to ensure that the grid did in fact cover the anomaly.

The specified stations were surveyed in by Theodolite and E.D.M. device and pegged, staked, flagged and identified by co-ordinates which were written on the stakes.

.../2

Vertical angles were also read at each station, and elevations were calculated relative to an arbitrary datum point on each grid, which was assigned the arbitrary value of 100 metres elevation.

4.2 Magnetic and Gravity Surveys

The magnetic survey was done at the same time as gridding and levelling to ensure that the grid was satisfactorily located. One grid (M10) had to be modified slightly on the basis of this information. The gravity survey was done subsequently, after the magnetics had been checked at the Adelaide office.

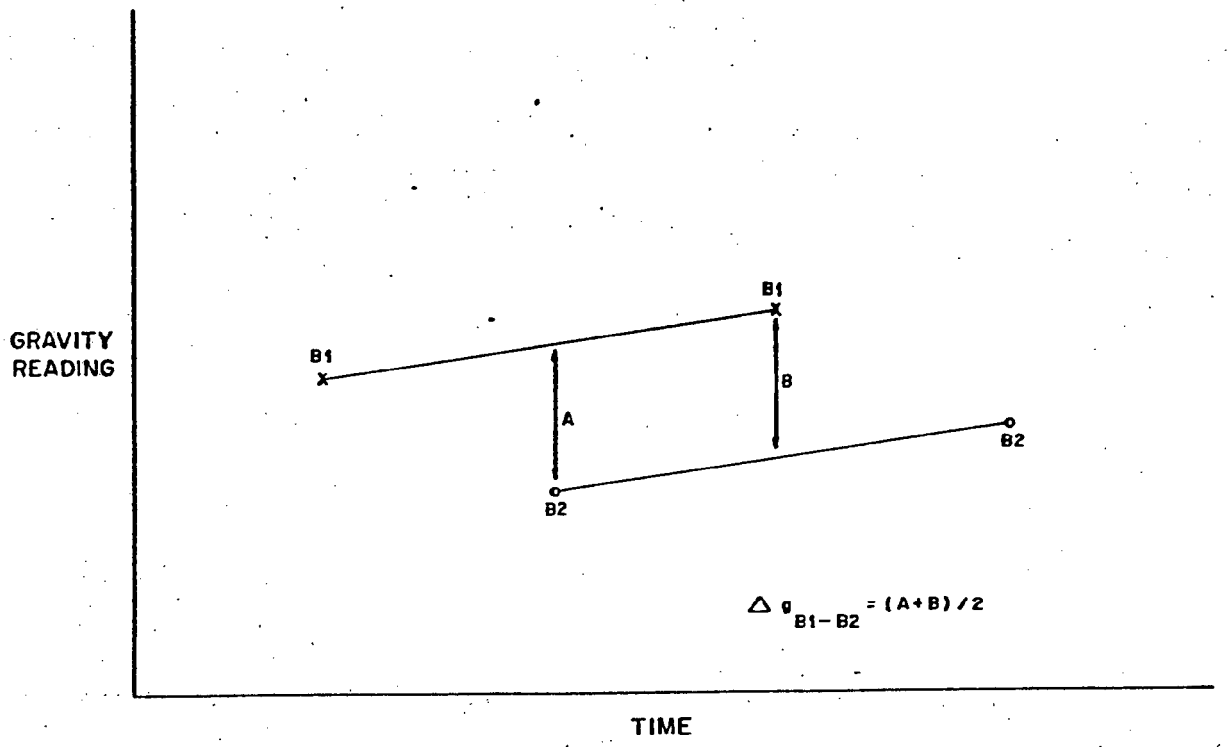
Standard looping procedures were used for drift control on both magnetic and gravity surveys. Base stations were established at convenient locations over each grid (usually on the baseline). Relative field values at these base stations were determined by tight loops, sequential readings being taken at Base Stations B1, B2, repeat B1 and repeat B2. Two differences in values are thus determined, as described below. Normal station looping involved taking a reading at a base-station, then readings at a series of other stations and finally repeating the reading at the base station, the whole loop taking less than one hour.

5. DATA REDUCTION

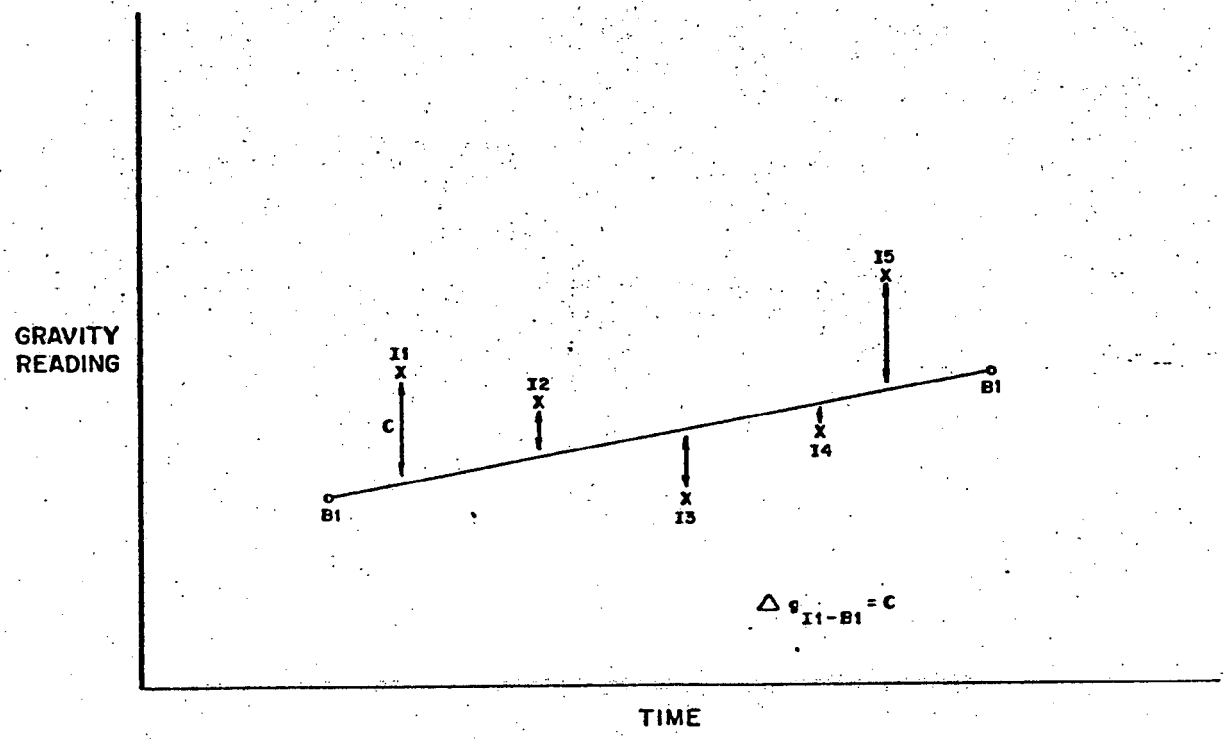
The method used for obtaining the difference between the gravity readings of two base stations is shown in Figure 2.

The difference in the gravity readings between the two base stations, B1 and B2 is taken as (A+B)/2. The drift-corrected Δg_{obs} for the intermediate station II is taken as C. If the two differences A and B differ by more than the prescribed survey accuracy, the loop is repeated. This also applies to intermediate station loops if the base-station readings differ excessively.

.../3



(a) BASE STATION DRIFT CORRECTION



(b) INTERMEDIATE STATION DRIFT CORRECTION

10000 N
11000 N
12000 N
13000 N
14000 N
15000 N
16000 N

7000 E
8000 E
9000 E
10000 E
11000 E

1A
1B

RUTHERFORDS DAM

WILD HORSE
LAGOON

N

CONTOUR INTERVAL 100 nT

GEOEX
PTY. LTD

MINAD – TETON AUSTRALIA

AREA M 1, LAKE FROME – S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED OCT '79			APPROVED A R D
DRAWN R G Z	PROJECT Nº 79262		SHEET Nº 1

6131-11

10000N 11000N 12000N 13000N 14000N 15000N 16000N

7000E 8000E 9000E 10000E 11000E

RUTHERFORDS DAM

WILD HORSE LAGOON

REFERENCE

TOTAL BOUGUER ANOMALY CONTOURS

INTERPRETED RESIDUAL BOUGUER ANOMALY CONTOURS

CONTOUR INTERVAL ..... 0·5 mgals

RECEIVED
18 JAN 1980
DEPT. OF MINES AND ENERGY SECURITY

GEOEX PTY. LTD.

MINAD – TETON AUSTRALIA

AREA M1, LAKE FROME – S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·67 gms/cc SCALE 1:10000

SURVEYED: OCT. '79		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT No 79006	SHEET No 2

EL 4173

6131-12

CONTOUR INTERVAL ..... 50 nT

GEOEX PTY. LTD.

MINAD – TETON AUSTRALIA

AREA M9, LAKE FROME – S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED OCT. '79		APPROVED: A.R.D
DRAWN - R.G.Z.	PROJECT Nº 79262	SHEET Nº 7

6131-13

4000 N

5000 N

6000 N

7000 N

6000

5000

350

400

450

500

550

600

650

750

800

3000N E

4000N E

5000N E

6000N E

CONTOUR INTERVAL ..... 0·5 mgals

GEOEX PTY. LTD.

MINAD – TETON AUSTRALIA

AREA M9, LAKE FROME – S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·67 gms/cc SCALE 1 : 10000

SURVEYED OCT. '79		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 79262	SHEET Nº 8

N

6131-14

7000E N

6000E N

5000E N

5·5

6·0

6·5

7·0

7·5

8·0

8·5

9·0

9·5

EL 411 BOUNDARY

5 35 5 43 5 96 5 87

5 64 5 86 5 87 6 11

6 39 6 23 6 16

7 02 6 51 6 35

7 47 6 85 6 60

8 07 7 47 7 38 7 25 6 92

7 95 7 72 7 46 7 27

8 57 7 99 7 77 7 67

8 49 8 17 8 01

9 12 9 13 8 41

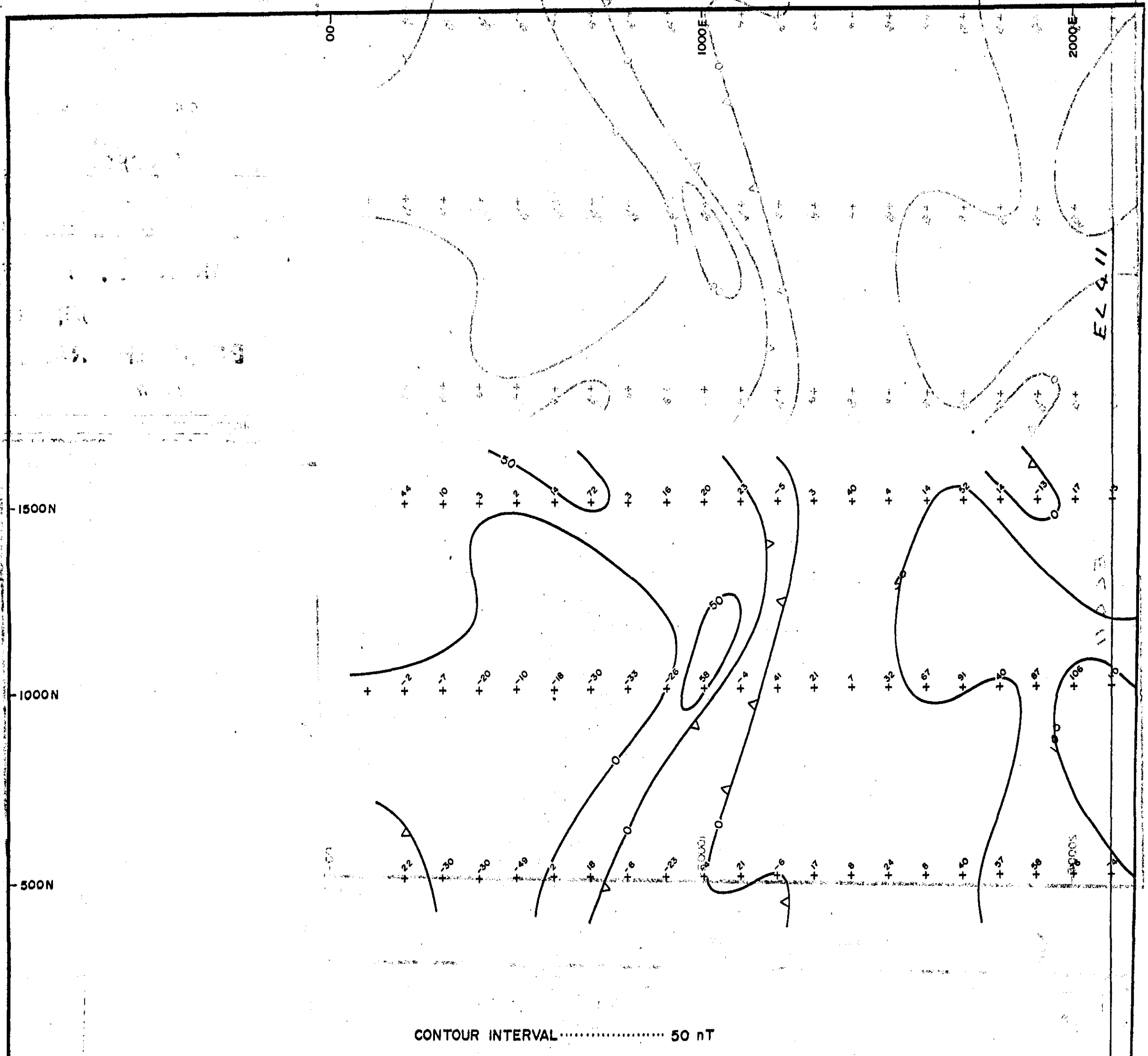
9 86 8 90

9 50 9 11

9 43

9 74

3½ x 0



GEOEX
PTY. LTD.

MINAD – TETON AUSTRALIA

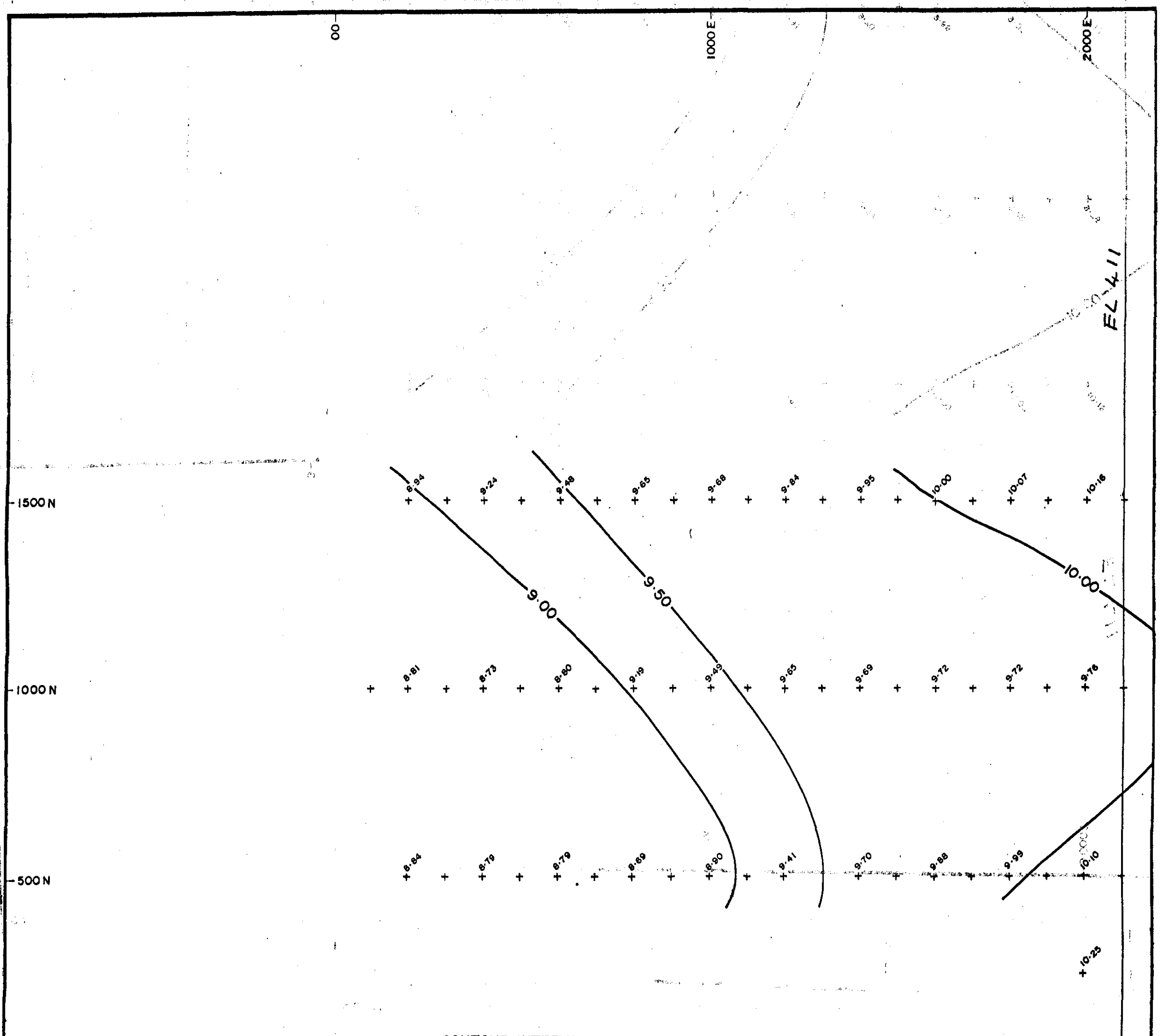
AREA M10, LAKE FROME – S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED: OCT. '79			APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 79262		SHEET Nº 9

6131-15



CONTOUR INTERVAL ..... 0·5 mgals

GEOEX PTY. LTD.

MINAD – TETON AUSTRALIA

AREA M10, LAKE FROME – S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·67gms/cc SCALE 1:10000

SURVEYED: OCT '79		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 79262	SHEET Nº 10

6131-16

The difference in the readings between the stations was multiplied by the instrument constant to convert the difference into milligals, the instrument having been calibrated in Adelaide using two gravity stations which are part of the Australian standard network. The calibration constant so determined was 1.0465 mgals/instrument unit.

The values of Δg_{obs} were then Bouguer corrected using the formula :

$$\Delta g_{Bouguer} = (0.3086 - 0.04191\varrho)\,\Delta h$$

where Δh is the elevation difference between the stations and ϱ is the density of the surface rocks in the area. A value of 2.67 was taken for ϱ. This value is the average value for the earth's crust, and was selected by default because elevation variations in the areas are too small to permit the calculation of a better value.

$$\text{Thus } \Delta g_{Bouguer} = 0.1967\,\Delta h$$

$$\text{And } \Delta g = \Delta g_{obs} + \Delta g_{Bouguer}$$

Once the gravity differences between the stations had been corected in this way, they were then all made relative to the survey area datum point. They were then used to check for loop misclosures.

The final correction applied to the data was the latitude correction which was calculated for each station using the formula (after - Parasnis, 1966).

$$\Delta g_{Lat.} = 5172.3\,(\sin^2 \phi_1 - \sin^2 \phi_o)$$

Where ϕ_1 is the latitude of the station, and ϕ_o is the latitude of the survey datum point.

The latitude of the survey datum was taken from the maps provided. The latitude for each station was then calculated by converting the grid co-ordinates to a true northing co-ordinate. This value was then converted from metres into minutes and seconds of latitude and added to the base station latitude to give ϕ_1.

.../4

The gravity data were partly reduced in the field to ensure that results were satisfactory. On return to Adelaide at completion of the survey, the basic data were entered into a computer and reprocessing done to ensure that no errors had occurred. This process also permits reduction parameters such as the Bouguer density to be modified with a minimum of labour and will shortly permit the automatic plotting and contouring of the final results.

Copies of the basic data and reduced values in tabulated form are included in this report as Appendix I.

The reduced data were then plotted on a grid with values which were all relative to the survey datum point.

Drift corrections for total field magnetic data were calculated in exactly the same way.

The magnetic data were also reduced relative to the survey datum point and plotted on the grid as such.

6. PRESENTATION OF DATA

The data are presented as contoured maps of total magnetic intensity and Bouguer Gravity Anomaly at a scale of 1:10,000. Contour Intervals are 50 nanoTeslas and 0.5 milligals, respectively.

The gravity data are also presented in tabulated form so that reprocessing can be done if required. The values included for each station are : Northing, easting, gravity reading, elevation, Bouguer correction, Latitude correction and Bouguer gravity anomaly.

7. INTERPRETATION.

7.1 Anomaly M-1

7.1.1 Magnetics.

The airborne anomaly splits into 2 clear peaks on the ground survey. Both being adequately delineated by the readings over the grid. Although the anomalies overlap it is not too difficult to separate them for interpretation purposes. Anomaly 1B is evidently caused by a source at considerable depth, judging by the long gentle slopes of the flanks. On the assumption that the sides of the causative body are steeply dipping, depths of the order of 1,000 metres are derived. If the sides of the source are gently sloping, with a dome-shaped cone section as might result from uplift of the magnetic basement, for example, then the depth could be considerably less. The ambiguities of potential field interpretation preclude differentiation between the two possibilities without additional evidence being provided.

Two sections were taken over the second Anomaly 1A, on lines 8500E and 9000E and depths of 430 and 310 metres deduced. Even allowing for possible errors, it therefore seems probable that this anomaly is considerably shallower than 1B.

7.1.2 Gravity Survey.

The gravity data are generally very smooth, with gentle gradients and low curvatures, all indicative of a lack of density variation in near surface rocks. The regional strike is roughly east-west, the gradient being about +2 mgals per kilometre to the south. Over the southern half of the grid the contours are no longer straight east-west, but show a flexure to the north. Assuming that the regional continues through the southern half of the grid, and subtracting this from the measured field, one obtains a residual anomaly. This anomaly is elongated in the north-south direction. The doubt is cast by uncertainty of the strength of the regional field at each location since all values on the grid south of about 11000N have a residual component.

Anyway, it is most unlikely that it could coincide with any of the magnetic anomalies, although the gravitational effect does overlap the magnetic response.

Analysis of this anomaly puts it at a depth of about 1200 metres, assuming a discrete causative body. Again, however, it is possible that shallowing of overburden could cause this effect. The required change, assuming a density difference of 0.5 gm/cc (not exceptional for overburden/bedrock contrast) would be about 150 metres. The depth to the density change in this case is indeterminate, since the shape of the gravity anomaly is determined solely by the gradient of the interface.

7.1.3 Conclusions.

The regional gravity increase southwards probably indicates a decreasing thickness of sediments overlying the crystalline basement. Moreover, it is quite possible that all gravity variations in this area result from changes in cover thickness. If so, and assuming a density contrast of 0.5 gm/cc between sediments and basement, then a basement relief of 650 metres is to be expected, the lowest point being at the north end of the grid, and the 0.5 mgal gravity contour interval being equivalent to 25 metre basement elevation contour interval. A basement ridge would thus extend north-north-west from about 10,000N, 9500E. On the other hand a discrete high density body could be present at a depth of about 1200 metres. The former explanation is favoured.

The deeper magnetic feature (1B) is expected to be basement rock changes, thus giving the depth to basement as about 1000 metres. The shallower feature (1A) at a depth of 310 to 430 metres would thus appear to be supra-basement. The limited data would indicate a structure of rectangular plan some 1400 metres by 500 metres striking N75^{o}E and centred at 1090N on Line 9000E, or near the base of the postulated basement ridge.

The deeper magnetic anomaly is probably too deep to be of further direct interest. Anomaly 1A is more promising, however, and might warrant further work. It's depth makes it a difficult target for most geophysical systems, although an induced polarisation and

resistivity survey might prove of value. A further possibility is the drilling of an exploratory hole in this region and the use of drill-hole geophysics to extend the range of exploration to a radius of about 100 metres from the drill-hole.

7.2 Anomaly M9

7.2.1 Magnetic Anomaly.

The airborne anomaly has clearly been located on the grid. Equally clearly there is another anomaly, which the airborne contouring took to be continuous with this, to the west. The ground anomaly appears to be circular in plan and gentle in gradient and curvature, indicating considerable depth of burial. Type curves indicate some 1150 - 1500 metres.

7.2.2 Gravity Survey.

This shows a regional trend increasing at a rate of some .25 mgals/100 metres to the south-east. While there is no clear gravity anomaly coincident with the magnetic high, there is some disturbance in the regional trend on the south-east flank of it. Possible causes are a change in depth to basement or some structural or compositional change in the basement itself. The available information does not permit depth estimates.

7.2.3 Conclusions.

The gravitational picture again probably indicates varying thickness of sedimentary cover, being shallowest in the south-east of the grid and showing a relief of 300 metres in all, assuming a density contrast of 0.5 gm/cc.

The source of the magnetic anomaly is circular in plan, and evidently at considerable depth. It is probably too deep to be of further direct interest.

7.3 Anomaly M10

7.3.1 Magnetic Anomaly.

The airborne anomaly occurs on one flight line only, with an amplitude of about 40 nT. The grid laid down appears to be offset from the anomaly. The grid was extended to the south, but time and magnetic storms prevented coverage of the extra line.

This anomaly is evidently fairly shallow. The near surface noise, sparse reading density and low amplitude of this anomaly make a detailed interpretation impossible.

7.3.2 Gravity Survey.

The gravity regional pattern strikes roughly north-south. It is suspected that the overburden is thinner in this region than elsewhere (up to 100 metres thinner) to fully account for variations here.

7.3.3 Summary.

The magnetic and gravity results are not impressive and probably reflects depths to basement.

A detailed magnetic survey, and possibly conductivity survey work, should precede drilling.

8. GENERAL CONCLUSIONS.

The ground magnetic anomalies proved to be more complex than the airborne areas resulting in multiple targets. Estimates of depth to the targets were possible in most cases, resulting in a range from 200 to 1000 metres.

The gravity surveys are of excellent quality and generally show regional features, in all cases interpreted as resulting from variations in depth to crystalline basement. Where Bouguer gravity anomaly closures indicated the possibility of discrete target, the estimated depths were over 1000 metres.

Recommendations for further work are:-

Anomaly M1. An exploratory drill-hole with down-hole geophysics to extend the range of exploration.

Anomaly M9. No further geophysical work.

Anomaly M10. Detailed and extended magnetic work to delineate the anomaly preparatory to drilling. Resistivity mapping, with either electromagnetic or galvanic techniques, is suggested also prior to drilling.

A.R. DODDS.
Senior Geophysist.

APPENDIX

Tabulation of Gravity Survey Results

MINAD AREA M1 GRAVITY SURVEY

0123

NORTHING m	EASTING m	ELEVATION m	BOUGUER CORRECTION milligals	LATITUDE CORRECTION milligals	CORRECTED GRAVITY milligals
10200	8000	96.54	-.48388274	.23548567	10.745778
10400	8000	96.16	-.55862885	.37937687	10.699808
10600	8000	95.62	-.66484701	.52326807	10.564809
10800	8000	95.46	-.69631906	.66715928	10.279558
11000	8000	94.82	-.82220725	.81105048	10.046401
11200	8000	95.1	-.76713117	.95494168	9.7482805
11400	8000	94.49	-.88711835	1.0988329	9.526257
11600	8000	94.34	-.9166234	1.2427241	9.2848332
11800	8000	91.84	-1.4083741	1.3866153	9.1253436
12000	8000	91.62	-1.4516482	1.5305065	8.8963133
12200	8000	93.18	-1.1447957	1.6743977	8.6249719
12400	8000	91.52	-1.4713182	1.8182889	8.4475731
12600	8000	91.23	-1.5283613	1.9621801	8.0739612
12800	8000	92.94	-1.1920038	2.1060713	7.63329
13000	8000	93.43	-1.0956207	2.2499625	7.2822918
13200	8000	94.63	-.85958031	2.3938537	6.8302559
13400	8000	92.01	-1.3749351	2.5377449	6.4535598
13600	8000	91.6	-1.4555822	2.6816361	6.0720414
13800	8000	92.68	-1.2431459	2.8255273	5.5807039
14000	8000	94.41	-.90285438	2.9694185	5.0707116
14200	8000	92.27	-1.323793	3.1133097	4.6209917
14400	8000	92.95	-1.1900368	3.2572009	4.1242291
14600	8000	92.54	-1.2706839	3.4010921	3.6903856
14800	8000	91.73	-1.4300112	3.5449833	3.2929771
15000	8000	91.32	-1.5106583	3.6888745	2.8800637
15200	8000	90.99	-1.5755694	3.8327657	2.4357938
15400	8000	88.24	-2.1164952	3.9766569	2.1224792
15000	7000	89.58	-1.8529168	3.719406	2.1758991
14800	7000	89.62	-1.8450488	3.5755148	2.584056
14600	7000	89.62	-1.8450488	3.4316236	3.0523673
14400	7000	89.92	-1.7860387	3.2877324	3.4541086
14200	7000	91.92	-1.3926381	3.1438412	3.829198
14000	7000	93.92	-.99923752	2.99995	4.2723099
13800	7000	92.37	-1.304123	2.8560588	4.8177083
13600	7000	93.3	-1.1211917	2.7121676	5.2282559
13400	7000	92.51	-1.2765849	2.5682764	5.6876839
13200	7000	93.29	-1.1231587	2.4243852	6.053029
13000	7000	93.62	-1.0582476	2.280494	6.4083464
12800	7000	91.28	-1.5185263	2.1366028	6.7250965
12600	7000	91.3	-1.5145923	1.9927116	6.9932743
12400	7000	92.31	-1.315925	1.8488204	7.3829304
12200	7000	90.25	-1.7211276	1.7049292	7.7861515
12000	7000	90.23	-1.7250616	1.561038	8.0202988
11800	7000	92.66	-1.2470799	1.4171468	8.2183444
11600	7000	92.63	-1.2529809	1.2732556	8.4714547
11400	7000	93.8	-1.0228416	1.1293644	8.6414228
11200	7000	93.33	-1.1152907	.98547317	8.77659
11000	7000	92.55	-1.2687169	.84158197	8.91357
10800	7000	94.56	-.87334933	.69769077	8.9191189
10600	7000	92.63	-1.2529809	.55379957	8.9973337
10400	7000	91.67	-1.4418132	.40990837	9.1616977
10200	7000	93.93	-.99727052	.26601717	9.1640966
10200	9000	100.58	.31078647	.20495418	11.379103
10400	9000	98.48	-.10228416	.34884538	11.177946
10600	9000	98.9	-.01967003	.49273658	10.912597
10800	9000	97.11	-.37176357	.63662778	10.720092
11000	9000	96.76	-.44060867	.78051898	10.418398

5037054

11200	9000	96.41	-.50945378	.92441018	10.085309
11400	9000	94.5	-.88515135	1.0683014	9.670365
11600	9000	95.36	-.71598909	1.2121926	9.392146
11800	9000	94.37	-.91072239	1.3560838	9.2418864
12000	9000	91.84	-1.4083741	1.499975	9.1026583
12200	9000	90.77	-1.6188435	1.6438662	8.8634077
12400	9000	91.48	-1.4791863	1.7877574	8.6969611
12600	9000	91.97	-1.3828031	1.9316486	8.419218
12800	9000	91.84	-1.4083741	2.0755398	8.1032406
13000	9000	91.86	-1.4044401	2.219431	7.7330483
13200	9000	92.39	-1.300189	2.3633222	7.3428257
13400	9000	93.29	-1.1231587	2.5072134	6.8579422
13600	9000	90.71	-1.6306455	2.6511046	6.4158591
13800	9000	90.9	-1.5932724	2.7949958	5.8959684
14000	9000	92.28	-1.321826	2.938887	5.348526
14200	9000	93.88	-1.0071055	3.0827782	4.7972652
14400	9000	95.19	-.74942814	3.2266694	4.3040762
14600	9000	94.52	-.88121734	3.3705606	3.8557182
14800	9000	93.21	-1.1388947	3.5144518	3.4384471
15000	9000	92.05	-1.3670671	3.658343	2.9983559
15200	9000	92.92	-1.1959378	3.8022342	2.4761764
15400	9000	85.31	-2.6928271	3.9461254	2.2795608
15600	9000	81.45	-3.4520903	4.0900166	2.0199988
15800	9000	79.27	-3.8808969	4.2339078	2.0124059
15600	10000	84.72	-2.8088803	4.0594851	2.8681398
15800	10000	80.74	-3.5917475	4.2033763	2.7733438
16000	10000	76.31	-4.4631298	4.3472675	2.6318927
15600	10000	84.72	-2.8088803	4.0594851	2.8681398
15400	10000	91.82	-1.4123082	3.9155939	3.0795532
15200	10000	92.66	-1.2470799	3.7717027	3.4619328
15000	10000	93.92	-.99923752	3.6278115	3.848439
14800	10000	92.81	-1.2175749	3.4839203	4.2187604
14600	10000	92.94	-1.1920038	3.3400291	4.4510178
14400	10000	91.01	-1.5716354	3.1961379	4.75423
14200	10000	90.74	-1.6247445	3.0522467	5.0176897
14000	10000	91.8	-1.4162422	2.9083555	5.3125308
13800	10000	93.14	-1.1526638	2.7644643	5.599658
13600	10000	89.57	-1.8548838	2.6205731	6.1558568
13400	10000	89.5	-1.8686528	2.4766819	6.495284
13200	10000	90.58	-1.6562165	2.3327907	6.7626642
13000	10000	89.73	-1.8234118	2.1888995	7.0899427
12800	10000	92.08	-1.3611661	2.0450083	7.2251597
12600	10000	91.82	-1.4123082	1.9011171	7.5324464
12400	10000	93.17	-1.1467627	1.7572259	7.7849131
12200	10000	92.9	-1.1998718	1.6133347	8.0902329
12000	10000	94.26	-.93235942	1.4694435	8.3655966
11800	10000	93.44	-1.0936537	1.3255523	8.6673811
11600	10000	95.04	-.77893319	1.1816611	8.8539079
11400	10000	94.16	-.95202945	1.0377699	9.1648204
11200	10000	95.58	-.67271503	.89387869	9.2374537
11000	10000	97.59	-.27734742	.74998749	9.7034626
10800	10000	97.89	-.21833733	.60609629	10.031949
10600	10000	98.1	-.17703027	.46220509	10.35843
10400	10000	99.6	.11802018	.31831389	10.687494
10200	10000	97.98	-.20063431	.17442269	10.999358

12000	11000	93.95	-.99333652	1.438912	7.6095605	
12200	11000	93.38	-1.1054557	1.5828032	7.541915	
12400	11000	93.37	-1.1074227	1.7266944	7.5111667	
12600	11000	93.77	-1.0287426	1.8705856	7.3308355	
12800	11000	93.9	-1.0031715	2.0144768	7.0241403	
13000	11000	93.49	-1.0838187	2.158368	6.6373894	
13200	11000	91.54	-1.4673842	2.3022592	6.355855	
13400	11000	89.04	-1.959135	2.4461504	6.1178779	
13600	11000	88.42	-2.0810892	2.5900416	5.8153999	
13800	11000	87.88	-2.1873073	2.7339328	5.5443555	
14000	11000	86.33	-2.4921928	2.877824	5.3362687	
14200	11000	85.47	-2.6613551	3.0217152	5.2115801	
14400	11000	84.77	-2.7990453	3.1656064	5.0660386	
14600	11000	83.45	-3.0586897	3.3094976	4.8194729	
14800	11000	84.92	-2.7695402	3.4533888	4.5199636	
15000	11000	87.18	-2.3249975	3.59728	4.224105	
15200	11000	92	-1.3769021	3.7411712	3.7934341	
15400	11000	89.07	-1.953234	3.8850624	3.6487809	
10200	11000	98.59	-8.0647123E-02		.1438912	9.7440616
10400	11000	98.06	-.18489828	.2877824	9.5482391	
10600	11000	98.22	-.15342623	.4316736	9.2840724	
10800	11000	97.42	-.31078647	.575648	9.0665358	
11000	11000	94.21	-.94219444	.719456	8.7202966	
11200	11000	93.2	-1.1408617	.8633472	8.3934305	
11400	11000	93.27	-1.1270927	1.0072384	8.1691182	
11600	11000	93.09	-1.1624988	1.1511296	7.9950483	
11800	11000	12000	2340.9303	1.2950208	2349.8236	
11800	11000	93.26	-1.1290597	1.2950208	7.7642436	

MINAD. AREA M9 GRAVITY SURVEY

SURVEY NAME : MINAD9

SURVEY CONSTANTS:-
INSTRUMENT CONSTANT = 1.0465
ROCK DENSITY USED FOR BOUGUER CORRECTIONS= 2.67
DATUM VALUES :
CO-ORDINATES NORTHING = 5000 EASTING = 3050 METRES
ELEVATION = 100.42 METRES
LATITUDE = 31.603333 DEGREES
ORIENTATION OF GRID 50.5 DEGREES EAST OF TRUE NORTH

NORTHING METRES	EASTING METRES	GRAVITY READING SCALE DIVS	ELEVATION METRES	BOUGUER MGALS	LATITUDE MGALS	FINAL GRAVITY MGALS
5000	5500	1.17	99.03	-.27	-1.37	9.52
5000	6000	.80	98.65	-.35	-1.65	8.80
5000	6000	.80	98.65	-.35	-1.65	8.80
5200	6000	.35	98.48	-.38	-1.56	8.41
5400	6000	-.20	98.74	-.33	-1.46	8.01
5600	6000	-.58	98.48	-.38	-1.37	7.67
5800	6000	-.91	97.67	-.54	-1.28	7.27
6000	6000	-1.30	97.44	-.59	-1.19	6.92
6200	6000	-1.59	96.76	-.72	-1.10	6.60
6400	6000	-1.78	96.03	-.86	-1.00	6.35
6600	6000	-2.11	96.23	-.82	-.91	6.16
6800	6000	-2.20	96.00	-.87	-.82	6.11
7000	6000	-2.51	95.87	-.89	-.73	5.87
6000	5500	-1.30	97.65	-.54	-.91	7.25
5800	5500	-.85	97.01	-.67	-1.00	7.48
5600	5500	-.43	96.83	-.71	-1.09	7.77
5400	5500	.10	96.64	-.74	-1.18	8.17
5200	5500	.72	98.81	-.32	-1.28	9.13
5000	5500	1.20	99.03	-.27	-1.37	9.56
5000	6000	.80	98.65	-.35	-1.65	8.80
4800	6000	1.13	99.01	-.28	-1.74	9.11
4600	6000	1.66	98.42	-.39	-1.83	9.43
4400	6000	2.05	98.48	-.38	-1.92	9.74
4800	5500	1.49	99.25	-.23	-1.46	9.80
5000	5500	1.20	99.03	-.27	-1.37	9.56
5200	5000	.37	99.16	-.25	-1.00	9.12
5400	5000	-.36	99.16	-.25	-.91	8.49
5600	5000	-.73	98.07	-.46	-.81	7.99
5800	5000	1.09	98.04	-.47	-.72	7.72
6000	5000	-1.34	97.11	-.65	-.63	7.38
6200	5000	-1.98	97.19	-.64	-.54	6.85
6400	5000	-2.55	97.87	-.50	-.44	6.51
6600	5000	-2.85	97.53	-.57	-.35	6.23
6800	5000	-3.27	97.35	-.60	-.26	5.87
7000	5000	-3.27	97.35	-.60	-.17	5.96
6000	4500	-1.03	98.64	-.35	-.35	7.47
5800	4500	-1.26	98.67	-.34	-.44	7.95
5600	4500	-.60	98.92	-.30	-.53	8.57
6000	4000	-1.48	98.48	-.38	-.07	8.07
6200	4000	-2.14	98.32	-.41	.02	7.47
6400	4000	-2.56	97.71	-.53	.11	7.02
6600	4000	-3.27	97.65	-.54	.21	6.39
6800	4000	-3.81	97.21	-.63	.30	5.86
7000	4000	-4.27	96.92	-.69	.39	5.43
7000	3050	-4.95	97.26	-.62	.92	5.35
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MINAD AREA MLO GRAVITY SURVEY

0127

SURVEY CONSTANTS:-
INSTRUMENT CONSTANT = 1.0465
ROCK DENSITY USED FOR BOUGUER CORRECTIONS= 2.67
DATUM VALUES :
CO-ORDINATES NORTHING = 1500 EASTING = 1600 METRES
ELEVATION = 101.44 METRES
LATITUDE = 31.1 DEGREES
ORIENTATION OF GRID 0 DEGREES EAST OF TRUE NORTH

NORTHING METRES	EASTING METRES	GRAVITY READING SCALE DIVS	ELEVATION METRES	BOUGUER MGALS	LATITUDE MGALS	FINAL GRAVITY MGALS
500	1600	.88	99.99	-.29	-.72	9.88
500	1400	.70	100.00	-.28	-.72	9.70
500	1200	.24	100.85	-.12	-.72	9.41
500	1000	-.46	101.83	.08	-.72	8.90
500	800	-1.18	104.44	.59	-.72	8.69
500	600	-1.34	105.75	.85	-.72	8.79
500	400	-1.52	106.64	1.02	-.72	8.79
500	200	-.87	103.61	.43	-.72	8.84
1000	1600	-.22	103.00	.31	-.36	9.72
1000	1400	-.13	102.32	.17	-.36	9.69
1000	1200	.22	100.34	-.22	-.36	9.65
1000	1000	.17	99.84	-.31	-.36	9.49
1000	800	-.54	101.86	.08	-.36	9.19
1000	600	-1.49	104.75	.65	-.36	8.80
1000	400	-1.38	103.81	.47	-.36	8.73
1000	200	-1.15	103.04	.31	-.36	8.81
1500	200	-1.42	103.28	.36	.00	8.94
1500	400	-1.20	103.68	.44	.00	9.24
1500	600	-.77	102.73	.25	.00	9.48
1500	800	-.42	101.79	.07	.00	9.65
1500	1000	-.59	102.81	.27	.00	9.68
1500	1200	-.21	101.72	.06	.00	9.84
1500	1400	-.01	101.25	-.04	.00	9.95
1000	1600	-.22	103.00	.31	-.36	9.72
1000	1800	-.35	103.60	.42	-.36	9.72
1000	2000	-.70	105.58	.81	-.36	9.76
1500	2000	.56	99.41	-.40	.00	10.16
1500	1800	.45	99.49	-.38	.00	10.07
1500	1600	.00	101.44	.00	.00	10.00
250	1600	1.22	99.35	-.41	-.90	9.91
250	1800	1.39	99.23	-.43	-.90	10.06
250	2000	1.47	99.80	-.32	-.90	10.25
250	2200	1.45	100.88	-.11	-.90	10.44
500	2000	1.00	100.53	-.18	-.72	10.10
500	1800	.98	100.04	-.28	-.72	9.99
500	1600	.85	99.99	-.29	-.72	9.85

BOX SWAMP DAM

ROAD

RUTHERFORDS DAM

WILD HORSE LAGOON

1A

1B

1C

E. L. 911(614)

E. L. 722

BWT 22

BWT 23

BWT 24

BWT 25

BWT 26

BWT 27

BWT 28

BWT 29

BWT 30

BWT 31

BWT 32

BWT 33

BWT 34

BWT 35

BWT 36

BWT 37

BWT 38

5000N 6000N 7000N 8000N 9000N 10000N 11000N 12000N 13000N 14000N 15000N 16000N

7000E 8000E 9000E 10000E 11000E

N

CONTOUR INTERVAL ..... 100 nT

GEOEX PTY. LTD. 6131-1

MINAD – TETON AUSTRALIA

AREA M1, LAKE FROME – S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED: OCT.'79		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº: 79062	PLATE 1

5000N 6000N 7000N 8000N 9000N 10000N 11000N 12000N 13000N 14000N 15000N 16000N

BOX SWAMP DAM

BWT 22
BWT 23
BWT 24
BWT 25
BWT 26
BWT 27
BWT 28
BWT 29
BWT 30
BWT 31
BWT 32
BWT 33
BWT 34
BWT 35
BWT 36
BWT 37
BWT 38

7000E
8000E 140°10'
9000E
10000E
11000E

10·0 10·5 11·0 11·5 12·0 12·5 13·0 13·5 14·0 14·5 15·0 3·0 2·5 2·0 1·5 1·0 0·5 9·5 9·0 8·5 8·0 7·5 7·0 6·5 6·0 5·5 5·0 4·5 4·0 3·5 3·0 2·5 2·0

© BW MIA-1

RUTHERFORDS DAM

WILD HORSE LAGOON

N

E.L. 911 (614)

E.L. 722

REFERENCE

TOTAL BOUGUER ANOMALY CONTOURS

INTERPRETED RESIDUAL BOUGUER ANOMALY CONTOURS

CONTOUR INTERVAL ..... 0·5 mgals

GEOEX PTY. LTD. 6131-2

MINAD – TETON AUSTRALIA

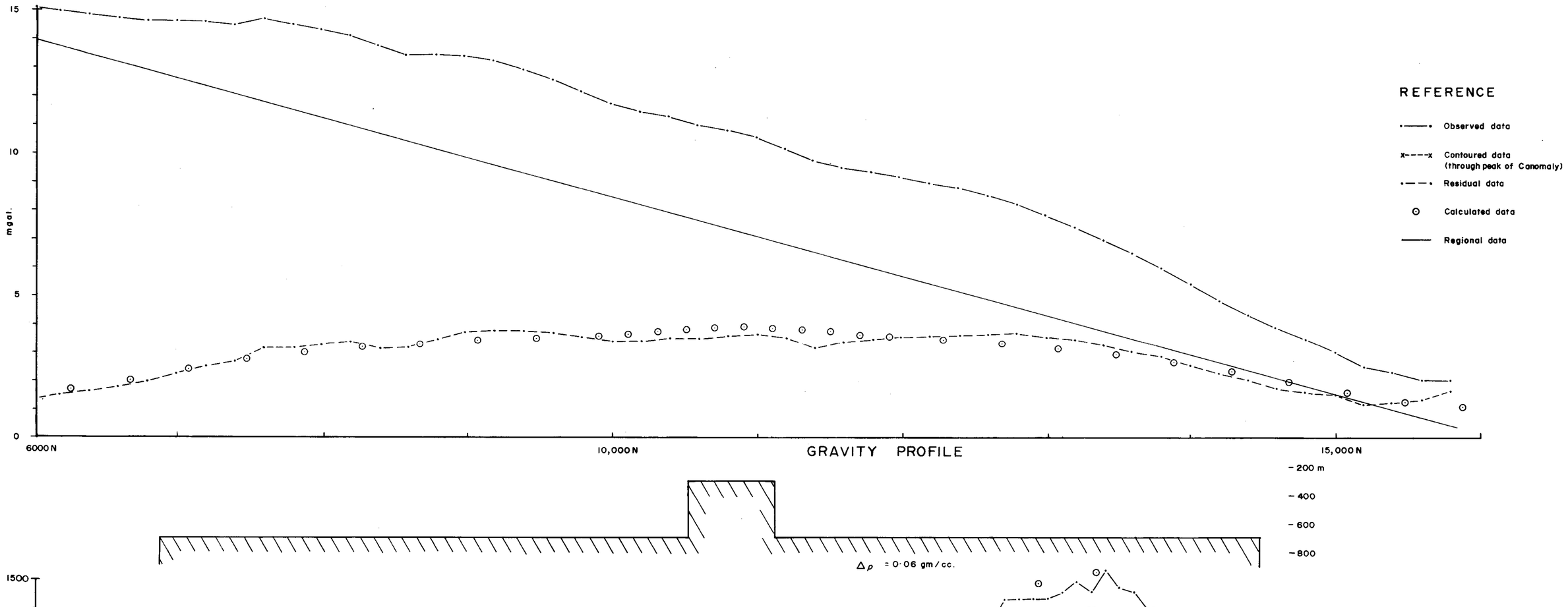
AREA M1, LAKE FROME – S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·67gms/cc SCALE 1:10000

SURVEYED: OCT. '79 APPROVED: A.R.D.

DRAWN: R.G.Z. PROJECT Nº 79262 PLATE 2



6131-3

MINES ADMINISTRATION PTY. LIMITED.

E.L.722 – BILLEROO WEST
ANOMALY M1
GRAVITY AND MAGNETIC PROFILES
LINE 9000E

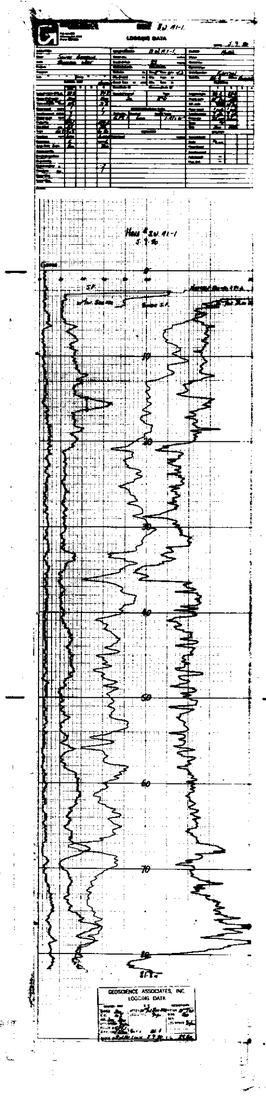
Compiled by: J. Ashley	Scale: 1: 20,000	Dwg. N°.	Plate: 3.
Drawn by: INTO Drafting	Date: May, 1981	Project: B.W.	

DRILL HOLE COMPOSITE LOGS : BWMIA-I

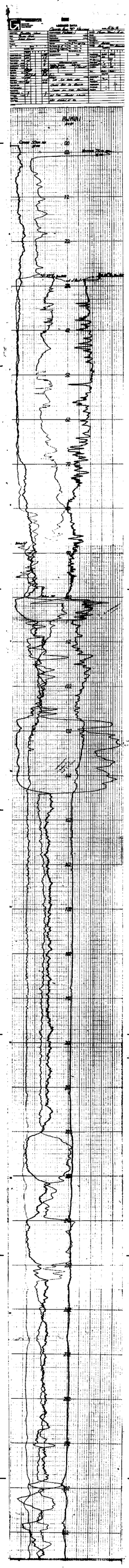
(31°15'44.46" S / 140°07'32.51" E)

PRECOLLAR

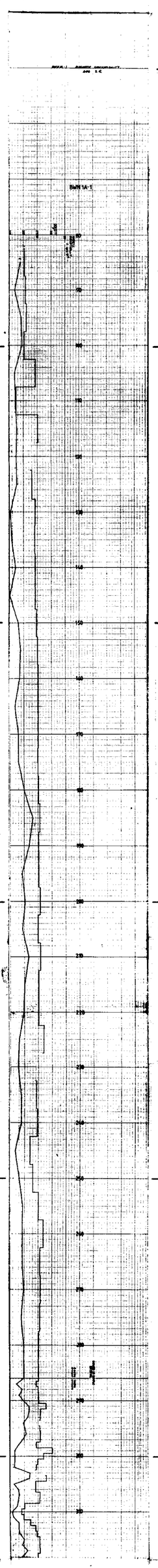
GAMMA – NEUTRON – SELF POTENTIAL – RESISTIVITY.
0 – 82 metres



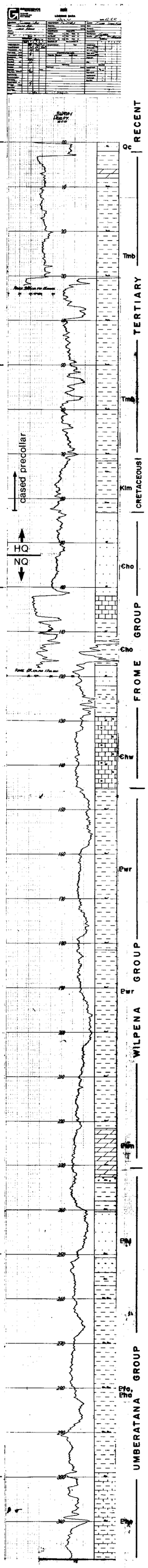
GAMMA – NEUTRON – SELF POTENTIAL – RESISTIVITY.
0 – 318 metres



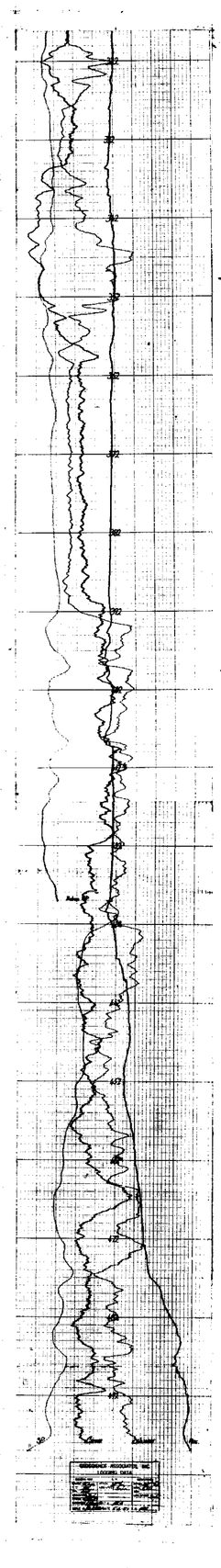
MAGNETIC SUSCEPTIBILITY – SPECIFIC GRAVITY.
50 – 318 metres



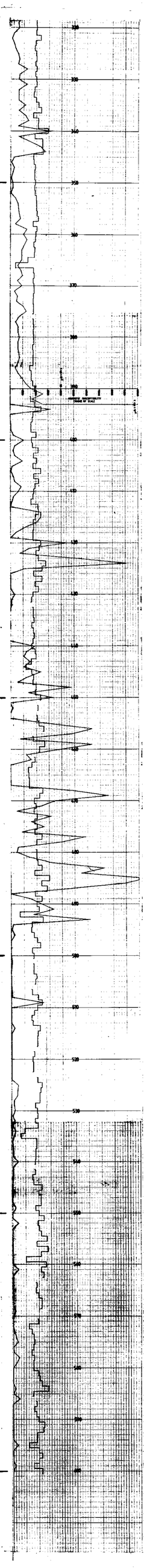
DENSITY – LITHOLOGY – STRATIGRAPHY.
0 – 318 metres



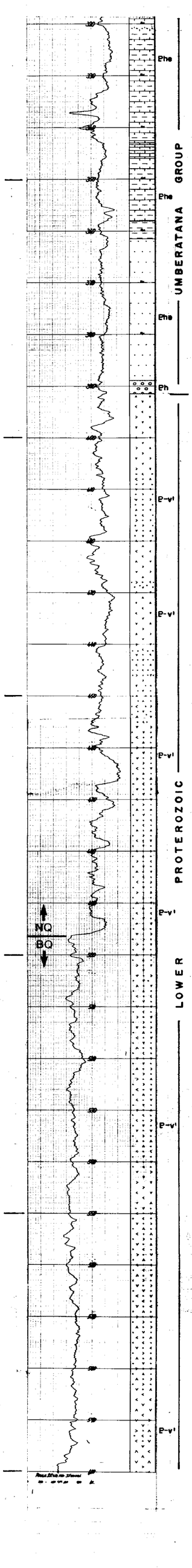
GAMMA – NEUTRON – SELF POTENTIAL – RESISTIVITY.
318 – 499 metres.



MAGNETIC SUSCEPTIBILITY – SPECIFIC GRAVITY.
318 – 600 metres (TD)



DENSITY – LITHOLOGY – STRATIGRAPHY.
318 – 600 metres (TD)



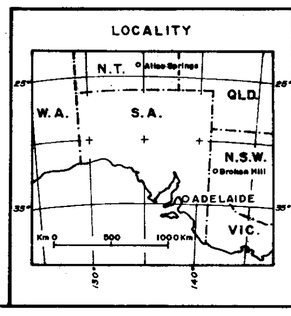
REFERENCE

- SANDSTONE
- SILTSTONE SHALE
- DOLOMITE
- LIMESTONE
- ARCHAEOCYATHA LIMESTONE
- CALCAREOUS SILTSTONE
- TILLITE
- CONGLOMERATE
- VOLCANIC
- (BRECCIATION)
- SILTY LIMESTONE
- GREYWACKE
- OOLITIC LIMESTONE
- UNCONFORMITY

Qc	COONONDINE FORMATION
Qpe	PURINILLA FORMATION
Tmb	NAMBA FORMATION
Klm	MARRÉE FORMATION
Cho	ORAPARINA SHALE
Chw	WILKAWILLINA LIMESTONE
Pwr	BRACHINA FORMATION
Pwn	NUCCALEENA FORMATION
Phl	ELATINA FORMATION
Pfa	AMBEROONA FORMATION
Pha	ANGEPENA FORMATION
Phe	ETINA FORMATION
Ph	WILLOCHRA SUBGROUP
P-v¹	BENAGERIE VOLCANICS

6131-4

LOCALITY



Revision	Date

Reference Dwg's

MINES ADMINISTRATION PTY. LIMITED

EL 722 – BILLEROO WEST

COMPOSITE LOGS

BWMIA-I

Compiled by: M. MOORE	Scale: 1:500	Dwg No	Plate: 4
Drawn by: INTO Drafting	Date: Oct. 1982	Project:	

00 MAGNETIC PROFILE

FENCE

GRADED TRACK

BASE LINE

MARSHES DAM

FENCE

FENCE

FENCE

00 1000E 2000E 3000E 3500E

8000N 7000N 6000N 5000N 4000N 3000N 2000N 1000N 00

G.N. M.N.

SHEET INDEX

A	B

Magnetic Profile A.Mills

GEOEX PTY. LTD. 6131-5

E.L.722 - BILLEROO WEST
MINAD - TETON AUSTRALIA

AREA M2, LAKE FROME - S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED: OCT.'79 & FEB.'81		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 81458	PLATE 5.

3500E 4000E 5000E 6000E 7000E 8000E

8000N 7000N 6000N 5000N 4000N 3000N 2000N 1000N

OLD TRACK

RAGLESS CATCH

GRADED TRACK

DOG FENCE

FENCE

BASE LINE

MAGNETIC PROFILE

250 200 800 750 4000 750 700 650 600 550 500 6000 400 350 300 250 150 100 50 8000

GN MN

SHEET INDEX

A B

Magnetic Profile A. Mills

GEOEX PTY LTD 6131-6

E.L.722 - BILLEROO WEST
MINAD - TETON AUSTRALIA

AREA M2, LAKE FROME - S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED: OCT.'79 & FEB.'81		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 81458	PLATE 6.

00
1000E
2000E
3000E
8000N
7000N
6000N
5000N
4000N
3000N
2000N
1000N
00
10·5
10·0
9·5
9·0
8·5
8·0
7·5
7·0
6·5
6·0
5·5
FENCE
GRADED TRACK
BASE LINE
MARSHES DAM
FENCE
FENCE
FENCE
G N
M N
SHEET INDEX
A
B
GEOEX PTY. LTD.
6131-7
E.L.722 – BILLEROO WEST
MINAD – TETON AUSTRALIA
AREA M2, LAKE FROME – S.A.
CONTOUR MAP OF
BOUGUER GRAVITY ANOMALY
SCALE 1:10000
SURVEYED: OCT.'79 & FEB.'81
APPROVED: A.R.D.
DRAWN: R.G.Z.
PROJECT Nº 81458
PLATE 7.

3500E 4000E 5000E 6000E 7000E 8000N

8000N 7000N 6000N 5000N 4000N 3000N 2000N 1000N

OLD TRACK

DOG FENCE

RAGLESS CATCH

GRADED TRACK

BASE LINE

FENCE

10·0 10·5 11·0 11·5 9·0 8·5 3·5

G N M N

SHEET INDEX

A	B

GEOEX PTY. LTD.

6131-8

E.L.722 - BILLEROO WEST
MINAD - TETON AUSTRALIA

AREA M2, LAKE FROME - S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

SCALE 1:10000

SURVEYED: OCT '79 & FEB. '81		APPROVED: A.R.D.
DRAWN: R.G.Z	PROJECT Nº 81458	PLATE 8.

00 1000E 2000E 3000E 4000E 5000E 6000E

5000N 4000N 3000N 2000N 1000N 00

400 550 650 750 800 700 600 500 450 400 350 300 250

1000 2000 3000 5000 6000

W 0 1000 2000 3000 4000 E

GRAVITY PROFILE

MAGNETIC PROFILE

N 45° E

FENCE

VERMIN PROOF FENCE

SUSPENSION FENCE

TRACK

BASE LINE

SW

GN MN

GEOEX PTY. LTD.

6131-9

E.L.722 - BILLEROO WEST
MINAD - TETON AUSTRALIA

AREA M8, LAKE FROME - S.A.

CONTOUR MAP OF TOTAL MAGNETIC INTENSITY

SCALE 1:10000

SURVEYED: OCT. '79 & FEB. '81		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº 81458	PLATE 9

00 1000E 2000E 3000E 4000E 5000E 6000E

5000N 4000N 3000N 2000N 1000N 00

W E SW NE

GRAVITY PROFILE 0 4000

MAGNETIC PROFILE

FENCE

VERMIN PROOF FENCE

TRACK

SUSPENSION FENCE

BASE LINE

LEGEND

0·25 — Residual contour

13·5 — Regional contour

— — Axis of gravity high

Possible fault (from.mag.& gravity)

15·5 — Gravity contour

(All values in m/gals).

Residual gravity — A. Mills, consultant

GN MN

6131-10

GEOEX PTY LTD.

E.L.722 BILLEROO WEST

MINAD – TETON AUSTRALIA

AREA M8, LAKE FROME – S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

SCALE 1:10000

SURVEYED: OCT.'79 & FEB.'81		APPROVED: A.R.D.
DRAWN: R.G.Z.	PROJECT Nº81458	PLATE 10.

QUARTERLY REPORT

EL 722 BILLEROO WEST
SOUTH AUSTRALIA

QUARTER ENDED 14.3.81

1. TITLE

EL 722 Billeroo West is located in the Lake Frome Embayment of South Australia. The title covering an area of 2490 square kilometres was re-granted to CSR Limited on 30.6.80 for a period of two years. Under the terms of a Joint Venture Agreement Minad-Teton Australia can earn an equity of 49% interest in the area.

2. INTRODUCTION

Work on the area included continuing diamond drilling and surface geophysics in the field and assessment of open hole drilling programmes undertaken during 1980.

3. ASSESSMENT OF TERTIARY PALAEOCHANNELS

3.1 Gould Dam Prospect

Progress has been made in interpreting electrical logs from holes with high salinity drilling fluid. Signatures of clay sand interfaces appear to be reversed irregularly throughout the deposit because of the varying fresh and saline water mixtures used during drilling.

3.2 Billeroo West Palaeochannel

Interpretation and collation of data has almost been completed. A broad reduction - oxidation zone has been delineated. The zone is oriented obliquely across the basal channel sand from the vicinity of Goulds Dam and trends eastwards to a terminal area in the vicinity of the confluence with the Curnamona Palaeochannel (see figure enclosed). Oxidation is believed to extend to the eastern extremity of the basal sand. The zone is believed to indicate the area with the greatest economic potential in the palaeochannel although no mineralization significantly better in grade or lithological characteristics suitable to in-situ leaching has been recognized.

A report on the 1980 drilling programme is scheduled to be completed during the next quarter.

4. COMBINED GROUND GEOPHYSICAL SURVEYS

During the period combined gravimetric and magnetic surveys have been carried out on two magnetic anomalies wholly within the Licence and two anomalies which lie across the boundaries. The work carried out by Geox Pty Ltd has only just been completed in the field. A comprehensive report is expected during the current quarter.

5. DIAMOND DRILLING ANOMALY MI

During the quarter drilling rates were low due to infrastructure failure on behalf of the contractor. By the end of the quarter the hole was down to in excess of 405 metres, an advance of 300 metres for the quarter.

The drill hole intersected a basal Cambrian succession between the base of the pre-collar at 83 metres and 157 metres. Underlying this a compressed shelf facies sequence of Adelaidian sediments was penetrated down to approximately 391 metres. Both Cambrian and Adelaidian sequences are horizontally bedded limestone and pelitic sequences with a regionally disconformable contact and virtually no tectonic disturbance.

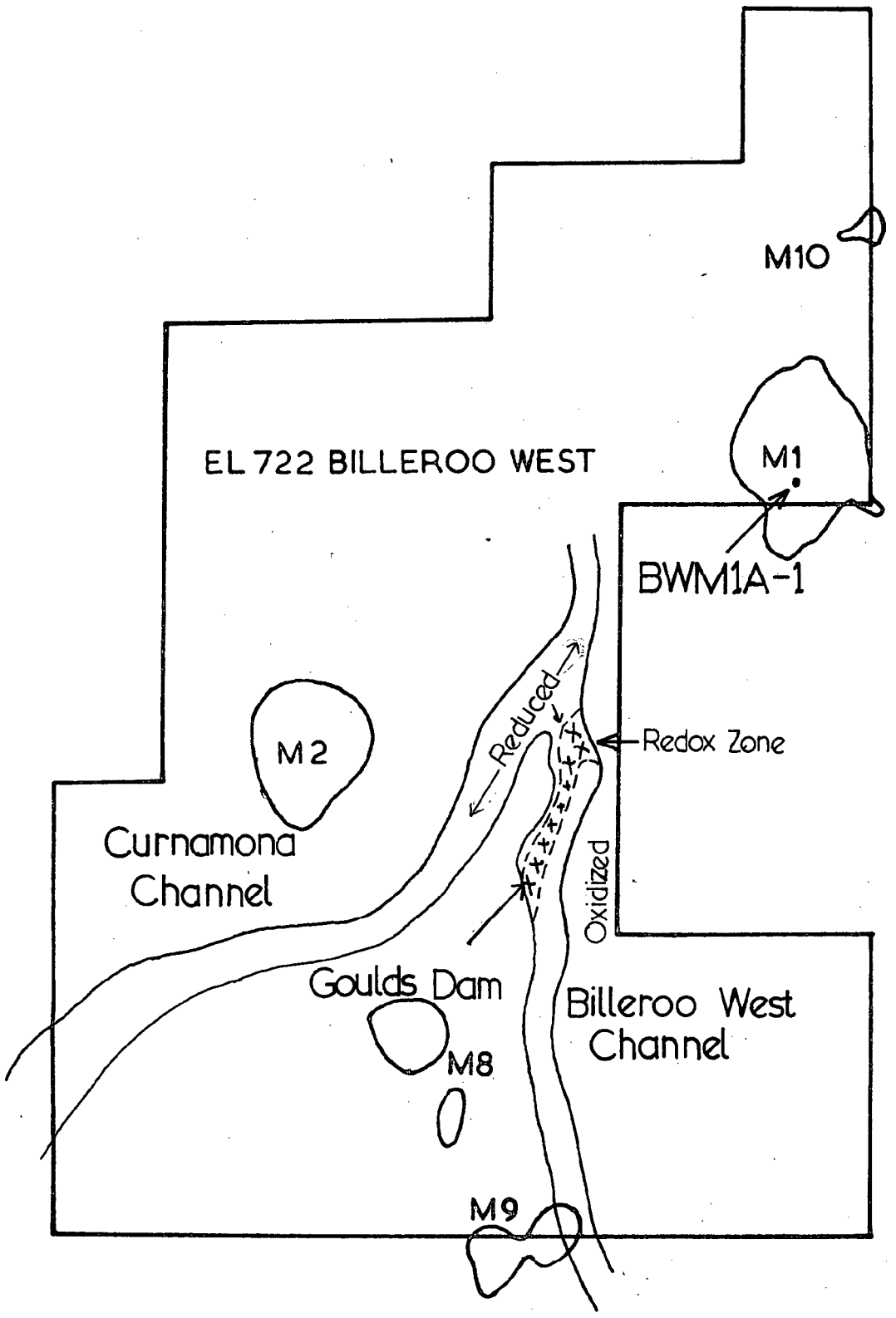
Below the Adelaidian and currently extending down to 480 metres is an acid volcanic complex which has been subject to polyphase alteration. The rock is a very fine grained pink suite of tuffs, volcanic breccias, intrusive and extrusive lavas with complex relations, which have been subsequently invaded by magnetite and sulphides. Sulphides are present in fine grains of microscopic size disseminated throughout the rock as well as veins which are accompanied by carbonate and fluorite. Pyrite is the main component but trace amounts of arseno-pyrite, galena and chalcopyrite have been recognized microscopically.

The magnetite is believed to be the main source of the surface magnetic anomaly.

Detailed investigations are continuing. The cores have been accepted for storage at the SADME core library. Magnetic susceptability and specific gravity measurements will be made prior to analytical sampling.

An expenditure statement showing the distribution of the $97,814 spent during the quarter is enclosed.

JL Curtis
Snr Geologist


M10
EL 722 BILLEROO WEST
M1
BWM1A-1
Reduced
Redox Zone
M2
Curnamona
Channel
Oxidized
Goulds Dam
M8
Billeroo West
Channel
M9
N
EL722 BILLEROO WEST

BRISBANE.

31st March, 1981.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 28.2.81

REF : AC/MDE

	$	$
Geophysical and Geological Costs		
Salaries and Wages	31,715	
Consultants Fees	2,649	
Drafting Supplies, etc.	1,532	
Geophysics Contractor - Logging	19,052	
Geophysics Contractor - Other	450	
Surveying Contractor	16,082	
Surveying Consumables	50	71,530
Drilling Costs		
Drilling Contractor	11,035	
Access and Line Clearing	4,350	
Drilling Consumables	1,149	16,534
Logistics		
Travel and Accommodation	1,542	
Vehicle Hire	7,567	
Communications	255	
Freight	119	
Equipment Hire	216	
General Expenses	114	
Rents on Prospecting Areas	(63)	9,750
		$97,814

G. B. Monk,
Accountant.

QUARTERLY REPORT
EL 722 BILLEROO WEST
SOUTH AUSTRALIA

QUARTER ENDED 14.6.81

1. DIAMOND DRILLING ANOMALY M1

Drilling hole BWM1A-1 continued during the quarter from 405 metres to a total depth of 600 metres. The acid volcanic sequence intersected at 391 metres beneath a compressed shelf facies sequence of Adelaidean sediments continued relatively unchanged to total depth. The rock is a fine grained pink suite of tuffs, volcanic breccias and intrusive and extrusive lavas. Very fine sulphides (microscopic) are disseminated throughout as well as concentrated in veins with carbonate and flourite - evidence of hydrothermal activity. Pyrite is the principal sulphide with trace arsenopyrite and galena recognized microscopically.

The hole was logged to 491 metres for gamma, sp, resistivity and neutron response and density to 600 metres. Magnetic susceptibility and specific gravity measurements have been completed along the full length of core. The very high magnetite content is now believed to explain the source of the surface magnetic anomaly.

The core has been accepted for storage at the SADME core library. Geochemical sampling of ¼ cores of representative lithologies has been made and samples will shortly be submitted for analyses.

Plotting of geophysical measurements was carried out and a lithological stratigraphic column prepared. Modelling using the geophysical measurements taken from drill cores is being carried out by J Ashley of Perth.

Corrections to gravity data on anomalies M8 and M2 are completed by Geoex and a report is expected shortly.

2. ASSESSMENT OF TERTIARY PALAEOCHANNELS

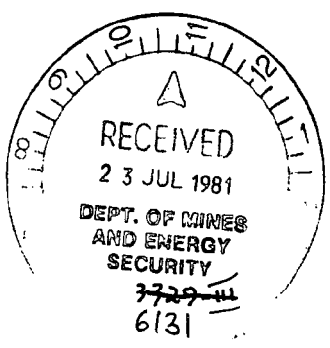
A report on the 1980 exploration drilling programme is near completion. There was no progress on the 1980 Goulds Dam drilling programme due to other work commitments.

3. EXPENDITURE

Please find enclosed an expenditure statement for the quarter ended 14.6.81.

M. Flook

M FLOOK
PROJECT GEOLOGIST



BRISBANE.

7th July, 1981.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 14.6.81

REF: AC/MDE

	$	$
Geophysical and Geological Costs		
Salaries and Wages	21,537	
Consultants Fees		
Drafting Supplies, etc.	1,202	
Geophysics Contractor - Logging	7,753	
Geophysics Contractor - Other	3,993	
Other Technical Services	197	34,682
Drilling Costs		
Drilling Contractor	37,793	
Access and Line Clearing	960	38,753
Logistics		
Travel & Accommodation	2,307	
Vehicle Hire	1,914	
Communications	539	
Freight	137	
Equipment Hire	30	
General Expenses	32	4,959
		$78,394

G.B. Monk,
Group Chief Accountant.

QUARTERLY REPORT

EL 722 BILLEROO WEST

SOUTH AUSTRALIA

QUARTER ENDED 14.9.81

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending on 14.9.82. Under the terms of a joint venture agreement interest is held at 51% by CSR Limited and 49% by Minad-Teton Australia. Since the joint venture agreement was written Mines Administration Pty Limited (Minad) has become a wholly owned subsidiary of CSR Limited through AAR Limited and Teton Australia Pty Ltd has become jointly owned by Teton Exploration Drilling Co of the USA and North Kalgurli Mines NL of Western Australia.

During the period evaluation work on the Billeroo West Palaeochannel and Goulds Dam Uranium Prospects has continued. A report on the 1980 drilling on the Palaeochannel is nearing completion.

During the period evaluation of drilling at geophysical anomaly M1 continued. Both geophysical modelling and geological assessment are incomplete. A major pumping test was also carried out on the drill hole in the hope that water might prove suitable for the Honeymoon Project. The results were disappointing and inconclusive. Analytical results are appended.

Geophysical surveys carried out since late 1980 on magnetic anomalies M2 and M8 were reported by Geox Pty Ltd. The results were evaluated by A Mills using computer modelling techniques. Anomaly M2 appears to have no gravity signature and seems to lie at depths in excess of 2000 metres. It is regarded as an unattractive drilling target at this time but will be reconsidered at a later date.

Anomaly M8 has irregularities in the gravity field which can be interpreted as real anomalies or as instrumental in origin due to the manner in which the field programme was carried out.

Depths in the order of 1500 to 2500 metres are possible for this anomaly because of its asymetrical profile. Two possible geological causes could explain the gravity anomalies. A small change in the morphology of the Cambrian/Tertiary unconformity or alternatively small elongate masses at depths of about 500 metres. The former possibility is favoured and the target is considered too deep to be an attractive drilling target at this time but it will be reconsidered at a later date. A Mills report on M8 is appended.

An expenditure of $16,058 was incurred. A statement is enclosed.

Lindsay Curtis

JL CURTIS
SNR GEOLOGIST SA
MINES ADMINISTRATION PTY LIMITED

BRISBANE.

28th October, 1981.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 14/9/81

REF: AC/MDE

GEOPHYSICAL & GEOLOGICAL COSTS	$	$
Salaries & Wages	13,899	
Consultants Fees	1,068	
Drafting Supplies, etc.	405	
Laboratory	310	15,682
LOGISTICS		
Travel & Accommodation	29	
Communications	214	
Freight	17	
Equipment Hire	116	376
		16,058

G.T. Hall,
Accountant.

ANALYTICAL RESULTS

P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

0137

Samples from:
Area:
Samples of:
Preparation:
Batch No.: A

Sheet No.:
Date:

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	T.D.S. g/l
H 15101	41.454
H 15110	36.944
H 15113	35.774
H 15116	35.676

Water Samples from pumping BWM1A-1 borehole drilled by Mirad Exploration Section early 1981.

Pumping took place July, 1981 as part of project to find good quality water suitable for the Honeymoon Project

ANALYTICAL METHODS:

Samples from: Minad

Area:

Samples of: Waters

Preparation:

Batch No.: A 4216

0138

Sheet No.: 1

Date: 7.10.81

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	U ppb
15101	26
15110	30
15113	22
15116	28

ANALYTICAL METHODS: U determined by Fluorimetry.

NATA

REPORT ON MINAD M8 AREA GRAVITY DATA

The Bouguer gravity map of area M8 is dominated by a steep regional gradient dipping to the south west. The removal of this gradient (fig. 1) reveals the presence of two small, elongate gravity highs situated directly above the magnetic anomaly. These features strike approximately north-south (which may be due partially to the grid orientation) and have peak residual values of approximately 0.35 mgals and 0.5 mgals. Because of the small amplitude of these anomalies, the definition of the regional gradient is critical. Due to the inadequate extent of the grid to the north and east this is defined from trends in the west of the area and on the 1:250 000 CURNAMONA Bouguer gravity map.

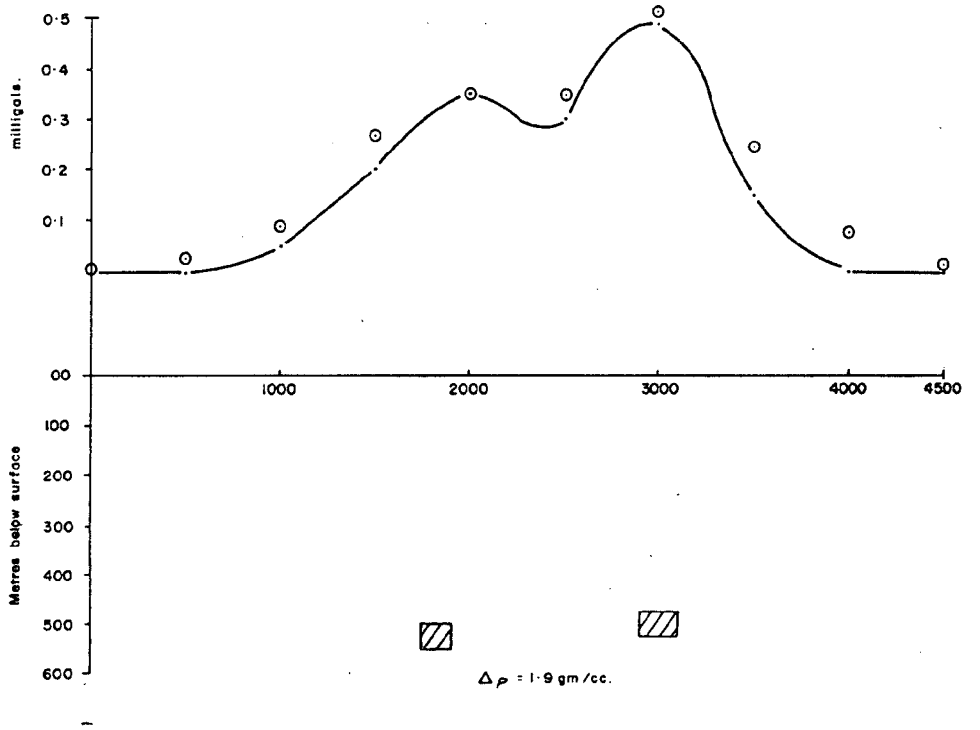
An east-west profile was drawn through the apparent centre of the two peaks to model. The first model assumed that the gravity anomalies were due solely to density variations in the sediments above the magnetic source; these are the most probable causes. Figure 2. shows a small sedimentary basin at a depth of 100m below ground level with a density contrast of 0.25 gms/cc, which fully accounts for the excess mass observed. Conversely, a small rise in the Cambrian-Tertiary boundary at the same location would also account for the excess mass, and the density contrast is about right for this interface.

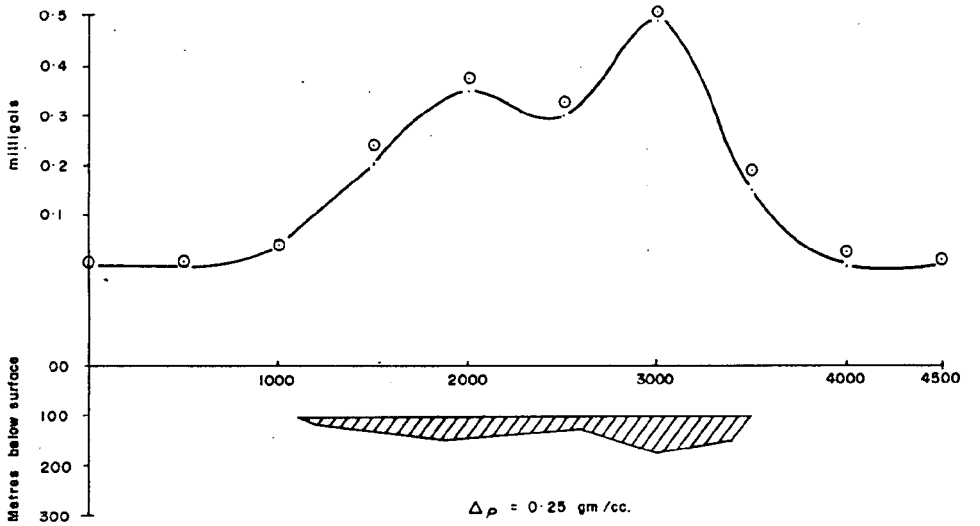
An attempt was then made to find a density contrast for the second magnetic model to fit this curve. Resultant curves were found to be totally unacceptable. A Roxby Downs type model was then assumed with two mineralized zones sitting

well above the basement. An initial contrast of 1.6 gm/cc was used, having been taken from the case history of the Elura orebody[1]. The final model (fig.3) shows two zones of density contrast 1.9gm/cc at depths of 500m and 475m. Although this model roughly fits the profile, the elongate shapes of the anomalies are not suggestive of an orebody. The most likely cause of these anomalies is relief on the Cambrian-Tertiary boundary, perhaps reflecting the more deep seated uplifting of the Proterozoic basement.

1. Blackburn, G, 1980. Gravity and Magnetic Surveys - Elura Orebody. In "Geophysics of the Elura Orebody, Cobar, N.S.W." Bull. Aust. Soc. Explor. Geophys. Vol. 11, no. 4, Dec. 1980.

Andrew Mills.





Residual anomaly

⊙ Calculated anomaly

MINES ADMINISTRATION PTY. LIMITED		
Scale: As shown	RESIDUAL GRAVITY	
Geo: J. L. C.	M 8	Fig.
Date: 22/9/81		

QUARTERLY REPORT

EL 722 BILLEROO WEST

SOUTH AUSTRALIA

QUARTER ENDED 14.12.81

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending on 14.9.82. Under the terms of a joint venture agreement interest is held at 51% by CSR Limited and 49% by Minad-Teton Australia. Since the joint venture agreement was written Mines Administration Pty Limited (Minad) has become a wholly owned subsidiary of CSR Limited through AAR Limited and Teton Australia Pty Ltd has become jointly owned by Teton Exploration Drilling Co of the USA and North Kalgurli Mines NL of Western Australia.

During the period evaluation work on the Billeroo West Palaeochannel and Goulds Dam Uranium Prospectshas continued. A report on drilling carried out along the Billeroo Palaeochannel has been completed. The report outlines a uniform stratigraphic subdivision of the palaeo-channel, a dispersed terminal redox interface with related mineralization largely restricted to silty and clay facies of the sediments.

On the basis of a 0.4% eU_3O_8 cut-off and a 0.12 minimum grade thickness product the palaeochannel might have a geological resource of 4000 to 5000 tonnes eU_3O_8 comprising 3,700 tonnes from the terminal redox zone and 1,000 or so tonnes from the Goulds Dam Prospect to the south.

Of this resource very little is likely to be recoverable by solution mining technology. However there is a limited potential for an as yet undetected narrow "roll over" mineralized zone in coarse permeable sand which would be amenable to solution mining and could have escaped detection because of the wide drill hole spacing.

At present it is planned to restrict further work to the Goulds Dam Prospect and evaluate this project against the the Honeymoon Project Pilot Plant operations.

On going AMIRA hydrological studies have been extended during the last quarter by Dr B Dickson of the CSIRO who sampled a number of water bores.

Evaluation of geophysical anomalies during the period continued with further geophysical modelling of anomaly M1 by J Ashley, and geochemical sampling of drill cores. There are several possible geophysical interpretations when the down hole geophysical measurements and geological constraints are applied to the surface field data. There is a potential for a major metals concentration 1000m or so below surface that warrants further assessment.

Analytical data received shows small basemetal levels associated with sulphide veining in basement volcanics.

A sirotem survey conducted during April 1981 over anomaly M1 with inconclusive results has been reported by Geox.

With the passage of time an overall perspective of the Frome Embayment has become desirable to establish a regional setting for the geophysical targets on Billeroo West and the adjoining licences in which interest is held by the company. A Frome Embayment Study has been initiated by commissioning Robertson Research to carry out a Landsat Photo-Lineament study on the premise that Proterozoic Basement structures that may be related to mineralization would be over printed through Adelaidian, Cambrian and Tertiary cover rocks. The study lends support to the thesis and suggests hitherto unrecognized structural trends may be present. Further work collating this study with previous similar studies in South Australia and structural linears discernable in geophysical data is envisaged.

Reports referred to above accompany this report.

An expenditure of $10,282 was incurred during the quarter. A detailed break down of these expenses is included.

JL CURTIS
Snr Geologist SA
for MINES ADMINISTRATION PTY LIMITED

Brisbane.
23 December, 1981

MINES ADMINISTRATION PTY. LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 14.12.81

REF: AC/MDE

GEOLOGICAL & GEOPHYSICAL COSTS		
Salaries & Wages	4,432	
Consultants Fees	1,566	
Drafting Supplies etc.	492	
Geophysics Contractor - Other	1,828	
Laboratory	877	9,195
DRILLING COSTS		
Drilling Consumables	218	218
LOGISTICS		
Travel & Accommodation	68	
Communications	158	
Freight	43	
Equipment Hire	550	
Legal Expenses	50	869
		10,282

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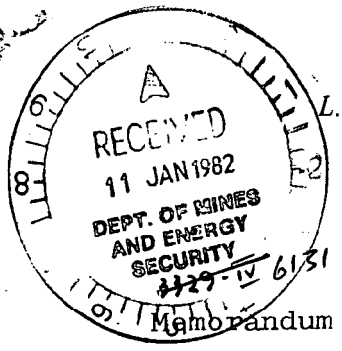
G.T. HALL
Accountant



ASHLEY GEOPHYSICS

L. 518 Aldersyde Road, Bickley, W.A. 6076.

Tel: (09) 293 1451

20th October 1981

Memorandum to: L.Curtis

Subject : Gravity Modelling, M1 Anomaly.

Further to your letter of 10th August, and our discussions at the ASEG Conference, some additional modelling of the gravity data over the M1 Anomaly has been carried out.

Two models are presented in the attached diagram; one is coincident with the flat-lying portion of the magnetic model and the other is a thin flat-lying sheet located more or less directly above the main portion of the magnetic model.

The former model has density contrast of 0.4gm/cc with the Adelaidean sediments ie it has density of ~3.1gm/cc. The fit with the observed (residual) anomaly is not particularly good and would be improved if the southern part of the model was at shallower depth (as suspected from the magnetic modelling). If this model is correct then the source rocks are different from those intersected in BWMIA (density 2.77gm/cc).

The second model has density contrast of 1.0gm/cc (ie density of ~3.7gm/cc) and fits the observed data quite well. The density of this model is typical of the hematite breccia at Roxby Downs; such breccias are essentially non-magnetic and the gravity model is spatially well located in this regard ie it overlies the main magnetic source and underlies the magnetic volcanics intersected in the drillhole.

The modelling of the M1 geophysical data may be summarised as follows:

1. The magnetic rocks (altered volcanics) intersected in drillhole BWMIA produce a 'local' magnetic anomaly of ~500nT superimposed on the 'main' M1 magnetic anomaly.

2. If the entire M1 magnetic anomaly is due to rocks similar to those intersected in BWMIA then the main magnetic source is a flat lying volcanic pile, of average thickness ~500m at depth ~900m, with probably

an associated volcanic vent near the northern margin of the pile.

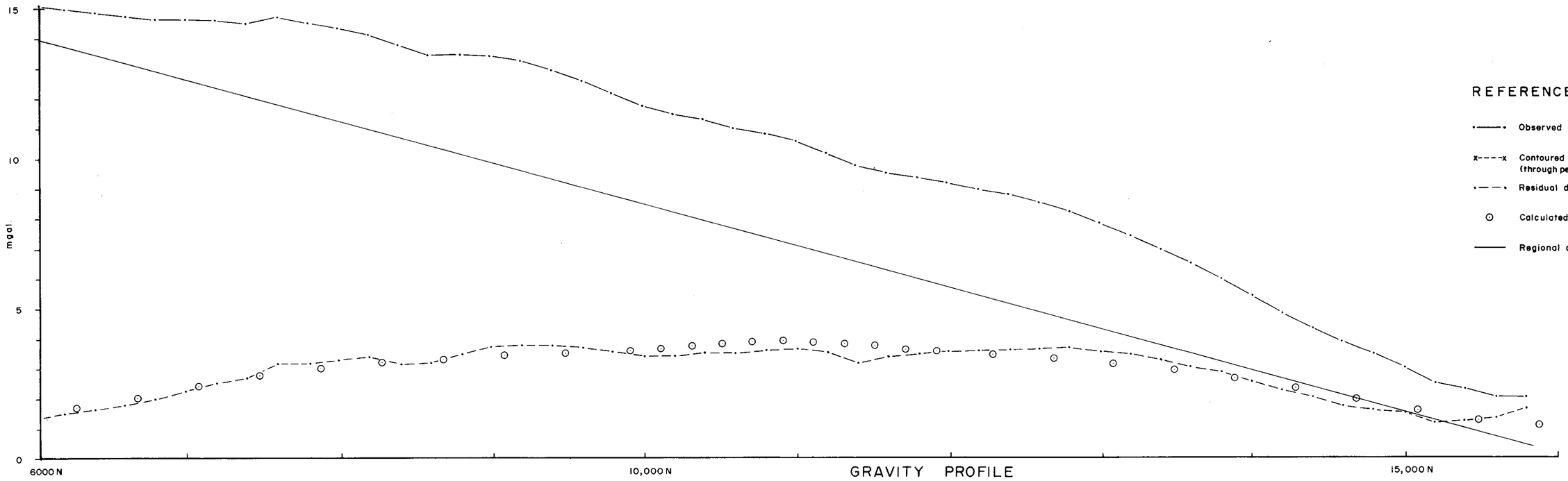
3. A residual gravity anomaly of ~3mgals is more or less coincident with the M1 magnetic anomaly. This anomaly cannot be explained by a flat lying volcanic pile composed of magnetic volcanics as intersected in BWMIA (the measured density of these rocks is 2.77gm/cc; the volcanic pile should have density of 3.1gm/cc to explain the gravity anomaly).

4. The gravity and magnetic anomalies can have a common source if the latter is a large plug-like (ie depth extensive) intrusive body. In this case the source would be considerably less magnetic than the magnetic volcanics in BWMIA.

5. The gravity anomaly could be explained by doming of the Cambrian sediments above the 'volcanic pile' - this is considered unlikely on geological evidence which indicates gently north-dipping Cambrian sediments.

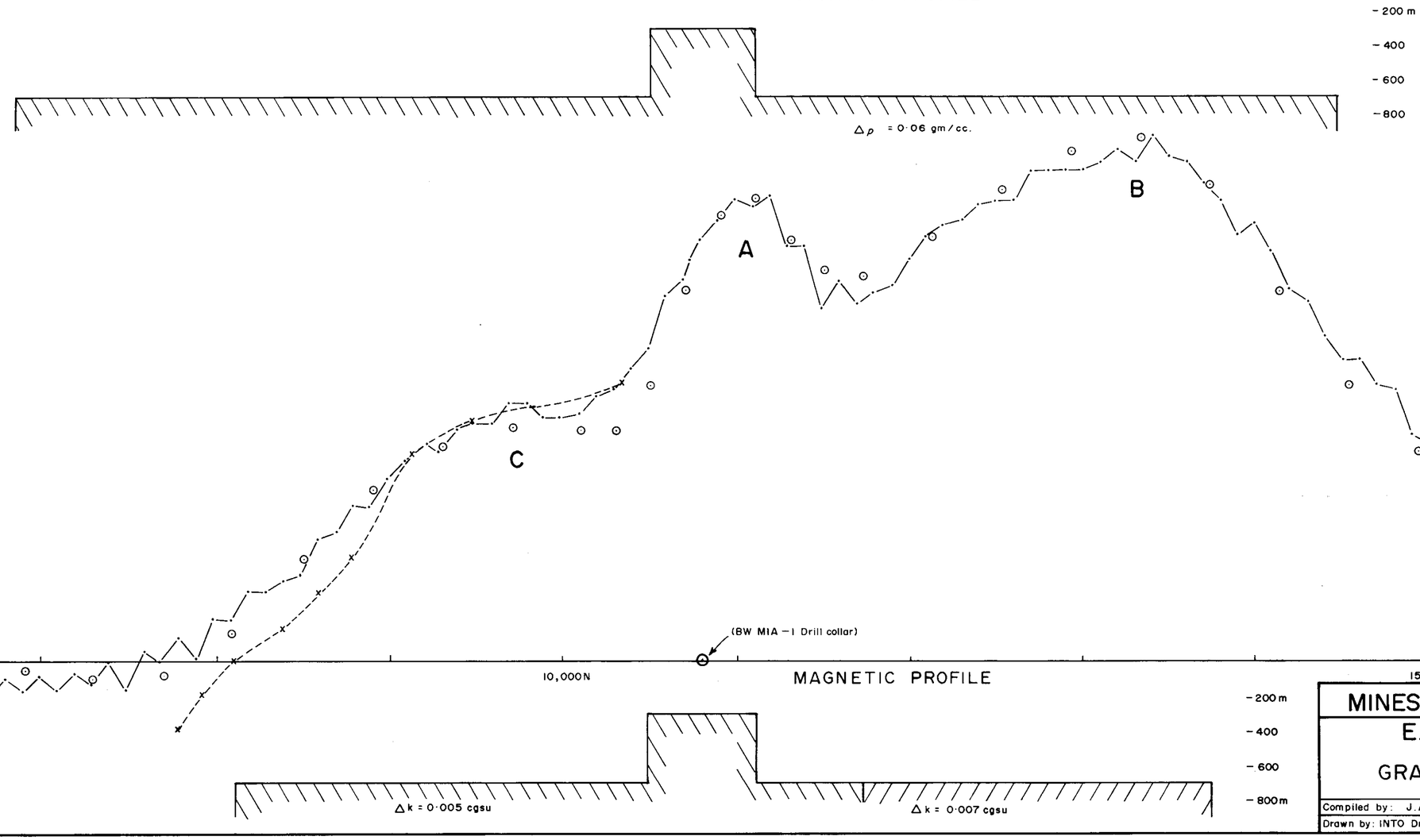
6. The gravity anomaly can be explained by a layer of high density rocks (density ~3.7gm/cc) overlying the 'volcanic pile' and underlying the magnetic volcanics intersected in BWMIA. Such heavy rocks would be consistent with 'Roxby Downs type' hematitic breccias.

J.Ashley



REFERENCE

- Observed data
- Contoured data (through peak of Canomaly)
- Residual data
- Calculated data
- Regional data

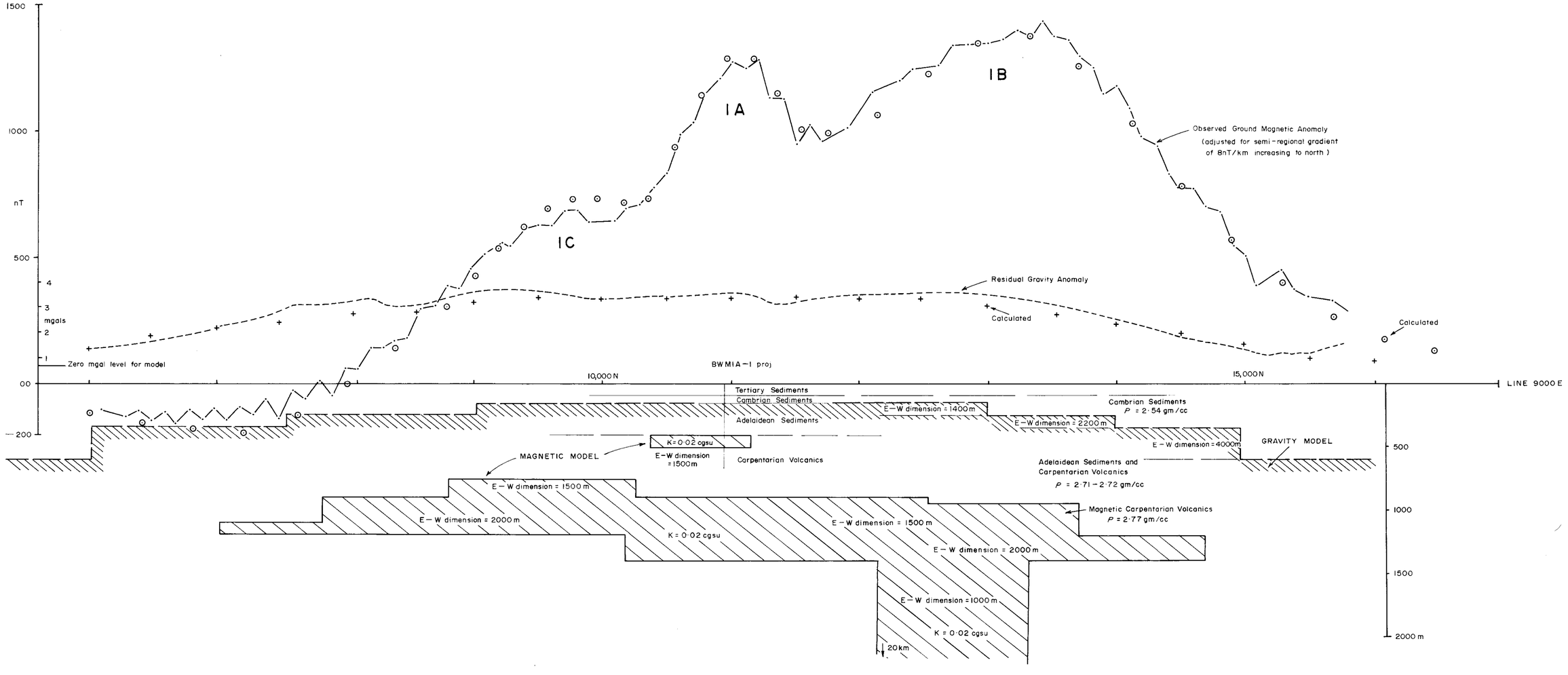


6131-17

MINES ADMINISTRATION PTY. LIMITED.

E.L.722 – BILLEROO WEST
ANOMALY M1
GRAVITY AND MAGNETIC PROFILES
LINE 9000E

Compiled by: J. Ashley	Scale: 1:20,000	Dwg. N°.	Plate:
Drawn by: INTO Drafting	Date: May, 1981	Project: B.W.	



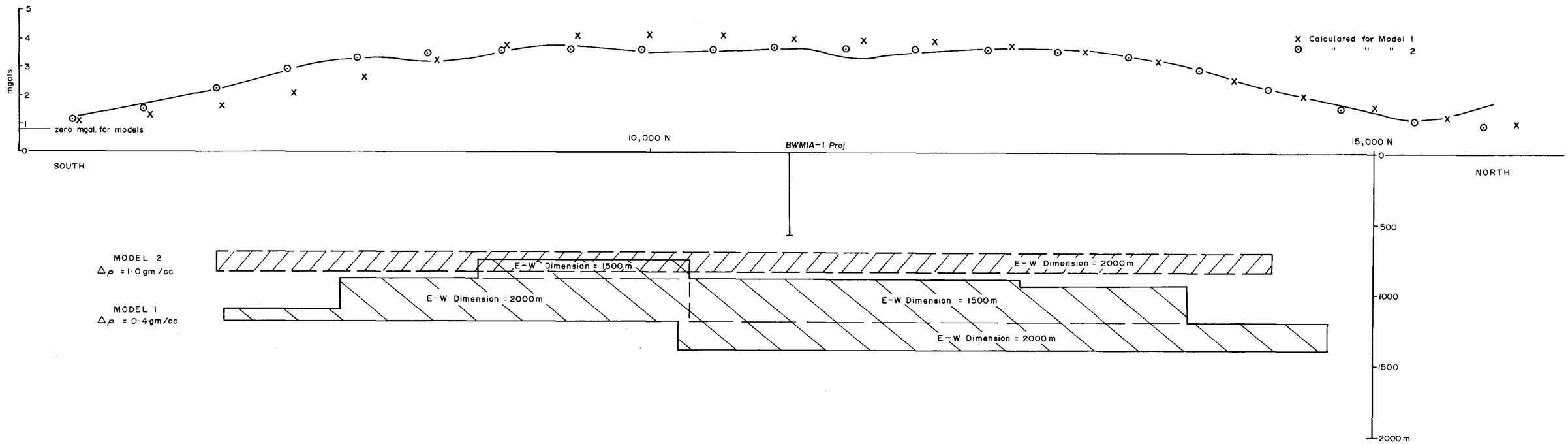
K = Magnetic susceptability

P = Density

MINES ADMINISTRATION PTY. LIMITED		
Scale, 1:20,000	LINE 9000E MAGNETIC AND GRAVITY MODELLING OF ANOMALY M1 E.L. 722 - BILLEROO WEST	Fig
Geo, J. Ashley		
Date, July 1981		

6131-18

LINE 9000 E



6131-19

MINES ADMINISTRATION PTY. LIMITED	
Scale: 1:20,000	GRAVITY MODELLING OF ANOMALY M1 E.L.722 — BILLEROO WEST
Geo:	
Date: Nov. 1981	Fig.

ROBERTSON RESEARCH (AUSTRALIA) PTY LIMITED

PROJECT NO. 1751

TECHNICAL MEMORANDUM 1212

NOTES ON A LANDSAT LINEAMENT STUDY OF THE LAKE FROM REGION FOR MINES ADMINISTRATION PTY LTD

1. INTRODUCTION

The project was commissioned by Mines Administration Pty. Ltd. based on the Robertson Research Australia Proposal No. 446. CSIRO Mineral Physics Computer Enhanced 1:250,000 colour prints were obtained for interpretation. The original interpretation overlays provide the basic data with additional geological boundaries compiled from the 1:250,000 geological map series, a compilation of the lineaments at the scale of 1:1,000,000 is attached (Enclosure 1).

2. LINEAMENT GROUPS

(i) Broken Hill Area

NNW-trending lineaments predominate and mark most notably the boundaries between Adelaidean sediments and the crystalline Willyama Complex basement. The complementary ENE direction is seen as the Darling River lineament and along the northern end of the Balcannia Graben.

A group of north-trending lineaments marks the northwest margin of the Broken Hill Block and a "platform area" of Adelaidean on the margin of the Frome Embayment.

West of Broken Hill NNE-trending lineaments mark the boundary between crystalline basement and younger cover rocks, and this tectonic direction is prominent in the Olary Province of the Broken Hill Block.

(ii) Lake Frome Area

This region of the Frome Embayment has a complex interplay of lineaments indicating a complex tectonic history. Three domains may be delineated:-

(a) South of Lake Frome there is a region of dense intersecting northeast (Adelaidean-Kanmantoo deformation) and northwest (Willyama, e.g. Macdonald Shears) trends. A boundary between the areas where each lineament direction is dominant lies approximately along the southerly extension of the Poontana Fault, albeit with a SSW-NNE alignment.

(b) Lake Frome is bordered on the west by a northeast-trending lineament, but the most significant trends are the Poontana Fault line (a faint Landsat linear at the northern end) and the parallel normal fault (and Landsat lineament) along the eastern shore of the lake. Just south of Beverley there is a distinct east-west lineament zone (made by drainage) which is coincident with a major east-west magnetic lineament. The magnetic lineament zone extends from the western margin of the Stuart Shelf through Olympic Dam, the southern boundary of the Mt. Painter Block and north of the ill-defined Benageric Ridge.

(c) North of Lake Frome and north and east of the Mt. Painter Block there is an area with a poor lineament pattern, bounded to the east by north-south lineaments following the drainage between Lake Callabonna and Lake Frome. This area has three zones of NE-trending lineaments terminated by a strong NW-orientated lineament along the Lake Gregory-Lake Callabonna line (with a parallel magnetic lineament).

(iii) Adelaide Fold Belt

West of the Frome Embayment the major lineament direction is northeast, probably reflecting the major shear component of the basement deformation during Kanmantoo folding. A particularly dense zone of lineaments extends southwest of Lake Frome across the Palachilna Sheet. There is some evidence for this line cutting obliquely across the northern part of the Benambric Ridge.

3. NOTES ON BASEMENT GEOLOGY

(i) Lower Proterozoic

Economic mineralisation of this epoch in the region surrounding Lake Frome is represented by the stratiform Pb-Zn-Ag lodes of Broken Hill. Could there be repetitions of this mineralisation underlying the Mesozoic-Tertiary and older cover rocks of the Frome Embayment? The structural deformation of the Broken Hill region has been ably described recently by Marjoribanks et al. (1980) and they indicate that the Broken Hill lodes are located in their present position due to a major F1 period of recumbent folding with a root zone for the lodes southeast of Broken Hill in the Darling Range area. And the obvious place to explore for repetitions would be to the southeast of this root zone area where remnants of the complementary (mirror image) folds may exist (Marjoribanks et al., 1980, Figure 12).

It may be conjectured that the genesis of the stratiform mineralisation may be related to the model proposed by Russell et al. (1981) forming in a (?)NE-trending graben or dilational fault controlled zone within the perhaps much broader flysch basin, the most obvious analagous deposit being the Middle Proterozoic Sullivan Pb-Zn mineralisation in British Columbia. It is not difficult to envisage such a dilational zone becoming the focus for a migmatite plume and recumbent folds.

Northwest of Broken Hill there appears to be:-

(a) no structural evidence for a Darling Range type root zone from which recumbent folds may have been derived.

(b) little evidence for significant stratiform Pb-Zn mineralisation. The "Mine Series" terminology used by Stevens et al. (1979) is considered to provide a misleading impression of the potential of this region, except for the Umberumberka mineralisation adjacent to the Mundi-Mundi boundary fault which is clearly a regionally important feature.

Southwest of the Broken Hill region in the Olary Province of South Australia, the Willyama Complex is dominantly granitoid and it seems entirely possible that this area represents the exposed part of a central migmatitic granitoid zone in the Lower Proterozoic "Willyama Mobile Belt" adjacent to the Archaean Gawler cratonic nucleus. The Benagerie Ridge would be inferred to be the northern extension of this migmatitic axial zone. And it is worth noting that the magnetic feature drilled at ETM5A-1 in the southern part of the Ridge comprised volcanics, presumably unmetamorphosed, thus postdating the Willyama (i.e. Carpentarian or Adelaidean) and providing an explanation for the significant magnetic signature in this area; otherwise, the signature could be Willyama meta-ironstones similar to those of the Broken Hill area and of considerable interest.

Thus, trying to locate Broken Hill lodes in the Willyama Complex basement west of the exposed Broken Hill Block appears to be a highly speculative and doubtful project. It is reasonable to suppose that the structural framework established by cratonisation in the Willyama Orogeny has controlled the subsequent intra-cratonic volcano-sedimentary regime in the Carpentarian and Adelaidean, and this framework may be evident in the Landsat lineament picture. But there are no obvious domains of "Willyama" type lineaments as opposed to Carpentarian or Adelaidean domains.

(ii) Carpentarian

The Olympic Dam Cu-U mineralisation appears almost certain to be related to pre-Adelaidean unmetamorphosed clastics with a related volcanic component, and thus may well be related in approximate age to the post-orogenic granites and undeformed volcanics found in the Gawler Ranges (~1,500my) and the granitic breccias at Roxby Downs may be inferred to have a (?post) 1,500my age. Also, Carpentarian associated copper mineralisation is known from ~~the~~ Yorke Peninsula at Wallaroo.

Undeformed volcanics with chemically similar bimodal characteristics have been located in deep drillholes in the Benagerie Ridge in the Frome Embayment at Mudguard No. 1, Bumbarlow No. 1 (Giles and Teale, 1979,1981) and probably BWM1A-1 and ETMSA-1 (Lindsay Curtis, pers. comm.). These volcanics west of the Adelaide Fold Belt have a basic component and an age (~1,360my) similar to the Roopena Volcanics south of the Gawler Range.

The Carpentarian epoch, post 1,800 to 1,700my, hosts major stratiform mineralisation in the Mt. Isa region and at McArthur River in dilational intra-cratonic basins with mainly N-S and E-W vectors characterised admittedly by carbonate sedimentation but also with bimodal volcanism (e.g. Eastern Creek tholeiites, tuffs in the Mt. Isa shales and in the HYC sub-basin at McArthur River).

This geological period thus appears attractive for stratiform mineralisation and the recent discovery of the Olympic Dam mineralisation ~~and the recent discovery of the Olympic Dam mineralisation~~ in South Australia enhances the importance of rocks of this age in the Lake Frome region.

However, a strictly chronostratigraphic relationship has not been established between the 1,360my volcanics in the Frome Embayment and the mineralising event(s) on the Stuart Shelf at Olympic Dam.

Recent deep drilling in the region indicates the wide distribution of Carpentarian volcanics, but the Landsat alone provides no evidence for their distribution.

(iii) Adelaidean

The Benagerie Ridge is defined by the absence of Adelaidean sediments beneath the Mesozoic-Tertiary cover of the Frome Embayment. The southern part of the Ridge, south of 31°S, has 400+ metres of Adelaidean cover at BWM1A-1 and ETM5A-1. Therefore, the Ridge may retract to the east or contain a downfaulted trough of Adelaidean in the southern sector (Enclosure 2).

4. CONCLUSIONS

Perhaps two major factors preclude this Landsat study from providing definitive information to assist in the definition of exploration targets in the basement terrain of the Frome Embayment:-

(1) The transported material of the sand plain and dune country east of Lake Frome and the alluvium cover west of Lake Frome from the Flinders Ranges.

(2) The complex fracture system of the region which was initiated in the Willyama Orogeny and is demonstrated by the NW, NE and E-trending directions of narrow retrogressive schist zones in the Broken Hill Block. Subsequent reactivation of these primary lines of weakness was common during "block tectonics" of dilational stress regimes during sedimentation and volcanism and during orogeny with compressional probably dominant strike dip deformation.

It may be inferred that if major mineralising episodes are essentially syn-depositional, then they are associated with dilational tectonic regimes. In the Lake Frome region the area south of Lake Frome looks to be an area of complex fracturing with a three-point convergence of NE, NW, N-trending lineaments typical of major dilational regimes with regional doming.

During the Carpentarian throughout Australia the N-S and E-W trends appear to be the dominant direction and there appears to be evidence for these directions being important in South Australia. Thus, in the Frome Embayment the N-S Frome graben with E-W magnetic linears is the focus of these tectonic directions. A secondary zone of N-S sediments also occurs along the western margin of the Embayment bordering the northwest margin of the Broken Hill Block.

5. REFERENCES

Giles, C.W. and Teale, G.S., 1979. "The Geochemistry of Proterozoic Acid Volcanics from the Frome Basin", Geol. Surv. South Australia, Quart. Geol. Notes 71, p. 13-18.

Giles, C.W. and Teale, G.S., 1981. "An Investigation of Altered Volcanic Rock in Bumbarton 1", Geol. Surv. South Australia, Quart.Geol.Notes 78,pp.4-10.

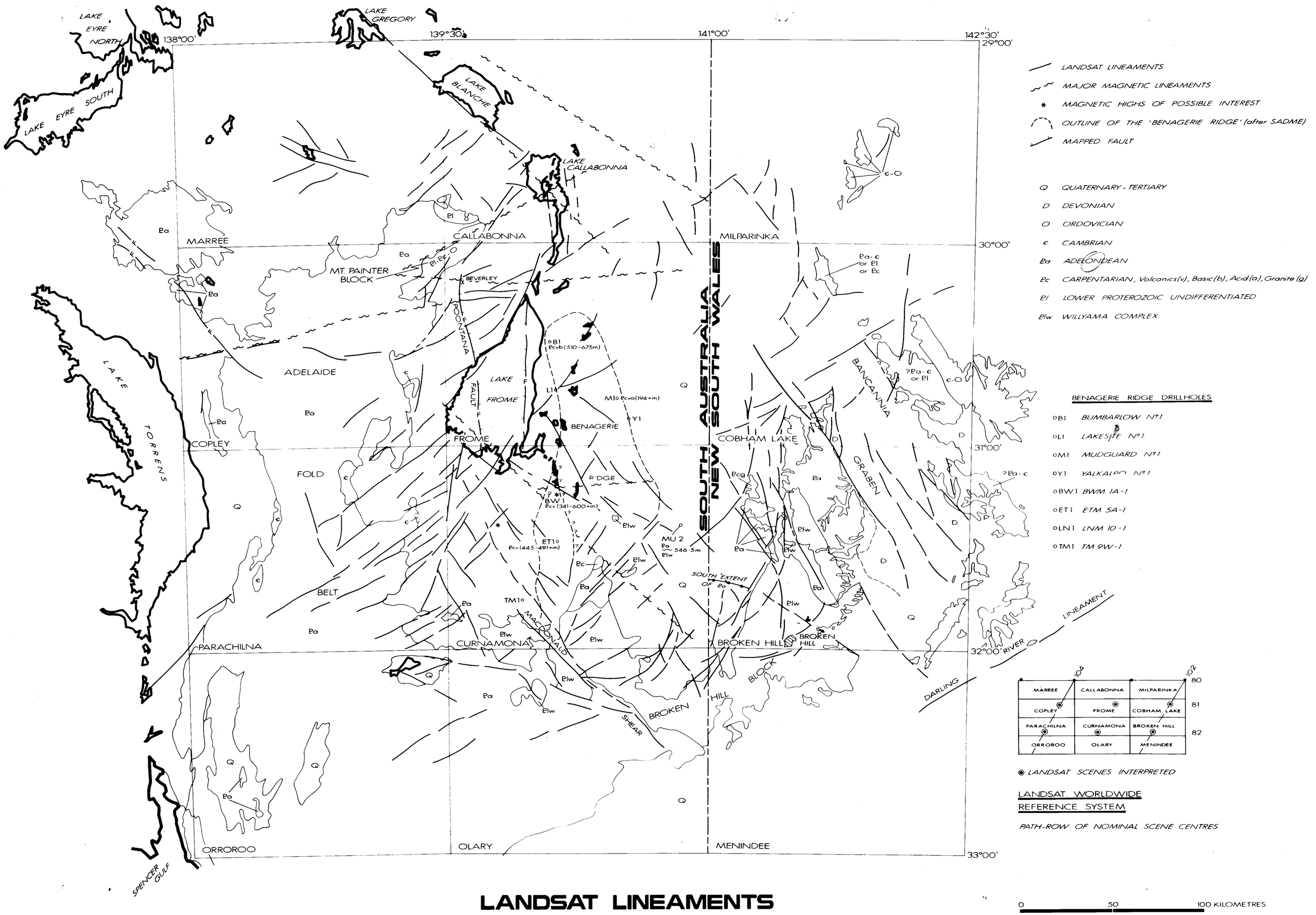
Marjoribanks, R.W., Rutland, R.W.R., Glen, R.A. and Laing, W.P., 1980. "The Structure and Tectonic Evolution of the Broken Hill Region (Australia). Precambrian Res. 13.

Russell, M.J., Solomon, M. and Walshe, J.L., 1981. "The Genesis of Major Exhalative Lead-Zinc Deposits", Mineralium Deposita, in press.

Stevens, B.P.J. et al., 1979. "A Guide to the Stratigraphy and Mineralisation of the Broken Hill Block", Geol. Surv. New South Wales, Rept. GS 1979/062.

12 October 1981

CMT/MZ



- LANDSAT LINEAMENTS
- MAJOR MAGNETIC LINEAMENTS
- MAGNETIC HIGHS OF POSSIBLE INTEREST
- OUTLINE OF THE 'BENAGERIE RIDGE' (after SADME)
- MAPPED FAULT

- Q QUATERNARY - TERTIARY
- D DEVONIAN
- O ORDOVICIAN
- C CAMBRIAN
- Ba ADELONDEAN
- Pc CARPENTARIAN, Volcanics(v), Basic(b), Acid(a), Granite(g)
- Pl LOWER PROTEROZOIC UNDIFFERENTIATED
- Plw WILLYAMA COMPLEX

BENAGERIE RIDGE DRILLHOLES

- oB1 BUMBARLOW Nº1
- oL1 LAKESITE Nº1
- oM1 MUDGUARD Nº1
- oY1 YALKALPO Nº1
- oBW1 BWM 1A-1
- oET1 ETM 5A-1
- oLN1 LNM 10-1
- oTM1 TM 9W-1

104		102	
MARREE	CALLABONNA	MILPARINKA	80
COPLEY	FROME	COBHAM LAKE	81
PARACHILNA	CURNAMONA	BROKEN HILL	82
ORRORROO	OLARY	MENINDEE	

◉ LANDSAT SCENES INTERPRETED

LANDSAT WORLDWIDE REFERENCE SYSTEM

PATH-ROW OF NOMINAL SCENE CENTRES

LANDSAT LINEAMENTS LAKE FROME REGION

0 50 100 KILOMETRES

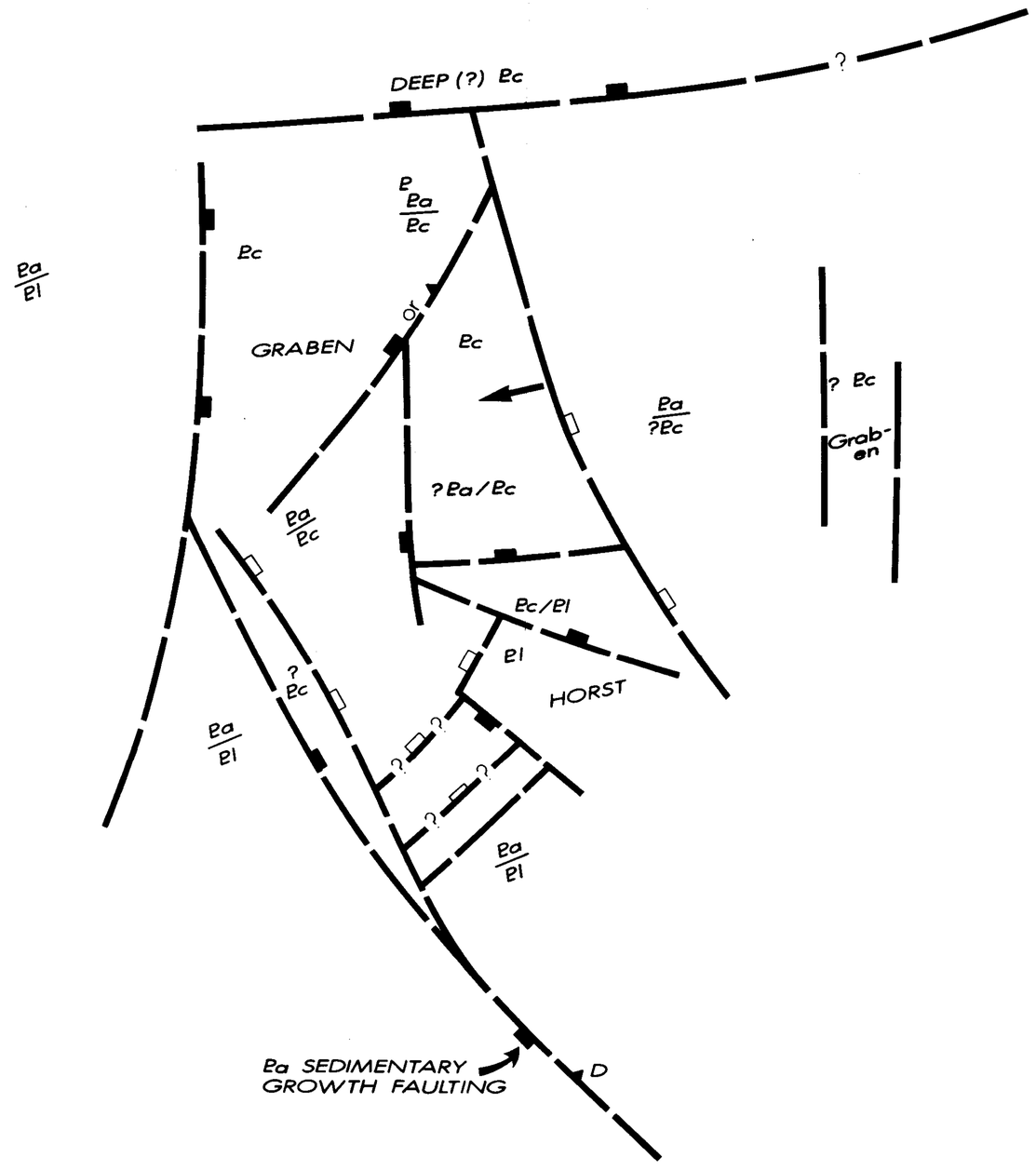
SCALE 1:1000000

PREPARED BY ROBERTSON RESEARCH AUSTRALIA
FOR MINES ADMINISTRATION PTY LTD
R.R.A. TECHNICAL REPORT 1212

6131-20

ENCLOSURE 1

142°30'



← DIP OF Pc ON BENAGERIE RIDGE – A TILTED HORST BLOCK.

D · DELAMERIAN OROGENIC FAULTING.

POSSIBLE STRUCTURAL ELEMENTS IN THE FROME EMBAYMENT

6131-21

OVERLAY TO ENCLOSURE 1

6131 V.I. ~~Confidential~~

REPORT ON A
TEST SIROTEM TRANSIENT EM SURVEY
AT
LAKE FROME, S.A.
FOR
MINES ADMINISTRATION PTY. LTD.

GEOEX
PTY. LTD.

LIST OF CONTENTS

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APPENDIX

A. SURVEY EQUIPMENT

B. LOOP CONFIGURATIONS

C. DATA PRESENTATION FORMATS

1. INTRODUCTION

Between 26th and 27th April, 1981, a test SIROTEM Transient EM survey was carried out at Lake Frome, South Australia for Mines Administration Pty. Ltd. The party leader was A.P. Indrans with on-site supervision by A.R. Dodds.

2. SURVEY SPECIFICATIONS

The test survey work was done in the area of the M1 magnetic anomaly, located in the Lake Frome area, approximately 150 kilometres west-north-west of Broken Hill. A drillhole which intersected the source of the magnetic anomaly had just been completed and intersected the magnetic material at a depth of rather over 400 metres. The object of the SIROTEM survey was to determine whether the source of the anomaly was detectable from the surface using standard surface SIROTEM techniques and also to determine what sort of response was obtained down the drillhole.

The surface work comprised coverage of a three kilometre long line extending 2 kilometres to the west of the drillhole and 1 kilometre to the east of it. The coincident transmitter receiver loop configuration was used for this work with a loop side of 200 metres and a station interval of 200 metres. This loop configuration is described in the appendix to this report, together with details on the SIROTEM technique in general.

The drillhole survey was done using a 40 mm. SIROTEM receiver probe connected to the SIROTEM instrument via a 4 conductor armoured cable, which was wound onto a Numec winch. The transmitter loop was on surface and comprised a 200 metre

square loop located symmetrically around the drillhole. The probe was initially lowered to the maximum allowable depth, which was 480 metres since the winch only took this amount of cable. Readings were then taken at 20 metre intervals on the way up the hole. Some problems were encountered with the depth indicator on the winch which had a tendency to slip, resulting in the actual depth measurements being somewhat inaccurate. However, they are not expected to be out by more than 10 - 20 metres overall.

The area is very conductive, resulting in many channels of data being readable both down the hole and on surface. A certain amount of electrical noise was evident in both survey techniques, resulting in rather ragged profiles below a level of approximately 10 microvolts per amp. Additionally, the effect of the drill rig which was still present over the hole can be seen in the surface survey data at approximately 99400E.

3. DATA PRESENTATION

The data for both surveys are presented as voltage profiles at a scale of 1:20,000 for the surface survey and 1:1,000 for the borehole survey. The details of these presentations can be seen in the appendix to this report.

4. COMMENTS

The high conductivity levels in the area can be clearly seen in the high responses obtained with the SIROTEM technique. Most of this response results from the background of sediments containing saline groundwater and only channels 12 upwards for the ground survey (delay times of 8.6 milliseconds and

greater) and channels 6 to 24 (2.6 milliseconds to 52.6 milliseconds) for the downhole survey as plotted. The earlier channels only show the response of background materials and particularly those nearer surface and are therefore not expected to yield any interesting results.

The results of the downhole survey show a steadily decreasing voltage response from 130 metres, which was the first reading taken below the casing, down to 480 metres, which was the maximum depth that could be reached with this equipment. This profile is just what would be expected from relatively homogeneous ground, with the response decreasing as the probe moves away from the energising transmitter loop. There is no indication of any variation from this trend other than a rather greater amount of noise in the readings below 350 metres.

The results of the surface survey are likewise generally negative, although the presence of the drill rig has detracted from the thoroughness of the test by superimposing a certain amount of noise on all channels in the main area of interest. However, the pattern seems fairly clear with a relatively flat response over the full 3 kilometres of line, but perhaps a slight increase in conductivity from west to east. The noise in the area of the drill rig is probably not significant since any anomaly would be expected to show through this noise and particularly to show to the west of it where source material is once again expected to occur.

It is therefore concluded that the material intersected in the drillhole is not sufficiently conductive to cause a reponse on this system.* The results of the

* Sirotem is unlikely to detect conductors > 150m away from measuring point in a down-hole measurement.

drillhole survey are fairly conclusive on this point. They also indicate there are no conductors in the vicinity of the drillhole. The surface survey is rather less conclusive, since there are doubts as to whether the penetration of the 200 metre square coincident loops was sufficient to detect conductors at a depth of 400 metres or more. It is possible that by using a larger transmitter loop and possibly a roving receiver that more favourable results might be obtained. However, the results that were obtained indicate that there are no conductors in this area which are detectable with the instrumentation and loop configuration which was used.

Respectfully submitted,
GEOEX PTY. LTD.

A.R. DODDS
Senior Geophysicist

No: 81573

19th November, 1981
pcl

APPENDIX

A. SURVEY EQUIPMENT

The SIROTEM equipment consists of a console, power pack, loop cable and connecting leads. SIROTEM has been designed to measure the transient decay over a larger number of channels than other instruments of this type, and to later time delays than ever previously possible. The particular advantage of later times is the ability to record conductors underlying highly conductive overburden and/or highly conductive surrounding hosts. SIROTEM records the transient over 32 contiguous channels out to a maximum time delay of 165 milliseconds. Table 1 gives the specific delay times for each channel. The instrument is very sensitive and has a low inherent noise. It has a degree of ambient noise rejection capability due to its ability to stack up to 4096 (2^{12}) separate readings to obtain the output average. This is performed simultaneously over all channels so that the background noise is common to all channels at the time of measurement. The readings corrected for output current variation are produced automatically on a printer. As opposed to dial readings, they are thereby objective, operator independent and in ready hard-copy form.

The instrument also has a significant amount of in-built data processing capability due to the incorporation of a microprocessor. Thus apparent resistivities - the resistivity the ground would have, were it homogeneous, to yield the response measured - can optionally be printed out for each channel in addition to the voltages.

B. LOOP CONFIGURATIONS

The standard loop configurations used for SIROTEM surveys are diagrammed in Figure A1.

TABLE A1

CHANNEL DELAY TIMES AND INTEGRATION WIDTHS

Channel No.	Nominal Mean Delay (msecs)	Nominal Width (msecs)	Actual Integration Window (msecs)
1	0.4	0.4	0.25 - 0.6
2	0.8	0.4	0.65 - 1.0
3	1.2	0.4	1.05 - 1.4
4	1.6	0.4	1.45 - 1.8
5	2.0	0.4	1.85 - 2.2
6	2.6	0.8	2.25 - 3.0
7	3.4	0.8	3.05 - 3.8
8	4.2	0.8	3.85 - 4.6
9	5.0	0.8	4.65 - 5.4
10	5.8	0.8	5.45 - 6.2
11	7.0	1.6	6.25 - 7.8
12	8.6	1.6	7.85 - 9.4
13	10.2	1.6	9.45 - 11.0
14	11.8	1.6	11.05 - 12.6
15	13.4	1.6	12.65 - 14.2
16	15.8	3.2	14.25 - 17.4
17	19.0	3.2	17.45 - 20.6
18	22.2	3.2	20.65 - 23.8
19	25.4	3.2	23.85 - 27.0
20	28.6	3.2	27.05 - 30.2
21	33.4	6.4	30.25 - 36.6
22	39.8	6.4	36.65 - 43.0
23	46.2	6.4	43.05 - 49.4
24	52.6	6.4	49.45 - 55.8
25	59.0	6.4	55.85 - 62.2
26	68.6	12.8	62.25 - 75.0
27	81.4	12.8	75.05 - 87.8
28	94.2	12.8	87.85 - 100.6
29	107.0	12.8	100.65 - 113.4
30	119.8	12.8	113.45 - 126.2
31	139.0	25.6	126.25 - 151.8
32	164.6	25.6	151.85 - 177.4

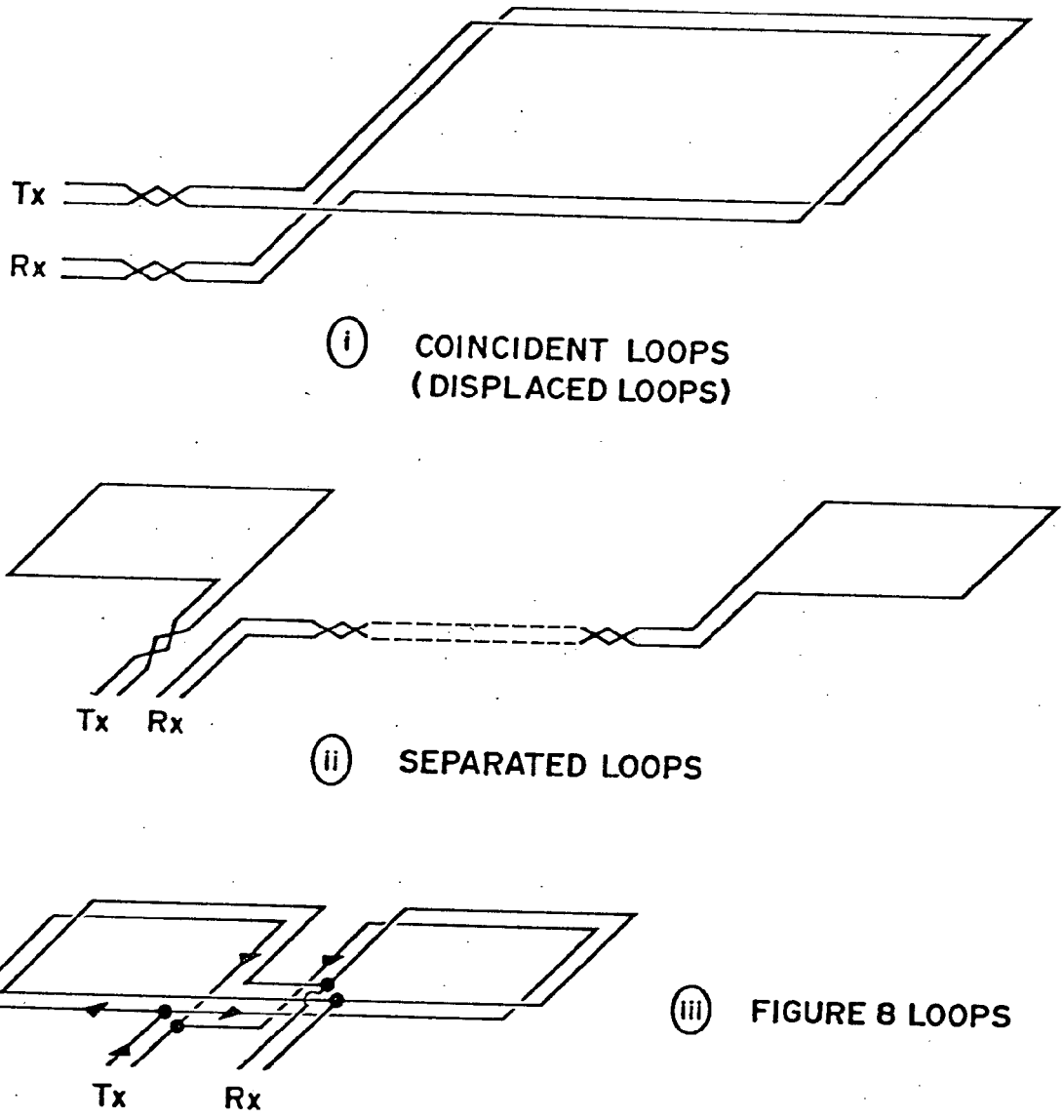

Figure A.1 Loop Configurations.

The most commonly used configuration for reconnaissance work is the coincident transmitter-receiver loop configuration. For this configuration, the transmitter and receiver loops are separated by a negligible distance or may even use the same wire. The loops are normally square with side length ranging from 25 - 200 metres, 100 metres being the most commonly used size. Adequate coverage is normally given by a station spacing of half the loop dimension, that is with a 50% overlap. Results of modelling studies, and experience, indicate that the depth penetration varies with the loop size and is, to an order of magnitude, equal to it. Thus with 100 metre square loops a depth penetration of the order of 100 metres can be expected.

The main advantages of the coincident loop configuration are that the wires are simple to move and thus a satisfactory data production rate can be achieved. Also the resulting data is relatively easy to interpret. The major disadvantage is that the configuration couples well with horizontal conductors, such as conductive overburden, so that the response from steeply dipping bedrock conductors can be swamped in the early channels. However. experience has shown that bedrock conductors usually result in satisfactory anomalies in the later channels, when the response from the overburden has died away. It might also be regarded as a disadvantage that the response for a narrow, steeply dipping conductor can be double-peaked, with a low response when the loops are directly over the conductor and high responses half a loop dimension to either side of the conductor itself. This can make the interpretation less obvious.

A variation of the coincident loop configuration has been devised for situations where the surface resistivities are very high or, more importantly, where strongly magnetic material is present in the immediate vicinity of the surface and close to the wires. This configuration is called the displaced loop configuration and is the same as coincident loops except that the transmitter and receiver loops are

off-set from each other by a distance of approximately 2 metres. Although more cumbersome to use than the coincident loop configuration, this method has the advantage that the results are guaranteed free from the contaminating effects of near-wire materials, and thus encourage more confident and more detailed interpretation.

Another frequently used layout is the separated loop configuration, also shown in Figure A1. For this configuration the transmitter and receiver loops are separated by distance, ranging from 1-3 loop dimensions, the loops themselves being usually 50 or 100 metres square. The station interval varies from a half to one loop dimension.

The separated loop configuration is rather more cumbersome in field use than coincident loops and requires more wire laid out on the ground. However, it has the advantages that it couples less well with conductive overburden, at least in the early channels, and also produces an anomaly directly over the conductor, which can simplify interpretation considerably. It might be regarded as an advantage also that anomalies with this configuration have a negative polarity and frequently stand out more clearly with standard plotting techniques. A disadvantage of the configuration is that the response from a homogeneous or two-layer half space is more complex, with a change in polarity frequently occurring between early and late channels. Additionally the effect of a vertical or steeply dipping change in sub-surface resistivity can cause a response which looks like the anomaly from a discrete conductor.

The third basic loop configuration, which is less commonly used, is the figure eight configuration, as shown in Figure A1-C. This configuration was designed specifically to maintain the advantages of coincident loops, but also increase the coupling to vertical conductors. The wires are

coincident but have a more complex figure eight pattern. The configuration is, therefore quite cumbersome to use in the field, but has the advantages that vertical conductors couple rather better than with coincident loops and, most significantly, an anomaly is produced directly over the conductor, as well as minor anomalies on either side. This configuration is normally only used in detailing or specific interest situations.

C. DATA PRESENTATION FORMATS

The standard data presentation is of the instrument output of normalised transient voltages, in units of microvolt/amp, plotted as profiles for each line, with a linear horizontal distance scale and a logarithmic vertical voltage scale. This convention allows the full range of voltages to be plotted on a reasonable sized graph and still allows the major features on each decay profile to be easily seen. Error bars are plotted to show the range of recorded values for each station and each delay time and provide an estimate of the accuracy of the reading.

One disadvantage of the above plotting technique is that variations in the voltage level from channel to channel are not evident. This can be overcome by calculating the apparent resistivities and plotting these on a resistivity time-distance plot. The horizontal scale is again a linear distance scale. The vertical scale in this case plots the channel delay times on a logarithmic scale. The value of the apparent resistivity is plotted at the intersection of the station location and the relevant channel number, and the results then contoured. Since there is a relationship between the delay time and the depth penetration for a given reading, the resistivity time-distance plots provide the diagramatic representation of the resistivity layering

in the ground in the absence of finite conductors.

It is also possible to plot the apparent resistivities for a given channel on a plan map, thereby showing the lateral variations over the whole grid of the response at a given time delay. On such plan contours the early channels tend to represent the near-surface or overburden resistivity variations while the later channels show more of the bedrock response and less response from the overburden.

MINES ADMINISTRATION PTY LIMITED

QUARTERLY REPORT

EL 722 BILLEROO WEST SOUTH AUSTRALIA

QUARTER ENDED 14TH MARCH 1982

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending on 14.9.82. Under the terms of a Joint Venture agreement interest is held at 51% by CSR Limited and 49% by Minad Teton Australia.

During the period study of landsat imagery, geological, aeromagnetic and gravity data has been undertaken to identify any structural trends that could have influenced the location of ore bodies that may be present.

Reporting of deep drilling activities and 1980 drilling at Goulds Dam is contemplated by mid year.

An expenditure of $5,983 was incurred during the quarter. A detailed break down of these expenses is enclosed.

J L Curtis
Snr Geologist SA
for MINES ADMINISTRATION PTY LIMITED

BRISBANE.

14.4.82.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL722 BILLEROO WEST

QUARTER YEAR ENDED 14.3.82

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	3,952	
Consultants Fees	300	
Drafting Supplies, etc.	1,499	5,751
Logistics		
Travelling and Accommodation	232	232
		5,983

.....

G.T. Hall,
ACCOUNTANT.

MINES ADMINISTRATION PTY LIMITED

QUARTERLY REPORT

EL 722 BILLEROO WEST SOUTH AUSTRALIA

QUARTER ENDED 14.6.82

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending on 14.9.82. Under the terms of a Joint Venture agreement interest is held at 51% by CSR Limited and 49% by Minad Teton Australia.

Reporting foreshadowed in the previous report has been delayed because of other unanticipated commitments.

The main activity in the short term will be directed to the reporting of the data as it stands and approaching prospective joint venture participants.

As expenditure of $3,724 was incurred during the quarter.
A detailed break down of these expenses is enclosed.

Lindsay Curtis.

J L Curtis
Snr Geologist SA
MINES ADMINISTRATION PTY LIMITED

6131

BRISBANE.
7th July, 1982.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 14.6.82

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	1,647	
Consultants Fees	10	
Drafting Supplies, etc.	1,704	3,361
Logistics		
Travelling and Accommodation	324	
Communications	9	
General Expenses	30	363
		$3,724

.....

G.T. Hall,
ACCOUNTANT.

MINES ADMINISTRATION PTY. LIMITED

QUARTERLY REPORT

EL 722 BILLEROO WEST, SOUTH AUSTRALIA

QUARTER ENDED 14 SEPTEMBER 1982

EL 722 Billeroo West is held by CSR Limited and is current for a two year period ending on 14.9.82. Under the terms of a Joint Venture agreement interest is held at 51% by CSR Limited and 49% by Minad=Teton Australia.

Reporting of Proterozoic basement exploration has been progressing steadily throughout the period. Close consultation with SADME geologists on the definition of the stratigraphy encountered during drilling has been undertaken by examining drill cores at the core library and a brief field trip to the Frome Embayment.

Recently as a result of this close collaboration a fence diagram of stratigraphically significant drill holes in the Frome Embayment has been constructed.

An expenditure of only $842 was incurred during the period. A detailed break down of these expenses is enclosed.

Lindsay Curtis.

J.L. CURTIS
SNR. GEOLOGIST S.A.,
MINES ADMINISTRATION PTY. LIMITED

BRISBANE.
8.9.82

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

QUARTER YEAR ENDED 14.9.82

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	244	244
Logistics		
Travelling and Accommodation	571	
General Expenses	27	598
		$842

per G.T. Hall,
ACCOUNTANT.

QUARTERLY REPORT
EXPLORATION LICENCE NO EL 1065
BILLEROO WEST
QUARTER ENDING 14.12.1982

Exploration Licence 1065 Billeroo West is held by CSR Limited for a two year period ending on 7.11.84. Under the terms of the Joint Venture agreement interest is held at 51% by CSR Limited and 49% by Minad Teton Australia.

During the period a report on 1979-82 Proterozoic basement exploration was completed. Please find the enclosed copy. (First report in Env 6131 pgs 3-108)

Continuing basement exploration is envisaged to investigate geophysical anomalies throughout the title. Ultimately because of the high cost of deep diamond drilling invitation for additional joint venture partners may be sought.

Expenditure for the quarter totalled $7017. Details are shown in the attached statement.

M. Moore.

M MOORE
GEOLOGIST
MINES ADMINISTRATION PTY LIMITED

Brisbane,
20 - 1 - 1983

A A R L I M I T E D

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL..722.BILLEROO.WEST

QUARTER YEAR ENDED 30.11.82

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	7,927	
Consultants Fees	(980)	
		6,947
Logistics		
Travelling and Accommodation	27	
General Expenses	43	70
		7,017

G.T. HALL
Accountant.

CSR 0173

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

DGT/SR/418

17 June, 1983

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Sir,

RE: EXPLORATION LICENCE 1065 - BILLEROO WEST, FIRST QUARTERLY REPORT ON EXPLORATION QUARTER ENDING 7TH FEBRUARY, 1983.

Exploration Licence 1065 Billeroo West is held by CSR Limited for a two year period ending on 7.11.84. Under the terms of the Joint Venture agreement, interest is held at 51% by CSR Limited and 49% by Minad Teton Australia.

During the period conceptual modelling and examination of data continued, following the completion of the 1979-82 Proterozoic basement exploration report. Continuing basement exploration is envisaged, to investigate geophysical anomalies throughout the title area.

Expenditure for the quarter totalled $18,079 . Details are shown in the attached statement.

Yours faithfully,

D.A. BRUNT
Regional Manager

c.c. L.J. Curtis
G.K. Alexander
DJC/File

BRISBANE.
21ST JUNE, 1983.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

3 MONTHS ENDED 7.2.1983.

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	16,177	
Consultants Fees	1,786	
Air Satellite Photos	116	18,079
		18,079

M.G.T. Livesey,
ACCOUNTANT.

0175

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
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GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

DGT/SR/418

17 May, 1983

The Director-General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Sir,

RE: EXPLORATION LICENCE 1065 - BILLEROO WEST, SECOND QUARTERLY REPORT ON EXPLORATION QUARTER ENDING 7TH MAY, 1983

Exploration Licence 1065 Billeroo West is held by CSR Limited for a two year period ending on 7.11.84. Under the terms of the Joint Venture agreement interest is held at 51% by CSR Limited and 49% by Minad Teton Australia.

Assessment of exploration data was carried out during this period. Further work programs are dependant on clarification of the Government's policy on development of uranium resources in South Australia.

Expenditure for the quarter totalled $2,336.00. Details are shown in the attached statement.

Yours faithfully,

D.A. BRUNT
Regional Manager

c.c. L.J. Curtis
G.K. Alexander
DJC/File

BRISBANE.
21ST JUNE, 1983

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

EL 722 BILLEROO WEST

FROM 7.2.1983 TO 31.3.1983

REF: AC/MDE

	$	$
Geophysical & Geological Costs		
Salaries and Wages	1,181	
Field Allowances	111	
Drafting Supplies, etc.	290	
Air Satellite Photo	32	1,614
Logistics		
Travelling and Accommodation	210	
Communications	78	
Legal Expenses	430	
General Expenses	4	722
		$2,336

M.G.T. Livesey,
ACCOUNTANT.

QUARTERLY REPORT

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

QUARTER ENDING 7TH AUGUST, 1983

Exploration Licence No. 1065 (Billeroo West) is held by CSR Limited. Under the terms of a Joint Venture Agreement interest is held 51% by CSR Limited and 49% by Minad-Teton Australia.

No field work was carried out during the quarter ending 7th August 1983. Further work programmes are dependant upon clarification of the Governments policy on exploration for and development of uranium resources in South Australia.

Only nominal expenditure for the quarter was incurred, details will be forwarded with subsequent Quarterly Reports.

David Brunt
23.9.1983

0178

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

Ref: GKA/SMS/418

15 December 1983

Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063

Dear Sir,

8TH QUARTERLY REPORT E.L. 1065 (BILLEROO WEST)

During the Quarter ending 7th November 1983, the Billeroo West Joint Venture reviewed the prospectivity of the area in the light of the Ministers statement of August 18, 1983 concerning uranium exploration. A proposal in respect of this matter is currently being compiled.

No field work was carried out in the Quarter. Expenditure totalled $368 as shown on the attached Expenditure Statement. Please find also enclosed expenditure statement for the Quarter ending 7th August 1983.

Yours faithfully,

M.D. Leggo
EXPLORATION MANAGER

INCORPORATED IN NSW

6131
II

Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR QUARTER ENDING 7TH NOVEMBER, 1983

	CSR
Geological and Geophysical	
Logistics Expenses	
Assays	
Survey, gridding, clearing	
Freight	
Camp services	
Vehicle operations	
Equipment rent	
Travel	
Salaries	299
Administration	69
Total	368

Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR QUARTER ENDING 7TH AUGUST, 1983

	CSR
Geological and Geophysical	
Logistics Expenses	
Assays	
Survey, gridding, clearing	
Freight	
Camp services	
Vehicle operations	
Equipment rent	
Travel	148
Salaries	
Administration	34
Total	182

0181

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
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GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

P.O. Box 259,
GLENSIDE, S.A. 5065

Ref: GKA/SMS/418

23 February 1984

Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST, FIFTH QUARTERLY REPORT FOR PERIOD ENDED 7TH FEBRUARY, 1984

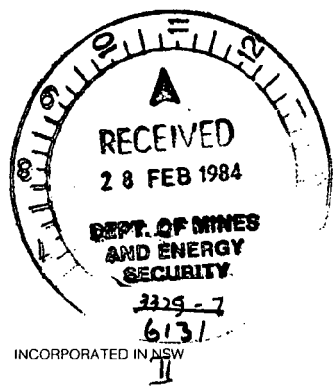
E.L. 1065 was granted to CSR Limited on 8th November 1982 for a 2 year period. During the 5th Quarter, ended 7th February, 1984, no field work was undertaken.

A review of the prospectivity of the area in the light of the Minister of Mines and Energy's announcements on Exploration Licence work committments was completed. A proposal for a substantial reduction in area is being considered by the Joint Venturers.

Expenditure during the quarter totalled $1,903. Details are shown on the attached Expenditure Statement.

Yours faithfully,

D.A. Brunt
REGIONAL MANAGER



Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR PERIOD 8TH NOVEMBER, 1983 TO 7TH FEBRUARY, 1984

	TOTAL 8/11/83 - 7/02/84
Geological and Geophysical	
Logistics Expenses:-	
Assays	
Survey, gridding, clearing	
Freight	
Camp services	
Vehicle operations	
Equipment rent	
Travel	534
Salaries	694
Administration	675
Total	1,903

0183

CSR

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

P.O. BOX 259,
GLENSIDE S.A. 5065

phn: 271 2400

26 June, 1984

Director-General,
Department of Mines and Energy,
P.O. Box 151
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST, SIXTH QUARTERLY REPORT FOR PERIOD ENDED 7TH MAY, 1984

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

During the 6th Quarter, ended 7th May, 1984, no field work was undertaken.

A technical assessment of the title to develop a feasible exploration programme was carried out subsequent to the title variation.

Expenditure during the quarter totalled $573. Details are shown on the attached Expenditure Statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR PERIOD 8TH FEBRUARY TO 7TH MAY, 1984

	TOTAL 8/2/84 TO 30/4/84
Logistics Expenses:-	
Regional Office Costs	31
Equipment Rent	288
Temporary Wages	50
Salaries	96
Administration	108
TOTAL	$573

0185

CSR

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
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SYDNEY 2001 AUSTRALIA
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P.O. BOX 259,
GLENSIDE S.A. 5065

phn: (08) 271 2400

21 September, 1984

Director-General,
Department of Mines and Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST, ~~11~~ 7TH QUARTERLY REEPORT FOR PERIOD ENDED 7TH AUGUST, 1984

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

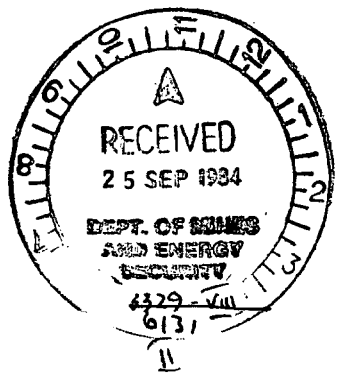
During the 11th Quarter, ended 7th August, 1984 no field work was undertaken.

Mr. P. Woyzbun, Geophysical Consultant was engaged to evaluate regional aeromagnetic and gravity data together with previous exploration results. This work was in progress at the end of the reporting quarter.

Expenditure during the quarter totalled $1246. Details are shown on the attached Expenditure Statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region



Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR PERIOD 8TH MAY TO 7TH AUGUST, 1984

	TOTAL 1/5/84 TO 31/7/84
Logistics Expenses:-	
Regional Office Costs	159
Equipment Rent	71
Data processing	3
Drafting/mapping	4
Salaries	646
Administration	363
TOTAL	$1246

0187

CSR

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
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CABLE 'CSRMINDIV' SYDNEY

P.O. BOX 259,
GLENSIDE S.A. 5065

phn: 271 2400

12 November, 1984

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST, ~~12~~ 8TH QUARTERLY REPORT FOR PERIOD ENDED 7TH NOVEMBER, 1984

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

During the 12th Quarter, ended 7th November, 1984 no field work was undertaken.

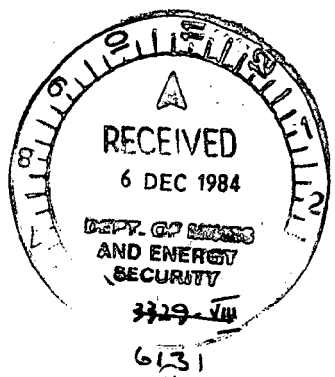
Mr. P. Woyzbun completed an evaluation of the geophysical data and reported the results of the work to CSR staff. The main recommendation was that a wide spaced 6 line km combined gravity and magnetic survey should proceed. Field work was in progress at the end of the reporting period.

Expenditure during the quarter totalled $7,606.00. Details are shown on the attached Expenditure Statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

c.c. G.K. Alexander



3329 TM
6131
11

Ref: 418

EXPLORATION LICENCE NO. 1065
BILLEROO WEST

EXPENDITURE STATEMENT
FOR PERIOD 8TH AUGUST TO 7TH NOVEMBER, 1984

		TOTAL 1/8/84 TO 31/10/84
Geology and Geophysics		$4,518
Logistics Expenses		
Regional Office Costs	$428	
Equipment Rent	$216	
Vehicle Operations	$ 18	
Freight	$ 45	
Drafting/mapping	$ 44	
Petrological Services	$ 66	
Travel	$167	
		$ 984
Administration		$2,104
TOTAL		$7,606

0189

Aluminium, Minerals And Chemicals Division

ALUMINIUM, MINERALS AND CHEMICALS DIVISION
CSR LIMITED
1 O'CONNELL STREET
SYDNEY AUSTRALIA
GPO BOX 483
SYDNEY 2001 AUSTRALIA
TELEPHONE (02) 235 8333
TELEX AA20285
CABLE 'CSRMINDIV' SYDNEY

P.O. BOX 259
GLENSIDE S.A. 5065

PHN: 271 2400

3/20/85 Wed 11:25:18

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
9 ~~13~~TH QUARTERLY REPORT
PERIOD ENDED 7TH FEBRUARY, 1985

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

A wide spaced 6 line km combined gravity and magnetic survey was carried out concurrently with work on the adjacent Lake Namba title E.L. 1203. Due to the annual Christmas break the final results were not received until late January. Amalgamation with previous ground data was in progress at the end of the reporting period.

NO HARD COPY AVAILABLE

GRAVITY DATA MAY BE ON DATA TAPE

Expenditure during the quarter totalling $608 does not reflect the work completed due to late invoicing. Details are shown on the attached Expenditure Statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

RECEIVED
25 MAR 1985
DEPT. OF MINES AND ENERGY SECURITY
2329-8
6131

cc GKA

Ref: 418

EXPLORATION LICENCE NO. 1065

BILLEROO WEST

EXPENDITURE STATEMENT

FOR PERIOD 8TH NOVEMBER, 1984 TO 7TH FEBRUARY, 1985

		TOTAL 1/11/84 TO 31/01/85
Geology and Geophysics		$304
Logistic Expenses		
Regional Office Costs	$75	
Equipment Rent	53	
Data Processing	5	$133
Administration		$171
TOTAL		$608

CSR

Minerals Exploration and Development Group

CSR LIMITED
PO BOX 259
GLENSIDE SA 5065 AUSTRALIA
TELEPHONE 08 271 2400
TELEX AA89710

11 June, 1985

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
10TH QUARTERLY REPORT
PERIOD ENDED 7TH MAY, 1985

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

During the current quarter Solo Geophysics & Co. recovered Geoex data from local ground gravity and magnetic surveys over the M1 and M5 magnetic features with appropriate grid and base level corrections, on to magnetic tape for amalgamation with the more recent survey data.

Delays were experienced due to work on other South Australian Proejcts and errors in the gravity station network data supplied to Solo by the Department.

Expenditure during the quarter totalling $8,397 does not reflect the work completed due to late invoicing. Details are shown on the attached Expenditure Statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

cc GKA
DJC/File

Ref:GKA/SW.25.11/5418

EXPLORATION LICENCE NO 1065

BILLEROO WEST

EXPENDITURE STATEMENT

FOR PERIOD 8TH FEBRUARY, TO 7TH MAY, 1985

		TOTAL 01/02/85 TO 30/04/85
Geology and Geophysics		$6,483
Logistic Expenses		
Regional Office Costs	$89	
Equipment Rent	4	
		$93
Administration		$1,821
TOTAL		$8,397

0193

CSR

Minerals Exploration and Development Group

CSR LIMITED
PO BOX 259
GLENSIDE SA 5065 AUSTRALIA
TELEPHONE 08 271 2400
TELEX AA89710

19 August, 1985

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
11~~5~~TH QUARTERLY REPORT
PERIOD ENDED 7TH AUGUST 1985

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

As a result of the examination of data held by Pan Australia Mining, the potential for sedimentary exhalative mineral deposits is considered to be enhanced.

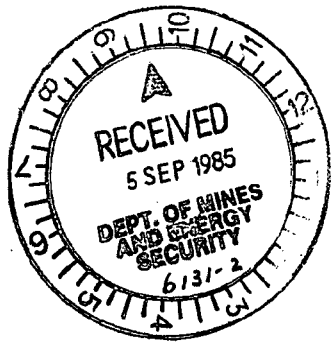
Mr. G. Chuck, consultant geologist was commissioned to review CSR and Pan Australia Data in respect of this concept.

Exploration strategy is currently being reassessed incorporating the findings of the review.

An expenditure of $3,973 is reported. Details are shown in the attached expenditure statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region



Ref: GKA/JMB/7.39/5418

EXPLORATION LICENCE NO. 1065

BILLEROO WEST

EXPENDITURE STATEMENT

FOR PERIOD 8TH MAY TO 7TH AUGUST, 1985

		TOTAL 01/05/85 TO 31/07/85
Geology and Geophysics		1,733
Logistics Expenses		
Travel	741	
Equipment Rental	160	
Drafting	30	
Sundries	320	1,251
Administration		989
TOTAL		$3,973

0195

CSR

Minerals Exploration and Development Group

CSR LIMITED
PO BOX 259
GLENSIDE SA 5065 AUSTRALIA
TELEPHONE 08 271 2400
TELEX AA89710

Ref: 8.86/DAB/SR

10 December, 1985

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
12 ~~11~~TH QUARTERLY REPORT
PERIOD ENDED 7TH NOVEMBER, 1985

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

Teton Austraia Pty. Ltd. has advised its intention to withdraw from the title. CSR has acted to acquire Teton's interest through completion of an assignment agreement covering all titles subject to the Minad-Teton Joint Venture Agreement.

An application for extension of term is currently before the Department.

During the current period review of the potential for polymetallic base metal deposits continued.

The stratigraphic position of rocks intersected in BWMIA-1 and ETM5A-1 remains enigmatic. There is a possibility of time-stratigraphic correlation between these units and those observed in the Pan-Australia drill holes to the east. There are no directly comparable rocks elsewhere, although basement sediments in MU2, Bumbarlow 1, and WK2 may be related. The low metamorphic grade and obvious folding of these units suggests that they may be of late Kimban age.

* **M. Sc THESIS** – RESULTS NOT AVAILABLE IN ENV. 6131.

To investigate these rocks and compare them with units exposed in the Mt. Painter and Olary blocks, CSR Limited is supporting a M.Sc project at the University of NSW, Sydney. The thesis by Mr. J. Heape will examine the

* See J. Heape M.Sc. thesis, Uni. of N.S.W.

lithogeochemistry and petrology of the rocks in relation to metallogeny. The project work is due to be completed by mid 1986. Support is being provided by way of information from previuos studies, interactive landsat processing of the Curnamona scene, funding of analytical costs and computer support.

* Mr. J. Heape spent some four weeks in South Australia, during the quarter, visiting the area and the adjoining Olary Block. 45 Samples from CSR and SADME drill holes, and 25 samples, from Pan Australia and Aberfoyle project areas were submitted for analytical determinations.

Analytyical results from this work have been received but are not yet interpreted.

Expenditure for the period totalled $2,205. Details are shown in the attached expenditure statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

* See J. Heape, M.Sc. Thesis, Uni. of N.S.W.

GKA/BW.26.65:5418

EXPLORATION LICENCE NO 1065, BILLEROO WEST

EXPENDITURE STATEMENT

FOR PERIOD AUGUST 8, TO NOVEMBER 7, 1985

		01/08/85 TO 31/10/85
Geotechnical Salaries		$999
Logistics Expenses		
Geochemical Analysis	$746	
Travel	($101)	
Field Camp Supplies	$5	
Equipment Rental	($7)	
Regional Office Costs	$276	$919
Administration		$287
TOTAL		$2,205

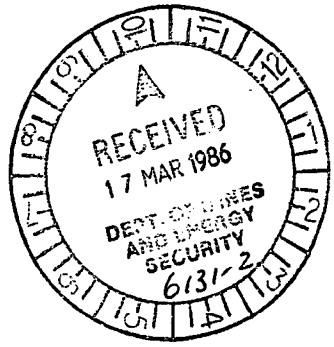
0198

Minerals Exploration and Development Group

CSR LIMITED
PO BOX 259
GLENSIDE SA 5065 AUSTRALIA
TELEPHONE 08 271 2400
TELEX AA89710

Ref: 10.10/DAB/SR

13 March, 1986



Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5053

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
~~17TH~~ QUARTERLY REPORT
PERIOD ENDED 7TH FEBRUARY, 1986

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

Teton Australia Pty. Ltd. has advised its intention to withdraw from the title. CSR has acted to acquire Teton's interest through completion of an assignment agreement covering all titles subject to the Minad-Teton Joint Venture Agreement.

M. Sc. Thesis

Mr. J. Heape forwarded whole rock geochemical analyses of rocks sampled at various localities within the Frome Embayment.

Remote Sensing

Preparation for study of the Curnamona Landsat Scene using Minerals Exploration and Development Groups image processor commenced prior to interactive enhancement and lineament interpretation. The images obtained have been recorded on colour slides for further examination.

Expenditure for the period was $3,190 as detailed in the attached statement.

Yours faithfully,

David Brunt
Regional Manager
Central Region

cc GKA

GKA/BW.26.65:5418

EXPLORATION LICENCE NO 1065, BILLEROO WEST

EXPENDITURE STATEMENT

FOR PERIOD NOVEMBER 8, 1985 TO FEBRUARY 7, 1986

		01/11/85 TO 31/01/86
Geotechnical Salaries		$2461
Logistics Expenses		
Travel	$268	
Drafting	$72	
Freight	$4	
Equipment Rental	$46	
Regional Office Costs	$305	$695
Administration		$34
TOTAL		$3,190

CSR 0201

Minerals Exploration and Development Group

CSR LIMITED
PO BOX 259
GLENSIDE SA 5065 AUSTRALIA
TELEPHONE 08 271 2400
TELEX AA89710

Ref: 12.75/DAB/SR

23 July, 1986

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5053

Dear Sir,

EXPLORATION LICENCE 1065, BILLEROO WEST
14TH QUARTERLY REPORT
PERIOD ENDED 7TH MAY, 1986

E.L. 1065 was granted to CSR Limited on 8th November, 1982 for a two year period. On the 20th March, 1984 a variation in the title was granted by the Minister of Mines and Energy, which reduced the title in area and expenditure commitments during the current term.

Teton Australia Pty. Ltd. has advised its intention to withdraw from the title. CSR has acted to acquire Teton's interest through completion of an assignment agreement covering all titles subject to the Minad-Teton Joint Venture Agreement.

During the current period CSR commenced reprocessing of aeromagnetic surveys of the southern portion of the "Curnamona" (1:250,000) Sheet.

The coverage extends over the adjacent exploration titles and the southern portion of Billeroo West. The work involves re-interpretation of magnetic domains with a view to determining the location of prospective Pb-Zn base metal environments.

Expenditure for the period is mainly geophysical work totalling $3,190 as detailed in the attached expenditure statement.

Please also note that in February - May'84 an inadvertant error in reporting sequence was made and quarterly reports for subsequent periods bear numbers increased by four. The correct reporting sequence is tabulated on attachment 2.

Yours faithfully,

David Brunt
Regional Manager
Central Region

0203

Minerals Exploration and Development Group

CSR LIMITED
69 KING WILLIAM ST
KENT TOWN SA 5067
AUSTRALIA
TELEPHONE 08 363 1414

Ref: 15.40/DAB/SR

11 November, 1986

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065 BILLEROO WEST
FIFTEENTH QUARTERLY REPORT
PERIOD ENDED 7 AUGUST 1986

E.L. 1065 was granted to CSR Limited on 8 November 1982 for a 2 year period and has been subsequently renewed annually since that time. The area of the title was reduced on 20th March, 1984.

During the reporting period aeromagnetic surveys of the southern portion of the Curnamona 1:250,000 sheet area were reprocessed by CSR Limited as part of a upgrading of the regional aeromagnetic data. A copy of the reprocessed and contoured "Telechie" survey at 1:100,000 scale is attached. Attempts were made to obtain the Benagerie and Lake Charles aeromagnetic data for reprocessing but the tapes are not yet available.

Expenditure during the Quarter totalled $4,889. Details are contained in the attached Statement of Expenditure.

Yours faithfully,

David Brunt
Regional Manager
Central Region

cc GKA

Ref : GKA/RAH/5418

EXPLORATION LICENCE NO. 1065, BILLEROO WEST
EXPENDITURE STATEMENT
FOR PERIOD MAY 8 TO AUGUST 7, 1986

		TOTAL 01/05/86 TO 31/07/86
Geotechnical Salaries		$ 1,545
Logistical Expenses		
Regional Office Costs	$ 665	
Equipment Rental	$ 126	
Computing	$1605	
Vehicle Operations	$ 222	
Travel	$ 40	
Drafting	$ 37	
Field Camp Supplies	$ 28	$ 2,723
Administration		$ 621
TOTAL		$ 4,889

0205

CSR

Minerals Exploration and Development Group

CSR LIMITED
69 KING WILLIAM ST
KENT TOWN SA 5067
AUSTRALIA
TELEPHONE 08 363 1414

Ref: 16.20/DAB/SR

18 December, 1986

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065 BILLEROO WEST
SIXTEENTH QUARTERLY REPORT
PERIOD ENDED 7 NOVEMBER, 1986

E.L. 1065 was granted to CSR Limited on 8 November 1982 for a 2 year period and has been subsequently renewed annually since that time. The area of the title was reduced on 20 March, 1984.

Discussions were held with a number of companies concerning a farm-out of CSR's interest in EL 1065 and the adjoining EL 5420?

During the reporting period efforts continued in respect of aeromagnetic map upgrading but the continuing unavailability of the Benagerie and Lake Charles data tapes has prevented substantial progress in this matter.

Expenditure during the Quarter totalled $6117. Details are shown on the attached statement.

Assessment of geophysical surveys carried out by Solo Geophysics has commenced. Please find the enclosed magnetic data tape which carries files of the most recent regional survey by Solo Geophysics and previous surveys by GEOEX on anomalies M1 and M5.

Yours faithfully,

David Brunt
Regional Manager
Central Region

Ref : GKA/RAH/5418 (2:33)

EXPLORATION LICENCE NO. 1065, BILLEROO WEST
EXPENDITURE STATEMENT
FOR PERIOD AUGUST 8 TO NOVEMBER 7, 1986

		TOTAL 01/08/86 TO 31/10/86
Geotechnical Salaries		$ 2,952
Logistical Expenses		
Regional Office Costs	$1187	
Equipment Rental	$ 377	
Computing	$ 127	
Vehicle Operations	$ 27	
Temporary Wages	$ 704	$ 2,422
Administration		$ 743
TOTAL		$ 6,117

0207

Minerals Exploration and Development Group

CSR LIMITED
69 KING WILLIAM ST
KENT TOWN SA 5067
AUSTRALIA
TELEPHONE 08 363 1414

Ref: 18.35/CGA/SR

12 March, 1987

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

EXPLORATION LICENCE 1065 BILLEROO WEST
SEVENTEENTH QUARTERLY REPORT
PERIOD ENDED 7 FEBRUARY, 1987

E.L. 1065 was granted to CSR Limited on 8 November 1982 for a 2 year period and has been subsequently renewed annually since that time. The area of the title was reduced on 20 March, 1984.

Discussions continued with a number of companies concerning a farm-out of CSR's interest in EL 1065 and the adjoining EL 5420. ? 1203

During the reporting period efforts were maintained in respect of aeromagnetic map upgrading but the continuing unavailability of the Benagerie and Lake Charles data tapes has prevented substantial progress in this matter.

Expenditure during the Quarter totalled $1126. Details are shown on the attached statement.

Yours faithfully,

C.G. Anderson
Supervising Geologist

cc GKA

CSR LIMITED REFERENCE 11-5418

EXPLORATION LICENCE NO.1065,
BILLEROO WEST
EXPENDITURE STATEMENT FOR QUARTER
ENDED FEBRUARY 7, 1987

	PERIOD 1/11/86 to 31/10/87
SALARIES	510
DIRECT EXPLORATION COSTS	
Survey, gridding	0
Freight	6
Field Camp Supplies	0
Vehicle Operations	0
Equipment Rent	51
Travel	0
Maps, Drafting	5
Petrology	0
Geophysics	0
Drilling	0
Consultant Costs	0
Computing	17
Airphoto/Landsat	0
Geochemical Analysis	0
Temporary Wages	166
SUB-TOTAL	245
REGIONAL OFFICE COSTS	242
ADMINISTRATION	129
TOTAL	1126

0209

Minerals Exploration and Development Group

CSR LIMITED
69 KING WILLIAM ST
KENT TOWN SA 5067
AUSTRALIA
TELEPHONE 08 363 1414

Ref: 22.75/JLC/SR

2 October, 1987

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

18 & 19

EXPLORATION LICENCE 1065 BILLEROO WEST
EIGHTH AND NINTH QUARTERLY REPORTS
PERIODS ENDING 7 MAY AND 7 AUGUST, 1987

E.L. 1065 was granted to CSR Limited on 8 November, 1982 for a 2 year period and has been subsequently renewed annually since that time. The area of the title was reduced on 20 March, 1984.

Discussions continued with a number of companies concerning farm-out of CSR's interest in EL 1065 and the adjoining EL 5420. No formal offer was received up to the time of reporting.

Investigations into the viability of placing Tertiary uranium interests under Retention Leases and rationalizing the licence with the adjoining area, Lake Namba EL 1203 was initiated.

Expenditure of $6538 was incurred, being mostly related to the seeking of ~~farm-out offers~~. Details are provided in the attached statements of expenditure.

Yours faithfully,

Lindsay Curtis

J.L. Curtis
Senior Geologist
for
C.G. Anderson
Supervising Geologist

CSR LIMITED REFERENCE 11-5418

EXPLORATION LICENCE NO.1065,
BILLEROO WEST
EXPENDITURE STATEMENT FOR QUARTER
ENDED AUGUST 7, 1987

	PERIOD 1/05/87 to 31/07/87
SALARIES	1778
DIRECT EXPLORATION COSTS	
Survey, gridding	0
Freight	11
Field Camp Supplies	0
Vehicle Operations	24
Equipment Rent	0
Travel	0
Maps, Drafting	39
Petrology	0
Geophysics	0
Drilling	0
Consultant Costs	0
Computing	0
Airphoto/Landsat	0
Geochemical Analysis	0
Temporary Wages	0
SUB-TOTAL	74
REGIONAL OFFICE COSTS	0
ADMINISTRATION	327
TOTAL	2179

CSR LIMITED REFERENCE 11-5418

EXPLORATION LICENCE NO.1065,
BILLEROO WEST
EXPENDITURE STATEMENT FOR QUARTER
ENDED MAY 7, 1987

	PERIOD 1/02/87 to 30/04/87
SALARIES	2552
DIRECT EXPLORATION COSTS	
Survey, gridding	0
Freight	0
Field Camp Supplies	0
Vehicle Operations	627
Equipment Rent	59
Travel	0
Maps, Drafting	6
Petrology	0
Geophysics	0
Drilling	0
Consultant Costs	0
Computing	0
Airphoto/Landsat	0
Geochemical Analysis	0
Temporary Wages	0
SUB-TOTAL	692
REGIONAL OFFICE COSTS	611
ADMINISTRATION	504
TOTAL	4359

0212

Minerals Exploration and Development Group

CSR LIMITED
69 KING WILLIAM ST
KENT TOWN SA 5067
AUSTRALIA
TELEPHONE 08 363 1414

Ref: 24.16/DAB/SR

24 December, 1987

Director-General,
Department of Mines & Energy,
P.O. Box 151,
Eastwood S.A. 5063

Dear Sir,

QUARTERLY REPORT
EXPLORATION LICENCE NO. 1065
PERIOD ENDED NOVEMBER 7, 1987

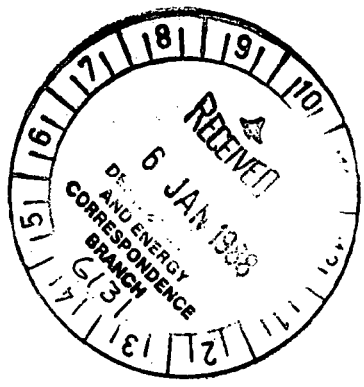
E.L. 1065 was originally granted to CSR on 8 November, 1982. A reduction in area was made on 20 March, 1984.

During the Quarter ended November 7, 1987 planning was initiated to peg claims over the Gould's Dam Uranium deposit and adjoining areas of Tertiary uranium exploration potential with a view to converting these to Retention Leases. Planning for future partial relinquishment and amalgamation with adjoining E.L. 1203 was also undertaken.

Expenditure totalled $767. Details are shown on the attached Statement.

Yours faithfully,

David Brunt
Manager - Uranium

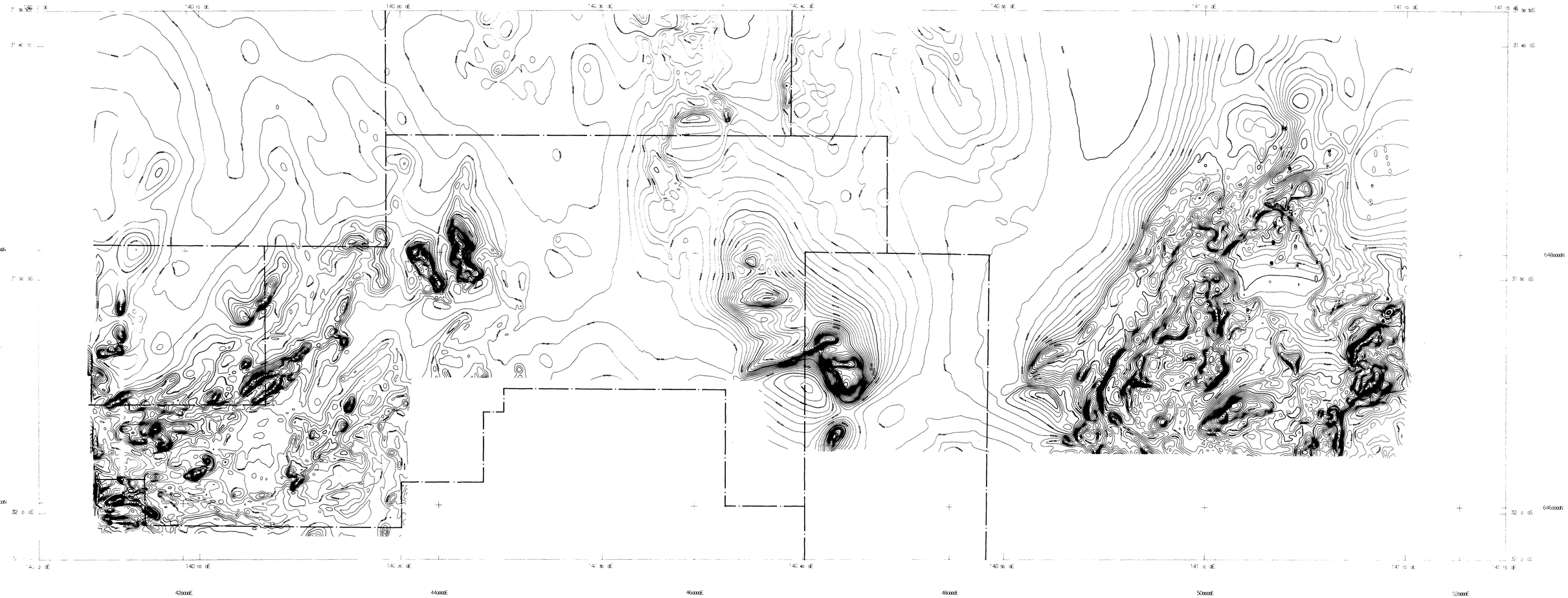


cc A. Barends

CSR LIMITED REFERENCE 11-5418

EXPLORATION LICENCE NO.1065,
BILLEROO WEST
EXPENDITURE STATEMENT FOR QUARTER
ENDED NOVEMBER 7, 1987

	PERIOD 1/08/87 to 31/10/87
SALARIES	195
DIRECT EXPLORATION COSTS	
Survey, gridding	0
Freight	15
Field Camp Supplies	42
Vehicle Operations	0
Equipment Rent	0
Travel	0
Maps, Drafting	20
Petrology	0
Geophysics	0
Drilling	0
Consultant Costs	0
Computing	0
Airphoto/Landsat	0
Geochemical Analysis	0
Temporary Wages	0
SUB-TOTAL	77
REGIONAL OFFICE COSTS	0
ADMINISTRATION	495
TOTAL	767



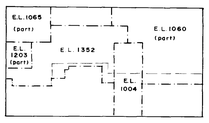
N.B. —

Coordinates as shown on this map are taken from digital records of aeromagnetic data and are in error by (approximately)
Northing — 16860 metres
Easting + 14330 metres
Corrections have been determined empirically, by matching of aeromagnetic contours to surrounding surveys.
E.L. Boundaries are therefore approximate only.

Sheet 1 of 1
Grid notation refers to Australian Map Grid Zone 54

Data reduction	:	CSR Minerals, E & D Group
Plotted	:	Calcomp 960
Grid Mesh Size	:	125 x 150 m
Grid Filter	:	Not Applied
IGRF	:	Not Known
Contour Interval	:	100, 250 and 1000 nT

CSR



INDEX TO CSR TENEMENTS IN SURVEY AREA.

0 2500 5000metres
SCALE 1:100000

6131-22

CSR LIMITED - MEDG

TELECHIE S.A.

REPROCESSED SADME
AEROMAGNETIC DATA
CONTOUR INTERVAL = 100 nT

SCALE : 1: 100000	DRG No.
AUTHOR :	
DATE : 3-JAN-86	
REVISED :	