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Soloriens Mining Pty. Ltd.

E.L. 53/88 Mount Frankland
Annual Report: Year 4

(6 Jan 1991 - 5 Jan 1992)

1992 - 1993

Checked with Ken Morrison 2.2.93 N.J.T.

K.C. Morrison
November 1992

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TENEMENT INFORMATION

Exploration Licence 53/88 is a 25 km^2 tenement surrounding the Balfour mineral district in N.W. Tasmania (Plan 1).

The E.L. was originally 245 km^2, granted in January 1989, and has had three partial relinquishments prior to the present licence year.

E.L. 53/88 is owned 100% by Soloriens Mining Pty. Ltd. and contains seven mining tenements owned by other parties (see Plan 1).

SUMMARY OF PREVIOUS WORK

Year 1

Review of past exploration for copper and tin in the Balfour region.

Regional gravity survey, at approximately 1 km station spacing and a Bouger anomaly precision of 0.5 mGal. The survey showed a probable subsurface northerly extension of the Interview Granite to the Balfour area, where the northern edge of the granite coincides with a major east-west gravity trend. On the basis of these results that portion of the E.L. containing granite with less than 1 km of roof rock thickness was retained and the remainder of the E.L. was surrendered.

Year 2

No substantial exploration was completed.

Year 3

A lead isotope study of the Balfour mineralisation commenced. Pyrite from the Murrays Reward workings is unusually thorium enriched, with the least radiogenic samples producing Pb 207/204 plots within the field of the known Cambrian VMS base metal deposits of western Tasmania. The growth curves on Pb isotope ratio plots and the Th/U ratios were interpreted by SIROTOPE as indicating a most likely Cambrian age for the mineralisation and a metamorphic fluid source.

Initial tests were made on the trace element composition of mine drainage and natural stream waters at Balfour, and there is potential application for discriminating between mineralisation types and for use as an exploration tool.

MINERAL LEASES – EL. 53/88

No.	Owner	Area
58M/68	S.A.TATLOW	4 ha
63M/68	S.A.TATLOW, B.C.LING & R.LING	8 ha
4M/74	J.H HOLLOWAY & R.J. SOUTH	9 ha
1M/76	M. LAAN & N.R. LANGSFORD	5 ha
2M/76	M. LAAN & N.R. LANGSFORD	3 ha
27M/86	B.C. & R. LING & S.A.TATLOW	8 ha
1M/87	P. COSMETTO & B.C. LING	[illegible] ha

043004

5 cm

92-3403.

SOLORIENS MINING PTY LTD

EL. 53/88 – MT FRANKLAND, TASMANIA

LOCATION PLAN & CONTAINED MINERAL LEASES (Competitor)

COMPILED	V.H
DRAWN	T.K.D.Contracting
DATE	
SCALE	1 : 25,000
PLAN No.	1

EXPLORATION COMPLETED IN YEAR 4

1 Lead Isotope Study

Following on from work reported in Year 3, concentrates of pyrite and galena from tin/tungsten sulphide mineralisation exposed at Balfour (324,500mE, 5,429,300mN) were analysed for lead isotopes by the SIROTOPE service of CSIRO.

The results (Appendix 1) show no difference in the isotopic composition of lead in pyrite compared with galena. The data are tightly clustered, unlike the previous Murrays Reward samples, but plot on the same linear trend as Murrays Reward pyrites for both Pb 207/204 vs. Pb 206/204 and Pb 208/204 vs Pb 206/204.

The main difference between the two sites is that the tin/tungsten mineralisation shows lower and much less variable Pb 206/204 than the copper mineralisation.

All samples are enriched in Pb 208 relative to Tasmanian Cambrian VMS mineralisation and this is consistent with the high Th/U ratio recorded from Murrays Reward.

Although the Pb 206/204 values are lower than expected for Devonian lead, it is likely on geological and geophysical grounds that the Balfour tin/tungsten mineralisation is genetically related to subsurface Devonian granite and therefore the isotopic similarity of the two mineralisation types at Balfour implies a Devonian age for the copper. SIROTOPE explains the high Pb 208/204 and the high Th/U at both sites as lead in the Devonian granite, inherited from Proterozoic high grade metamorphic rocks.

2 Interpretation of Regional Linear Structures

Linear trends derived from airphotos, magnetics and gravity were mapped to search for patterns of intersections, trend corridors or dislocations which may correlate with the major early copper workings, Induced Polarization anomalies from previous exploration or the shape of sub surface granite modelled from gravity (Plan 2, Plan 3, Appendix 2).

The copper mineralisation at Balfour sits within a zone or linears which trend NNW - SSE in the southern (Balfour) end and swing to a NW - SE trend at the northern (The Clump) end. A set of cross cutting linears trend WSW - ENE and there appears to be a consistent spacing of approximately two kilometres between the structures. They exert some control over the shape of the interpreted granite subsurface.

There is some evidence that the main known copper workings (shown on Plan 2 and Plan 3 from the south to north: Murrays Reward, Central,

319 000m E. 20 21 22 23 24 25 26 27

38 37 36 35 34 33 32 31 30 29 28

STATE FOREST

ARTHUR - PIEMAN

PROTECTED

AREA

FRANKLAND RIVER

STATE FOREST

ARTHUR-PIEMAN PROTECTED AREA

FRANKLAND

Little Frenchman

Specimen Hill

Skinners Flat

MOUNT BALFOUR

MOUNT FRANKLAND

LEGEND

AIR PHOTO LINEARS.

MAGNETICS - DERIVED STRUCTURAL TRENDS.

I.P. ANOMALIES (A.C.I. LTD. '1967 WORK.)

MAJOR ABANDONED COPPER WORKING.

AREA OF PROPOSED DETAIL GRAVITY SURVEY.

5 cm

8-3-2703

SOLORIENS MINING PTY LTD.

EL. 53/88 - MT. FRANKLAND.

INTERPRETED STRUCTURAL TRENDS. AND GEOPHYSICAL ANOMALIES.

COMPILED K.M./D.C.	DATE. NOV. 1992	PLAN Nº 3
DRAWN. A.J.J.	SCALE. 1:25000.	

043006

319 000mE. 20 21 22 23 24 25 26 27

38 37 36 35 34 33 32 31 30 29 28

STATE FOREST

ARTHUR - PIEMAN

PROTECTED

AREA

FRANKLAND

RIVER

H.

H.

H

STATE FOREST

ARTHUR PIEMAN PROTECTED AREA

FRANKLAND

MOUNT BALFOUR

MOUNT FRANKLAND

LEGEND

SUBSURFACE GRANITE - GRAVITY INTERPRETATION.

(H) LOCALLY SHALLOW GRANITE ROOF.

GRAVITY DERIVED STRUCTURAL TREND.

MAJOR ABANDONED COPPER WORKING.

6213-4036

SOLORIENS MINING PTY LTD.

EL. 53/88 - MT. FRANKLAND.

REGIONAL GRAVITY INTERPRETATION.

5 cm

COMPILED D.L.	DATE NOV. 1992	PLAN Nº 2
DRAWN A. J. J.	SCALE 1:25000	

043007

Balfour Blocks and Mt Balfour) may occur at the intersection of the two main sets of linears. A more subtle E - W trend is also apparent in some places. The three trends exert major control on drainage and topography in the Balfour region.

3 Gravity Surveys

The method of close spaced (50 - 100 metre station spacing) gravity was applied to two areas with minor known mineralisation to test for detection of small bodies of extra mass and the relationship between mineralisation and structural trends.

The areas (Plan 2) are at Murrays Reward and The Clump area, in the south and north of the E.L. respectively. The southern area is mainly covered by Mining Leases held by M. Laan and partners at Balfour, and an agreement was struck with the lessee prior to conducting the survey.

The gravity surveys were conducted by Dr. R. Richardson, Tasmania Department of Mines and the data were interpreted and mapped by Dr. D. Leaman, Leaman Geophysics, Hobart. (See Appendix 3)

In both areas the three structural trends observed regionally are resolved by the gravity. The east-west trend is best developed in the northern part of the southern area.

The three known sites of mineralisation coincide with both the trend intersections and with offset localised gravity highs, suggesting that the extra mass of mineralisation, and possibly alteration, may be seen by the gravity survey.

An expanded survey and extensive profile modelling are needed to resolve the depth, dip and size of the sources of the gravity highs.

CONCLUSIONS

1 Lead isotope work indicates that the lead in pyrite and galena has a common source and suggests that the copper and tin/tungsten at Balfour have a common source. Isotope ratio growth curves suggest a Cambrian age but when geological and geophysical evidence is considered along with the high thorium content of both types of mineralisation, a Devonian granite carrying lead derived older metamorphic rocks is a likely source for the hydrothermal fluids.

2 A pattern of linear structures from regional scale gravity magnetics and airphoto data shows three main trends and suggests that the copper mineralisation may occur at sites of intersections within a corridor trending NNW in the southern part of the E.L., swinging NW in the north.

3 Detailed gravity surveys on two areas carrying copper mineralisation demonstrated the association of mineralisation with trend intersections and probably with gravity highs. The method shows potential to be extended to generate drilling targets, particularly in the northern area.

PROPOSED YEAR 5 EXPLORATION

Year 5 work will focus on expanding the detailed geophysical work in The Clump area, in the northern part of the E.L.

Grid based gravity, magnetics and geological mapping will be done with the aim to model and position a drilling target.

Assistance will be provided for a B. Sc. Honours student at the University of Tasmania to undertake a mapping and petrology/geochemistry project within the Balfour region.

Sirotope

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AUSTRALIA

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THE Pb ISOTOPIC COMPOSITION OF MINERALIZATION FROM THE BALFOUR PROSPECT, WESTERN TASMANIA

SIROTOPE REPORT SR 237

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1. INTRODUCTION

This report presents the results of Pb isotope determinations of mineralization from the Balfour prospect, Tasmania. Balfour is located near the west coast of Tasmania, close to the Murray's Reward prospect for which Pb isotope data has previously been presented. Regionally, the Devonian Interview Granite has intruded Precambrian metasediments which are correlates of the Rocky Cape Group (Williams et al., 1989). The mineralization at Balfour is Sn-W vein-style with pyrite and galena. Field relations suggest the mineralization is Devonian in age and related to intrusion of a granitic body indicated by geophysical data.

Six samples were provided from the Balfour deposit by Garry Davidson of CODES. Galena was handpicked from three of these and pyrite handpicked from the remainder. Methods of Pb isotope analysis are given in the Appendix.

Comparisons are drawn between the data for these samples, the Murray's Reward results and Pb isotope target signatures for Cambrian mineralization hosted by the Mount Read Volcanics. The target signatures for mineralization at Hellyer and Que River, depicted as 95% confidence ellipses, have recently been slightly revised based both on new analyses of Hellyer (**SIROTOPE** unpubl. data) and on a reappraisal of available data from Que River (Gulson and Porritt, 1987).

2. Pb ISOTOPE RESULTS

Lead isotope ratios, and Pb contents for the pyrites determined by isotope dilution are given in the Table and plotted in the Figure with reference to the average crustal Pb evolution curve, or growth curve, of Cumming and Richards (1975), revised target signatures discussed above and previous data from the Murray's Reward prospect (Carr and Dean, 1991).

The data form a very tight cluster with no differnces in isotopic composition between the pyrite and galena samples. The relatively high-Pb contents of the pyrites (> 1000, 580 and 200 ppm) probably indicates the presence of galena inclusions.

The Balfour data have slightly lower $^{206}Pb/^{204}Pb$ ratios than the least radiogenic Murray's Reward data, and plot on the same linear trend. Like Murray's Reward, the Balfour mineralization is characterised by similar $^{207}Pb/^{204}Pb$ ratios as the Cambrian VHMS target signatures but is considerably enriched in ^{208}Pb.

3. ASSESSMENT

Due to the high-Pb nature of the Balfour mineralization, these data are considered to represent initial Pb isotope ratios (i.e. they have not changed due to radiogenic addition since the formation of the mineralization). The similarity of the Balfour results with the highest-Pb, least radiogenic Murray's Reward data indicates that this sample is also close to an initial Pb isotope ratio (MR 5 with ≈ 250 ppm Pb; Carr, 1991). This suggests that it is unlikely that there has been substantial U enrichment and thus a Proterozoic age of mineralization at both deposits is highly improbable.

Due to the close spatial and presumed genetic association of the Balfour sulfides with Devonian granite (thought to be the Interview Granite), it was expected that these samples would yield an unequivocal Devonian Pb isotope signature (i.e. $^{206}Pb/^{204}Pb$ ratio > 18.4). Like Murray's Reward, the most prominant feature of the Balfour data are the high $^{208}Pb/^{204}Pb$ ratios. This suggests high Th/U in the source rocks of the Pb in the mineralization. High Th/U are considered in the plumbo-tectonic model of Doe and Zartman (1979) to be characteristic of lower crustal rocks, typically those that have undergone high grade metamorphism and removal of U. This also results in lower U/Pb, hence retarded evolution in $^{206}Pb/^{204}Pb$ ratio. The high-Pb Balfour/Murray's Reward data exhibit lower $^{206}Pb/^{204}Pb$ ratios than expected for Devonian vein mineralization such as Queen Hill (Gulson and Porritt, 1987). High Th/U and low U/Pb characteristics are also displayed in Devonian mesothermal vein deposits of the Georgetown Province (Carr et al., 1988) where high metamorphic grade Proterozoic crust is thought to be the primary source of Pb.

In summary, the present results indicate that the Balfour and Murray's Reward mineralization most probably formed during the same hydrothermal event. These hydrothermal solutions derived Pb from rocks with high Th/U and probably also low U/Pb ratios. The most likely ultimate source for such Pb is older metamorphic crust. Whilst the rocks of the Rocky Cape Group are relatively low grade Precambrian metamorphics, there is evidence in the region of the Arthur Lineament of greenschist to amphibolite facies metamorphism (Turner, 1989).

Thus these results favour a Devonian origin for these deposits (Model 3 of Carr and Dean, 1991). If the Devonian Interview Granite is the immediate source of Pb, then it too should have a Pb isotopic composition similar to Balfour. This could be tested by analyses of unaltered potassium feldspar.

4. REFERENCES

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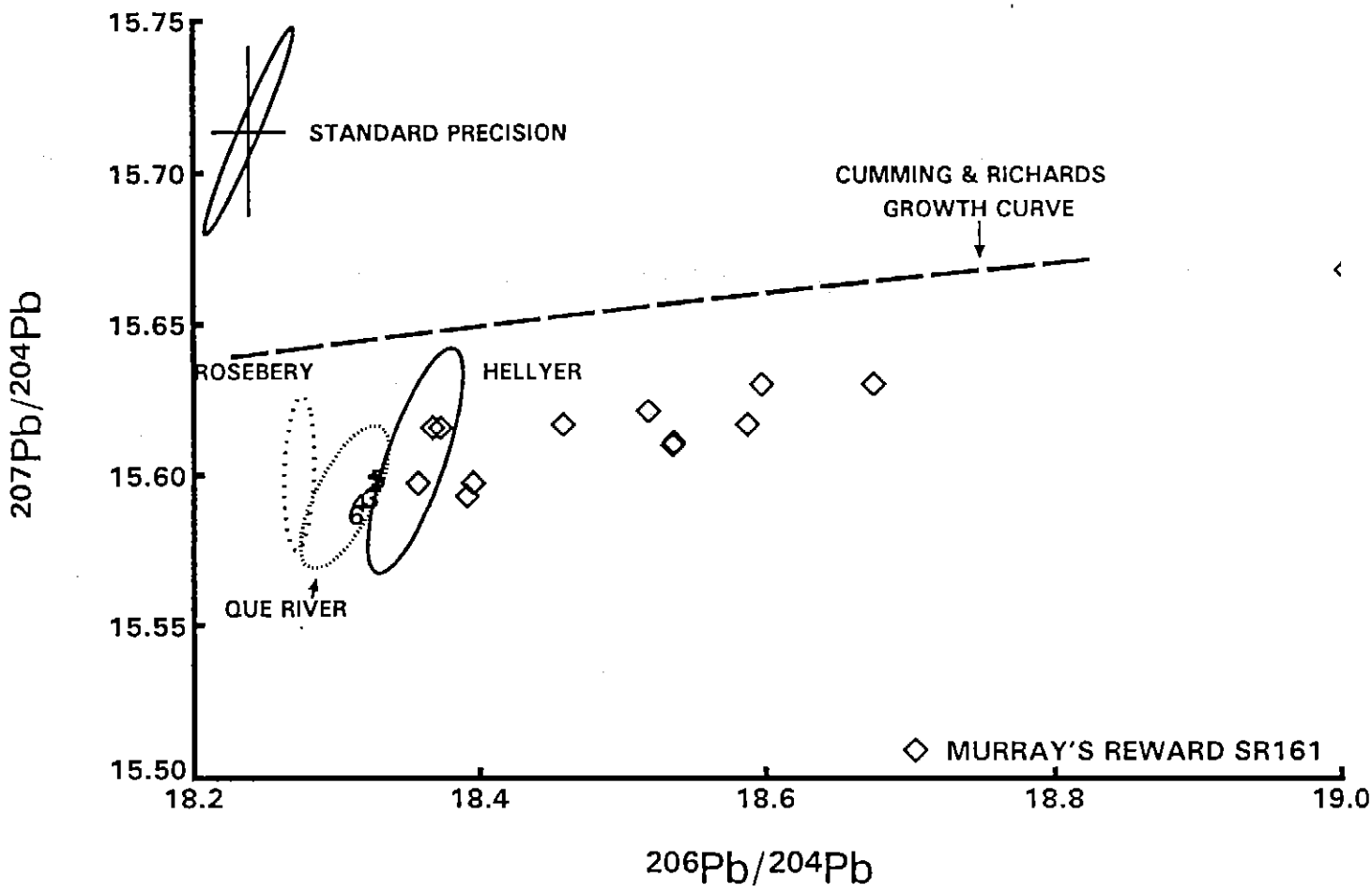
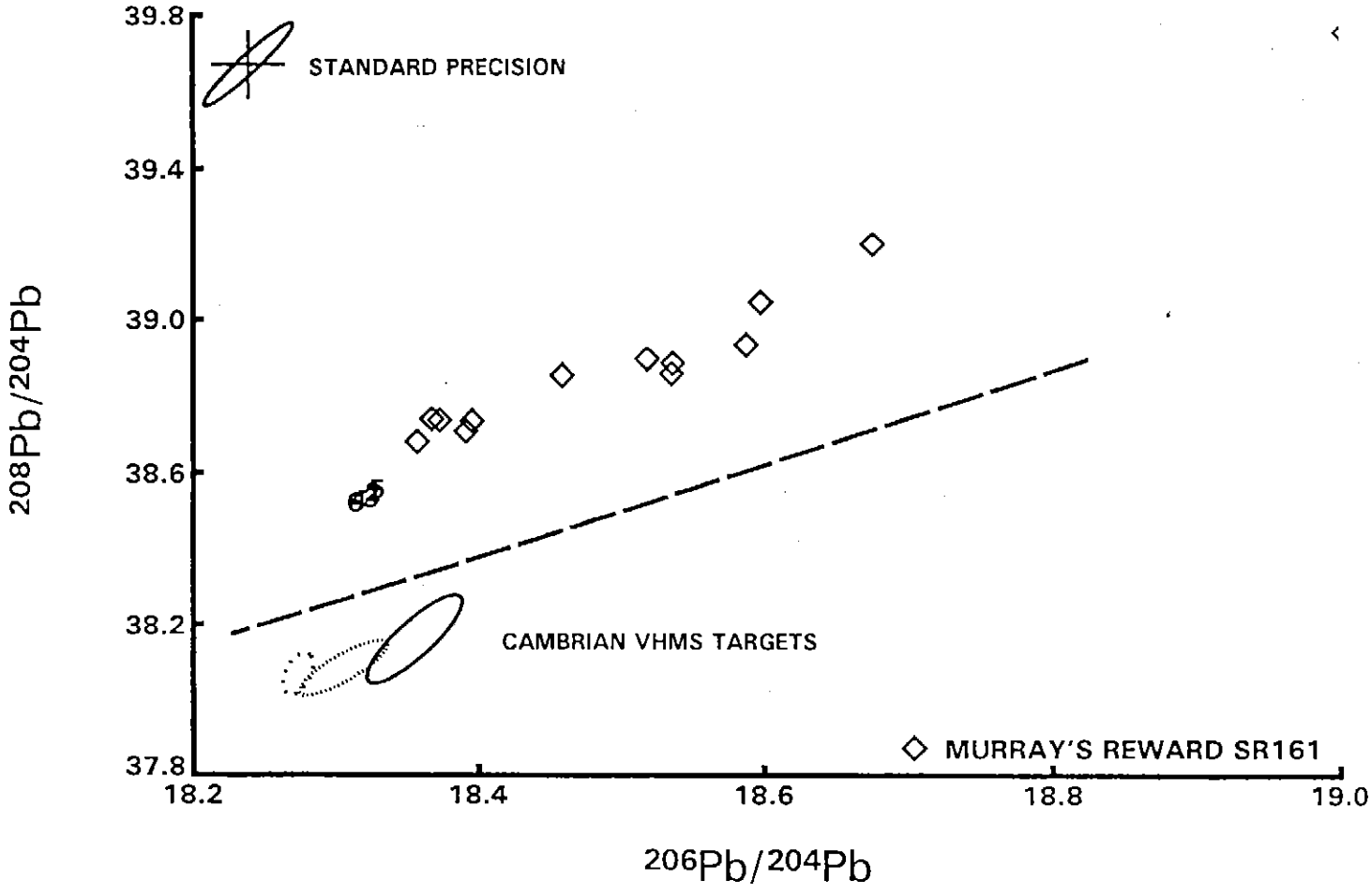
TABLE 1. LEAD ISOTOPE DATA FOR THE BALFOUR PROSPECT

Sample	$\frac{^{208}Pb}{^{206}Pb}$	$\frac{^{207}Pb}{^{206}Pb}$	$\frac{^{206}Pb}{^{204}Pb}$	$\frac{^{207}Pb}{^{204}Pb}$	$\frac{^{208}Pb}{^{204}Pb}$	Pb(ppm)
1 SAMPLE 1 gn	2.1036	0.8511	18.326	15.597	38.550	
2 SAMPLE 2 py	2.1036	0.8511	18.325	15.598	38.550	1260
3 SAMPLE 3 py	2.1030	0.8509	18.324	15.593	38.536	579
4 SAMPLE 4 gn	2.1037	0.8512	18.316	15.591	38.531	
5 SAMPLE 5 py	2.1038	0.8511	18.329	15.599	38.561	196
6 SAMPLE 6 gn	2.1036	0.8511	18.313	15.587	38.525	

gn denotes galena
py denotes pyrite
Pb contents for pyrites determined by isotope dilution
SAMPLE NUMBER PREFIXES REFER TO PLOTTED POINTS FIGURE 2

BALFOUR PROSPECT THIS STUDY





APPENDIX - LEAD ISOTOPE METHODS

Galenas were dissolved in concentrated HNO_3 acid and Pb purified by micro-electrodeposition techniques onto Pt electrodes. Pyrites were weighed into a teflon beaker along with a known amount of ^{202}Pb spike in order that Pb contents could be determined simultaneoualy with isotope ratios. They were dissolved in a mixture of 7N HCl and 7N HNO_3 acids. Lead was extracted by anion exchange methods in dilute HBr solutions and purified as for the galenas.

Lead isotope ratios were determined on a VG ISOMASS 54E thermal ionization mass spectrometer run in fully automated mode. The results have been normalized to the accepted values of in international standard NBS SRM 981 by applying a correction factor of +0.08% per atomic mass unit. Precision estimates, shown as error bars in the upper left hand corner of the accompanying Figures, are based on over 1300 analyses of international standards and natural samples. Also shown are the 95% confidence ellipses for the standard data. Lead contents are precise to within about ± 10% for low to moderate Pb samples. However, for high Pb samples (*about > 1000 ppm*), the measurement of the $^{206}Pb/^{202}Pb$ ratio becomes increasingly inaccurate so that the calculated Pb levels are only an approximation.

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REVIEW OF GEOPHYSICAL DATA
EL 53/88 MT FRANKLAND
for
SOLORIENS MINING PTY LTD

by
D.E. Leaman

October 1992

FRANKL1

INTRODUCTION

Geophysical data accumulated in the Balfour region, and in particular between Specimen Hill and the Clump (EL 53/88, Mt Frankland) has been reviewed in order to assess those methods which might prove beneficial in a licence-wide application or which might guide immediate focus and targetting.

The location of the licence area is shown in Figure 1 which also summarises the findings of this review.

COMMENTS ON DATA REVIEWED

Magnetics:
Some moderately detailed ground surveys have been completed but these are largely restricted to the region around, and a little north of, Specimen Hill (Chesnut, 1964, 1965; CRA, 1979). Some clear trends and breaks in trend are evident in these compilations but it is difficult to locate features precisely from the old base maps. The dominant trend is NNW but there are breaks and offsets near Balfour which are a little north of east.

Two aeromagnetic data sets exist but neither are of high resolution. A local survey centred on Balfour was flown by CRA (1979) and the adequate location of the survey means that trend and unit information can be defined. The terrain clearance for this survey was 75 m with a line spacing of 200 m. The contour map presentation does not afford any fine detail however.
A regional aeromagnetic survey by the BMR was completed in 1986 (see Leaman, 1988). The high clearance (150 m) and wide line spacing (500 m) limits the use of this data at the scale of this EL but it is the only data set to cover the entire licence area in moderate detail. It has the advantage of insetting the EL in a regional setting.

Correlations are possible between surveys to show consistent response patterns have been observed but it is clear that magnetic methods can provide much useful structural information provided a complete, high resolution data set is available. Trends extracted from the existing surveys are shown in Figure 1 but few are precisely located and give only the sense noted. There is also a need for gradient analysis but no suitable data set exists.

Gravity:
A regional gravity survey covers the region with a nominal spacing of 1 km. This is adequate for regional purposes but is unable to accurately define unit or trend limits or orientations (see Leaman, 1989).

The anomalies in the regional data are largely controlled by the presence of granite beneath and SW of Balfour. A local crest is implied in the Specimen Hill area. An outline of the roof of the granite is indicated in Figure 1 as are two crestal positions. This data has not been modelled in detail and the depth to granite is not known with certainty (see Leaman, 1988).
The relief on the granite roof is likely to be of the order of 1500 m and important fracture sets are almost certainly related which have controlled fluid movement above the roof. The estimated limit of shallow roof is also thought to be the position at which the granite margin plunges steeply to great depths. Since this is also likely to be the site of a major diapiric fracture the region above may also be mineralised or been subject to remobilising influences.
Regional trends from this data set have been superimposed in Figure 1 and there is generally good, but coarse, agreement with the regional magnetic survey. The two surveys certainly suggest that some zones contain major fractures or rock changes which transect the normal grain of the region.
Gravity data can clearly assist understanding of this region but require a general station spacing of no more than 250-400 m.

Chesnut (1964) has described a local gravity survey near Specimen Hill. This appears to have been a good, levelled survey using an arbitrary base value, but was not terrain corrected. This survey must be interpreted in terms of the regional context and its most interesting feature is the break in trends which occurs near 29700 mN. This sub E-W feature can be recognised in magnetic data and is sympathetic to a primary regional trend nearby of the same orientation (Figure 1).
It may be possible to recover this survey if a true observed value could be assigned to at least one station position.

Electrical methods:
A variety of electrical methods have been tested over the years but all have been restricted to a handful of limited grids such as near The Clump, Block and Murrays Reward. Results are described by Bell & Hallof (1967), McIntyre (1971), CRA (1979), McKay & Flis (1980) and Dickson (1983). Unfortunately these surveys offer restricted coverage and some ambiguous results. There are suggestions that some faults or unit boundaries have been mapped, especially near Specimen Hill. Some NNE trends are evident near Specimen Hill which offset the primary grain (e.g. lines 92, 102) or about 29700 mN.
This information, where usable, has also been incorporated into the summary shown in Figure 1.

SUMMARY

Figure 1 presents the accumulated findings of the literature and data search within the constraints imposed by data coverage and location with minimal quantitative interpretation (which cannot be supported by the present data base).

The trend map shows that major features occur at 25, 45, 80 and 310 degrees with some local variations within about 10 degrees.
The magnetic surveys define some unit trends. These are certainly disrupted and discontinuous but are not well defined with existing data.

Structural and target appraisal would be possible given a sound, detailed magnetic survey of the entire licence and supported by a moderate density gravity survey. It is not clear what would be learnt from more expensive and more extensive electrical surveys since little is known of the materials present.

The present compilation has, however, drawn attention to some important fracture and trend intersections and it is evident that elements of the modern topography and drainage have been controlled by some of these as well.

The known mineralised areas (not simply prospects with no historic recovery or working) can be linked with these. The error band represents the precision of the estimate taken as a radius and is the best permitted at present.

1. NE Specimen Hill	323 800 E, 5 429 700 N +/- 200 m Granite nearby.
2. SW Balfour town	324 500, 5 430 000 +/- 300 m (gran)
3. East airstrip	323 500, 5 430 200 +/- 300 m (gran)
4. Central zone	322 000, 5 432 500 +/- 300 m (gran)
5. Clump	321 500, 5 437 000 +/- 300 m (?gran)

Some other sites are indicated (allow 300-400 m radius), e.g., 322 700, 5 435 500 (no gran?); 322 000, 5 433 500 (gran); and perhaps 323 000, 5 433 500 (no gran); 324 000, 5 431 200 (gran); 323 700, 5 433 000 (no gran?).

A comprehensive survey of the entire licence area is recommended in order to refine these general implications and permit complete interpretation. Some additional geological mapping and sampling of rock properties is also advised.
It is also suggested that at least two of the known mineralised sites be surveyed in detail and the results compared to assess any common denominators - including the presence of sub E-W controls on structure or fluids. Sites near Balfour township (#2) and the Clump (#5) would test such fine targetting procedures. Detailed gravity coverage may define any anomalous mass associated.

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GRAVITY SURVEYS
EL 53/88 MT FRANKLAND
for
SOLORIENS MINING PTY LTD

by
D.E. Leaman

November 1992

FRANKL2

INTRODUCTION

Two semi-detailed gravity surveys have been completed in the EL as a result of review of previous data and implications for regional setting (Leaman, 1992). These were designed to provide
a) comparative information on two mineralised zones,
b) tests of local indications of regional trend controls.
c) reviews of any local controlling structures or units,
d) evaluation of local deposit signatures, if any.

The sites examined were centred on Murray's Reward SW of Balfour township and at The Clump at the north of the licence area.
Regional reviews have demonstrated that the Balfour mineralisation is far from randomly located and that clear structural and fracture controls were evident. The role of an irregular underlying granitic mass remains unclear. Unfortunately the reviews showed, late in the licence year, that a high quality magnetic survey and regional infill of existing gravity surveys was desirable. But it has not been possible to organise such surveys in the time available pending renewal of licence and good weather.
Consequently the secondary recommendation of Leaman (1992) to undertake some comparatively limited gravity surveys near key sites has been completed in order to provide some immediate direction for the exploration programme.

SURVEYS

The surveys were undertaken by a Mines Department field crew headed by Dr. R.G. Richardson. This crew was contracted to observe about 50 stations in each small, specified area. The areas proposed are shown in Figure 1 of Leaman (1992). The field report and details of the survey method and base references are given by Richardson (1992). Gravity observations were terrain corrected by Leaman Geophysics.

RESULTS

The results of the two surveys, expressed as Bouguer anomalies reduced at density 2.67 gm/cc, are shown in Figures 1 and 2.

Figure 1, for the southern area near Balfour, does not reveal any strong localised trend even when additional contours are included. It should be noted that precision of elevation determinations restricts the overall accuracy of the Bouguer anomalies and a contour interval finer than 0.5 mgal is not generally recommended.

There are, however, suggestions of sub E-W elements at 5 429 500 and 5 429 900 mN and a NW-SE feature through 324 500 mE, 5 429 750 mN. Such trends are consistent with the regional suggestions. Values of the gravity field appear to increase locally to the SW but this effect is dependent on the reliability of a single regional stations just beyond the area of Figure 1.

The most interesting feature of this survey is the small positive anomaly near the old southern workings at 324 600, 5 429 500. This lies to the eastern side of the main magnetic anomaly in this region although difficulties persist in proper location of all previous information and thus limit solid correlations.
It is possible that other localised effects are present, e.g., 324 400, 5 430 100 and 324 200, 5 429 600, but these are poorly defined.
The anomaly noted is small but significant (Figure 3) and may reflect mineralisation of modest proportions. It is interesting to note that it occurs near the intersection of ENE, NW and N-s elements in both local and regional terms. The negative effect to the west may be due to alteration.

Figure 2 presents results from The Clump area. This survey does demonstrate a strong NW-SE gradient. Its extension to the SE is unclear and unproven with available data. The Bouguer anomalies on this feature, which may be either a ridge or step gradient anomaly possess some local pinnacles (321 250, 5 437 300; 321 400 and 321 600 at 5 437 050; and 321 800, 5 436 800). The first and last of these appear to be oriented nearly N-S (compare response near Balfour, Figure 1) and to be of similar amplitude (Figure 3). Cross trends are not established by this survey but may occur at 5 437 200 and 5 436 900 mN.

The perspective offered by this survey is insufficient to show whether the positive response is either most of what has been observed (~ 1.5 mgal) or whether it is a true step anomaly with crests. More data is needed, especially to the NE, in order to establish this. A very different interpretation may result and this is suggested in Figure 3.
If the crests, presumably mineralisation-related, lie on a gradient then the spiky effects reflect local mass excesses. But, if the broader feature is a true roll anomaly, as is suggested in Figure 3, then there may well be a larger and deeper excess mass system present, of which the spikes are merely the shallow parts. The extent of the anomaly may indicate a local unit may be responsible but the scale of the present survey is too limited to be sure and in the absence of a magnetic survey this possibility cannot be reviewed. Depending on

the nature of source assumed or present the depth to a vein type target may be more than 100-150 m. It is interesting that most responses, whether spikes or broad roll, appear nearly symmetrical. Although this may be partly an artifact of station spacing it would appear that local sources dip very steeply.

No modelling has been undertaken at this stage and there is little value in such analysis until some indication of local rock properties and lithological distributions is available. It would be very easy to assume all the responses noted are due to mineralisation or alteration - although the localised spikes certainly imply this - in the absence of a clear idea or the properties of that mineralisation or the surrounding rocks.

The two surveys thus possess some common characteristics but are, in detail, quite different and it is clear that the geological circumstances at each site are quite different. The southern site is certainly closer to granite but this in no way accounts for the detailed differences between surveys or areas.

CONCLUSIONS

There are few correlations between the two trial surveys. Each contains some small anomalies which, in the Balfour case, imply the presence of some small deposits. Some indication of local properties would allow crude estimation of anomalous mass. Refinements of such estimates also require confirmation of response with more accurate elevation determinations and a slight increase in coverage in order to better define background. Structural modelling would also be possible after some properly located geological mapping.

The present surveys, although limited in coverage, accuracy and analysis, may have defined some local targets. At least one of the defined target anomalies should be inspected on the ground, and perhaps drilled, although some additional work is advised first.

A comprehensive survey of the entire tenement remains a prime recommendation in order to define and relate indicated elements. A high resolution magnetic survey (ground or air) is suggested. Such a survey would allow appraisal of the entire licence and suggest sites for follow-up gravity surveys. This method coupling would appear to be very cost effective in this area.

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Report submitted on behalf of Leaman Geophysics

by

Dr. D. E. Leaman, B.Sc., Ph.D.,
F. Aus. I.M.M., M.M.I.C.A.

Date: 13/11/92

Station No	East (m)	North (m)	Elev (m)	Gobs	Gtheo	Terr Corr	B.A. (mgal)	File Name
9251.1123	321565.0	436640.0	183.50	980.273320	980.287614	0.15	21.95	BALF183C
9251.1124	321575.0	436565.0	187.90	980.272356	980.287675	0.19	21.83	BALF183C
9251.1125	321515.0	436500.0	187.20	980.272630	980.287726	0.15	21.88	BALF183C
9251.1126	321425.0	436455.0	191.70	980.271677	980.287760	0.15	21.77	BALF183C
9251.1127	321350.0	436400.0	193.40	980.271586	980.287803	0.14	21.96	BALF183C
9251.1128	321630.0	436830.0	172.40	980.275824	980.287462	0.41	22.68	BALF183C
9251.1129	321660.0	436860.0	166.20	980.277092	980.287439	0.51	22.85	BALF183C
9251.1130	321700.0	436895.0	154.30	980.279312	980.287411	0.45	22.70	BALF183C
9251.1131	321740.0	436925.0	148.20	980.280124	980.287388	0.47	22.36	BALF183C
9251.1132	321770.0	436970.0	144.20	980.280864	980.287352	0.53	22.40	BALF183C
9251.1133	321795.0	437020.0	144.10	980.281056	980.287313	0.67	22.76	BALF183C
9251.1134	321645.0	436745.0	175.50	980.275226	980.287531	0.27	22.49	BALF183C
9251.1135	321715.0	436680.0	180.60	980.274344	980.287585	0.37	22.65	BALF183C
9251.1136	321785.0	436750.0	180.50	980.274425	980.287530	0.39	22.79	BALF183C
9251.1137	321820.0	436780.0	168.10	980.276372	980.287506	0.43	22.36	BALF183C
9251.1138	321650.0	436605.0	179.90	980.274040	980.287644	0.23	22.01	BALF183C
9251.1139	321715.0	436820.0	177.30	980.274577	980.287472	0.56	22.54	BALF183C
9251.1140	321785.0	436895.0	174.30	980.274912	980.287413	0.63	22.41	BALF183C
9251.1141	321865.0	436940.0	173.10	980.274212	980.287378	0.89	21.77	BALF183C
9251.1142	321555.0	436960.0	167.20	980.277305	980.287356	0.44	23.28	BALF183C
9251.1143	321480.0	437020.0	165.40	980.277649	980.287306	0.37	23.25	BALF183C
9251.1144	321595.0	437030.0	150.30	980.280671	980.287301	0.55	23.48	BALF183C
9251.1145	321385.0	437060.0	171.50	980.276757	980.287272	0.35	23.57	BALF183C
9251.1146	321315.0	437165.0	165.80	980.277365	980.287187	0.33	23.12	BALF183C
9251.1147	321345.0	437195.0	152.00	980.279373	980.287163	0.41	22.52	BALF183C
9251.1148	321280.0	437220.0	166.10	980.277426	980.287142	0.29	23.25	BALF183C
9251.1149	321330.0	437260.0	147.70	980.280712	980.287110	0.35	23.00	BALF183C
9251.1150	321270.0	437325.0	147.70	980.281036	980.287057	0.43	23.46	BALF183C
9251.1151	321312.0	437320.0	144.00	980.281553	980.287062	0.36	23.18	BALF183C
9251.1152	321305.0	437380.0	144.60	980.281168	980.287013	0.35	22.95	BALF183C
9251.1153	321235.0	437385.0	149.20	980.280570	980.287008	0.21	23.12	BALF183C
9251.1154	321220.0	437475.0	148.40	980.280935	980.286935	0.20	23.39	BALF183C
9251.1155	321165.0	437440.0	144.80	980.281705	980.286962	0.17	23.39	BALF183C
9251.1156	321140.0	437090.0	187.30	980.272620	980.287243	0.23	22.45	BALF183C
9251.1157	321190.0	436985.0	180.60	980.273188	980.287329	0.17	21.55	BALF183C
9251.1158	321245.0	436900.0	184.90	980.272813	980.287398	0.15	21.93	BALF183C
9251.1159	321340.0	436850.0	177.40	980.274334	980.287441	0.17	21.96	BALF183C
9251.1160	321205.0	437265.0	174.60	980.275013	980.287104	0.28	22.53	BALF183C
9251.1161	321085.0	437150.0	181.20	980.274242	980.287194	0.16	22.85	BALF183C
9251.1162	321110.0	437380.0	163.90	980.277791	980.287009	0.33	23.35	BALF183C
9251.1163	321010.0	437230.0	171.40	980.275986	980.287128	0.19	22.76	BALF183C

Station No	East (m)	North (m)	Elev (m)	Gobs	Gtheo	Terr Corr	B.A. (mgal)	File Name
9251.1066	324460.0	429580.0	207.50	980.269071	980.293355	0.33	16.86	BALF183C
9251.1067	324490.0	429480.0	209.00	980.268787	980.293436	0.36	16.82	BALF183C
9251.1068	324545.0	429400.0	207.00	980.269456	980.293502	0.39	17.06	BALF183C
9251.1069	324585.0	429300.0	195.70	980.272093	980.293583	0.20	17.20	BALF183C
9251.1070	324625.0	429205.0	204.80	980.270095	980.293660	0.15	16.87	BALF183C
9251.1071	324655.0	429115.0	205.00	980.270085	980.293733	0.15	16.83	BALF183C
9251.1072	324640.0	429020.0	205.30	980.269984	980.293809	0.16	16.72	BALF183C
9251.1073	324635.0	428940.0	206.20	980.269750	980.293874	0.17	16.61	BALF183C
9251.1074	324200.0	429775.0	200.20	980.270673	980.293193	0.15	17.01	BALF183C
9251.1075	324300.0	429780.0	200.30	980.270724	980.293191	0.16	17.09	BALF183C
9251.1076	324360.0	429705.0	205.30	980.270024	980.293252	0.23	17.38	BALF183C
9251.1077	324460.0	429635.0	211.00	980.268442	980.293311	0.27	16.91	BALF183C
9251.1078	324540.0	429560.0	200.50	980.270856	980.293373	0.25	17.17	BALF183C
9251.1079	324620.0	429620.0	206.10	980.269253	980.293326	0.21	16.68	BALF183C
9251.1080	324625.0	429720.0	215.00	980.267509	980.293245	0.20	16.75	BALF183C
9251.1081	324680.0	429805.0	220.00	980.266070	980.293178	0.15	16.32	BALF183C
9251.1082	324715.0	429920.0	223.40	980.265400	980.293086	0.12	16.38	BALF183C
9251.1083	324470.0	429270.0	196.60	980.272133	980.293605	0.10	17.30	BALF183C
9251.1084	324335.0	429240.0	201.20	980.271444	980.293626	0.15	17.54	BALF183C
9251.1085	324305.0	429340.0	192.90	980.272965	980.293545	0.15	17.51	BALF183C
9251.1086	324410.0	429370.0	192.60	980.272732	980.293523	0.16	17.25	BALF183C
9251.1087	324640.0	429310.0	193.80	980.272285	980.293576	0.12	16.95	BALF183C
9251.1088	324595.0	429410.0	196.80	980.271900	980.293495	0.17	17.29	BALF183C
9251.1089	324640.0	429435.0	193.80	980.272103	980.293475	0.13	16.88	BALF183C
9251.1090	324690.0	429450.0	194.40	980.271839	980.293464	0.16	16.77	BALF183C
9251.1091	324740.0	429460.0	197.70	980.271788	980.293457	0.13	17.35	BALF183C
9251.1092	324555.0	429500.0	199.00	980.271423	980.293421	0.20	17.35	BALF183C
9251.1093	324580.0	429510.0	198.60	980.271809	980.293414	0.15	17.61	BALF183C
9251.1094	324630.0	429520.0	197.60	980.271322	980.293407	0.17	16.95	BALF183C
9251.1095	324510.0	429390.0	203.60	980.270460	980.293509	0.20	17.20	BALF183C
9251.1096	324440.0	429480.0	196.00	980.271525	980.293435	0.20	16.84	BALF183C
9251.1097	324390.0	429460.0	189.90	980.272600	980.293450	0.13	16.63	BALF183C
9251.1098	324340.0	429450.0	188.70	980.272802	980.293457	0.13	16.59	BALF183C
9251.1099	324295.0	429440.0	187.80	980.272924	980.293465	0.12	16.52	BALF183C
9251.1100	324410.0	429570.0	196.00	980.271190	980.293362	0.27	16.65	BALF183C
9251.1101	324360.0	429560.0	191.00	980.272630	980.293369	0.23	17.06	BALF183C
9251.1102	324420.0	429680.0	216.00	980.267205	980.293274	0.17	16.59	BALF183C
9251.1103	324440.0	429780.0	218.80	980.266739	980.293194	0.21	16.79	BALF183C
9251.1104	324420.0	429880.0	225.50	980.264690	980.293113	0.24	16.17	BALF183C
9251.1105	324410.0	429980.0	222.10	980.265806	980.293032	0.31	16.77	BALF183C
9251.1106	324380.0	430080.0	211.60	980.268422	980.292951	0.43	17.52	BALF183C
9251.1107	324365.0	430170.0	214.80	980.267438	980.292878	0.31	17.12	BALF183C
9251.1108	324320.0	430270.0	221.80	980.265289	980.292797	0.21	16.33	BALF183C
9251.1109	324225.0	429555.0	195.30	980.272377	980.293371	0.11	17.53	BALF183C
9251.1110	324080.0	429780.0	191.80	980.272184	980.293187	0.15	16.87	BALF183C
9251.1111	321000.0	437375.0	164.80	980.277690	980.287011	0.16	23.25	BALF183C
9251.1112	321065.0	437305.0	169.30	980.276828	980.287069	0.17	23.23	BALF183C
9251.1113	321145.0	437245.0	173.40	980.276017	980.287119	0.20	23.21	BALF183C
9251.1114	321210.0	437160.0	176.90	980.275196	980.287188	0.25	23.05	BALF183C
9251.1115	321255.0	437060.0	169.70	980.276483	980.287270	0.20	22.79	BALF183C
9251.1116	321320.0	436980.0	172.10	980.276088	980.287336	0.23	22.83	BALF183C
9251.1117	321415.0	436935.0	174.70	980.275510	980.287374	0.31	22.81	BALF183C
9251.1118	321495.0	436870.0	172.90	980.275946	980.287428	0.32	22.85	BALF183C
9251.1119	321560.0	436800.0	168.60	980.276473	980.287485	0.27	22.42	BALF183C
9251.1120	321600.0	436785.0	170.70	980.276362	980.287498	0.25	22.69	BALF183C
9251.1121	321590.0	436740.0	175.20	980.275581	980.287534	0.20	22.71	BALF183C
9251.1122	321580.0	436690.0	179.70	980.274313	980.287574	0.19	22.28	BALF183C

Tasmania Department Of Mines

Operations report — Gravity survey at Balfour for Cue Energy Resources

by R. G. RICHARDSON, B. Sc., (Hons), Ph.D.

Abstract

At the request of Cue Energy Resources the Department of Mines acquired gravity data at 98 points in the areas of interest. Stations were on nominal traverses at either 50 m or 100 m spacing and were levelled using a microbarometer to an accuracy of 2.5 m or better. The survey was conducted from 3 November 1992 to 5 November 1992 inclusive.

BASE STATIONS

The primary base station for the survey was station 8951.9922 near the phone box at the Arthur River township. It is located at the foot of the western leg of the "Arthur–Pieman protected area" sign and has a gravity value of 980305.94 mgal.

A temporary base was established near the junction of the Couta Rocks and Balfour Roads. For meter S183 this has a value of -308.5 scale divisions relative to the Arthur River base. This station was read three times per day.

GRAVITY METER

A Sodin gravity meter, #183, was used for the survey. The constant of this meter is 0.1014 mgal/scale division. The reading accuracy of this meter is 0.01 mgal on good ground and 0.02–0.05 mgal on soft ground.

BAROMETRIC HEIGHTING

A Baromec microbarometer capable of reading pressure to 0.05 millibar was used. Despite the inherent sensitivity of this instrument and the use of short (normally less than 5 minute) reading intervals pressure effects due to wind are believed to restrict the height accuracy on this survey to 2.5 m. Heights were referenced to spot heights and well defined topographic features.

DATA PROCESSING

All data were corrected for linear drift between base readings and datum shifted to be relative to the Arthur River base. The gravity data were reduced to Bouguer Anomalies using the 1930 International Gravity Formula and a Bouguer Density of 2.67 t/m^3. Terrain corrections were computed to a radius of 21 km using a density of 2.67 t/m^3.

DATA SUPPLIED

(i) A listing of the reduced data.

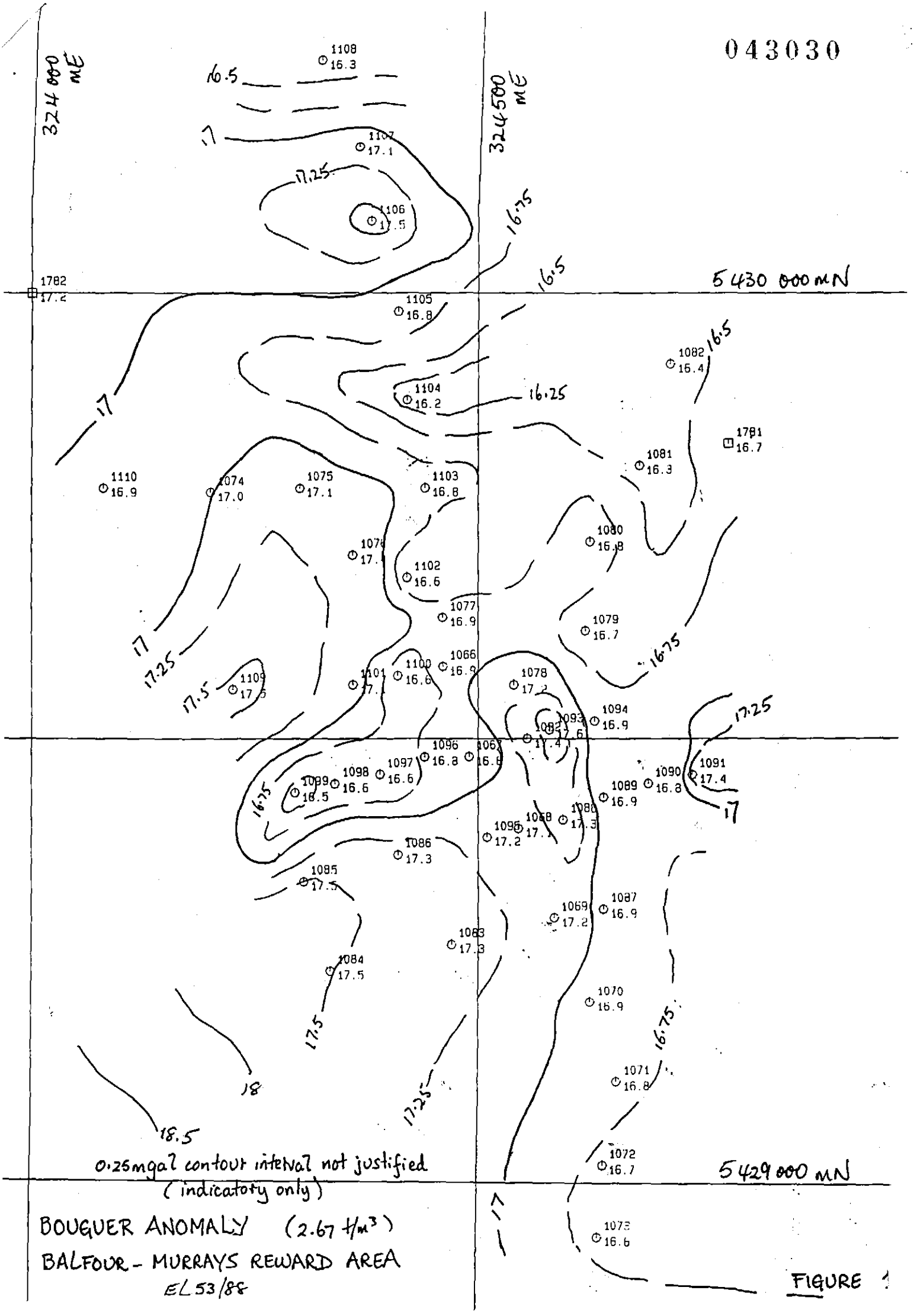
(ii) A set of handwritten field maps (1:10,000) showing station positions.

(iii) A set of Bouguer Anomaly postings (1:5000) delivered to Leaman Geophysics.

R. G. Richardson

SUPERVISING GEOPHYSICIST

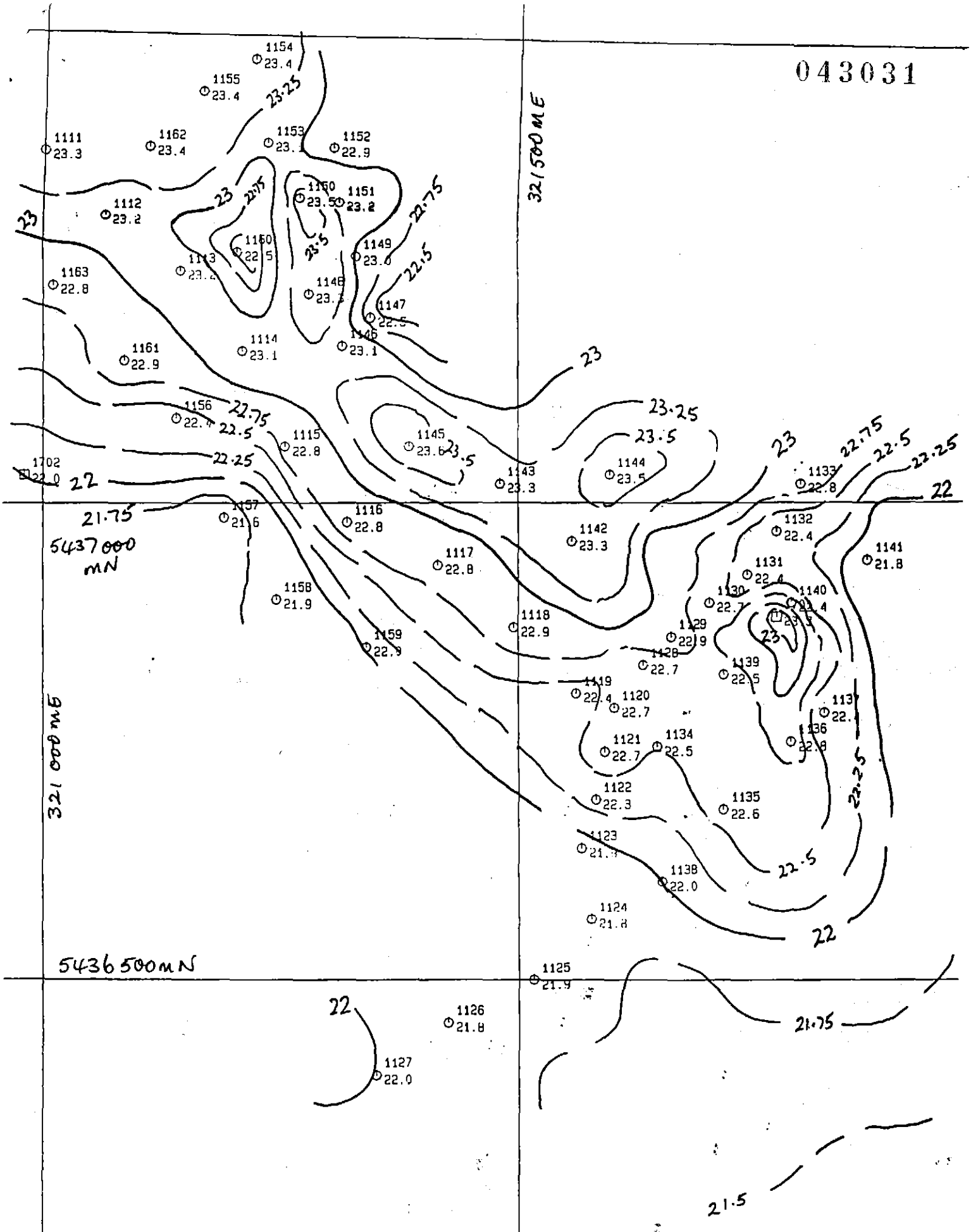
November 1992



0.25mgal contour interval not justified
(indicatory only)

BOUGUER ANOMALY (2.67 t/m³)
BALFOUR - MURRAYS REWARD AREA
EL 53/88

FIGURE 1

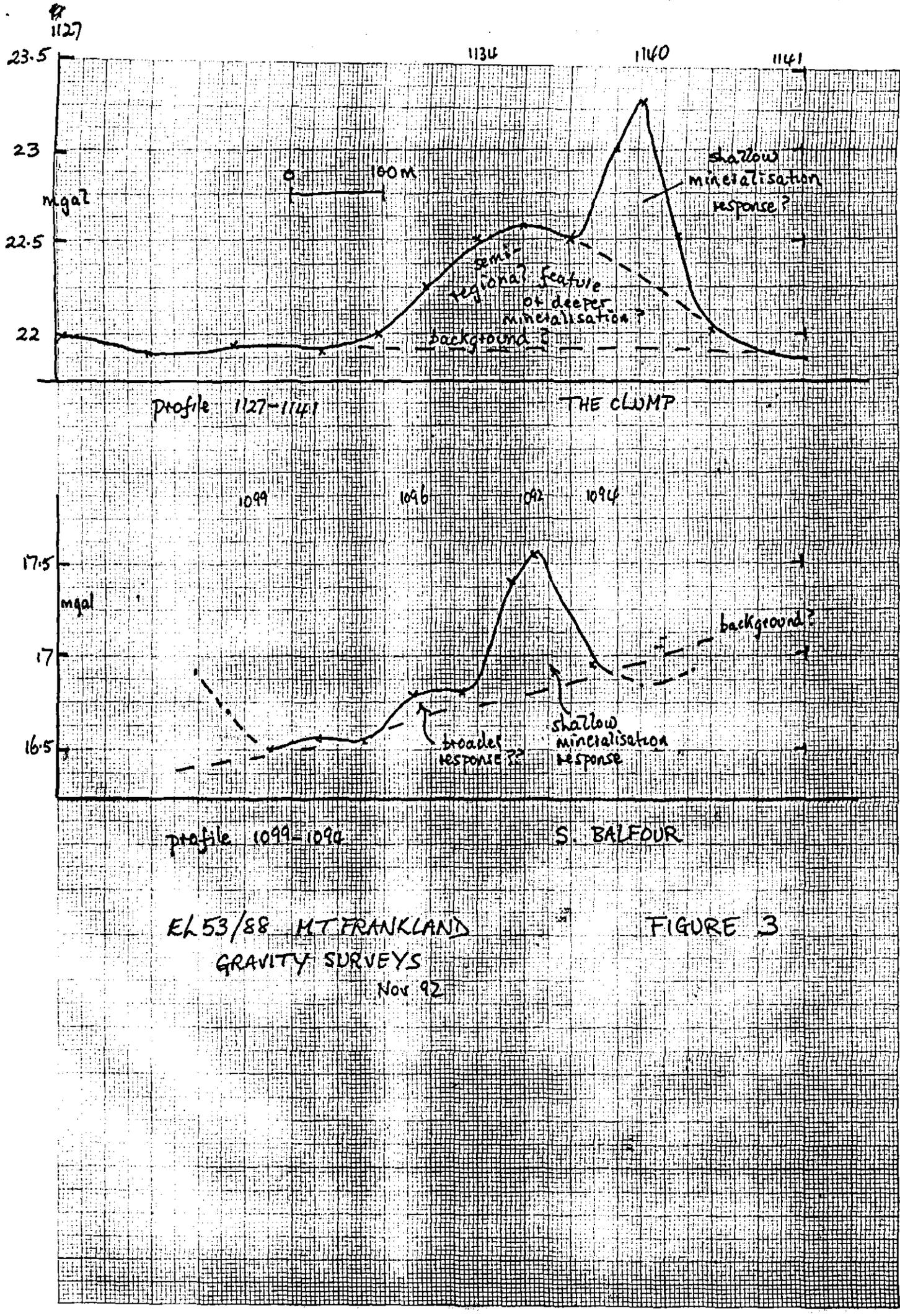


0.25 mgal contour interval not justified (indicatory only)

BOUGUER ANOMALY (2.67 t/m³)
THE CLUMP AREA

EL53/88

FIGURE 2



EL 53/88 MT FRANKLAND
GRAVITY SURVEYS
Nov 92

FIGURE 3