REPORT TO

MINEMAKERS LTD

ON THE

Modelling of gravity data over Aberfoyle – Storeys Creek, Tasmania

Geoforce reference: GF1183MM_4.0

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3 August 2010

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Executive Summary

This report details gravity modelling work undertaken in June 2010 by GroundProbe Geophysics Pty Ltd for MineMakers Ltd. The aim of this work was to use the geophysical data to help select drilling targets for tin-tungsten mineralisation in the Rossarden – Storeys Creek area. A total of fourteen 2D geological models were produced based on the gravity data and constrained by the known geology, estimated petrophysical properties, and available drillholes.

The fundamental hypothesis is that confined apophyses from the concealed Ben Lomond Granite ('cupolas') create mass deficiencies sufficient to be apparent in the local gravity field as negative anomalies. This hypothesis is valid assuming Mathinna group density of 2750 kg/m3 and granite density of 2590 kg/m3, but becomes seriously flawed if large sections of the Mathinna have reduced density as low as the 2650kg/m^3 measured for some samples.

This project builds upon work by D.E. Leaman in the early 1970's. Leaman's 1974 final report provides a thorough, high quality analysis of the gravity data using the best available techniques of the time and the mass assumptions details above. Modern modelling programs and faster computing enabled us to efficiently test Leamans results, and rapidly extrapolate. The testing indicated that Leaman's work generally holds up under scrutiny.

The results of the modelling indicate that, at least when using the cupola hypothesis and the bulk densities mentioned above, the Ben Lomond pluton has very complicated topography. Five cupolas are required to match the fine scale variations in the gravity field under Storey's Creek, Aberfoyle, Golf Course West, Eastern Hill and Anomaly 9. The modelling clearly indicates that the topography of the granite-Mathinna contact is much more extreme than the expected moderately dipping slope, especially around Eastern Hill and Storey's Creek with near vertical faces with up to 1.0km throw.

In conclusion it can be said that five 'geophysical' cupolas are required to match the gravity data, but the distinct lack of drill holes over these features means that the geological feasibility of these models is entirely unknown: The cupolas may indeed cause the observed peaks and troughs in the gravity response, but an equally valid, alternative cause is that these peaks and troughs are caused by low density (~2650 kg/m^3) Mathinna sediments, alteration along large fault zones, and Quaternary alluvium.

Further exploration should focus on discriminating the 'best' cupola for drill testing from the five possible options. For example, on first glance Golf Course West appears to be the most attractive target, but there is great uncertainty in this cupola due to the incomplete gravity coverage. If petrophysical testing shows a good chargeability contrast between Storeys Creek mineralisation and host rock, then modern 3D IP surveys could be used to screen all five cupolas up to 500m depth penetration. Additional gravity is required to extend the coverage of the Golf Course West anomaly to help improve the reliability of the modelling.

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1 Introduction and background

The Rossarden-Storeys Creek region contains a number of tin/tungsten prospects including the abandoned Storeys Creek Mine and the Aberfoyle Mine. Historical mining efforts in the region focussed on quartz veins containing cassiterite and wolfram. These veins are considered genetically related to the Devonian-aged Ben Lomond granite pluton, and are structurally concentrated along vein systems relatively close to the contact with the host Silurian Mathinna Group sediments. The genetic model is that the veins extend directly from aplite cupolas (apophyses in the granite topography), that protrude generally vertically from the broad flank of the Ben Lomond granite batholith. As surface mapping is not particularly effective at finding these cupolas, geophysical methods were considered.

Mathinna Group sediments and granite have different mineralogy, which results in distinctly different average density: The granite density is close to 2590 kg/m^3 while the Mathinna Beds ranges from 2650 kg/m^3 to 2800 kg/m^3 depending on relative abundance of quartzite to siltstone. It is postulated that, because of the density contrast between the Mathinna and the Ben Lomond Granite, shallower large 'cupolas' should create mass deficiencies sufficient to be apparent in the local gravity field as negative anomalies. This hypothesis is valid assuming Mathinna group density is a relatively uniform median 2750 kg/m^3, but becomes seriously flawed if large sections of the Mathinna have reduced density as low as the 2650kg/m^3 measured for some samples.

Gravity and seismics were trialled for Cominco by Geosurveys Ltd. The seismics were not considered effective (Leamen, 1974), reportedly because of a lack of clear reflective boundaries, but the gravity survey implied mass anomalies that could be associated with the granite intrusions. The gravity survey was thus extended to cover the Aberfoyle-Storeys Creek area on a grid spacing of approximately 180-220m This data forms the basis for this work. Location information for the lines modelled is listed in Table 1.1 with approximated locations indicated on the site plan Figure 1.1..

Gravity modelling is, by nature, highly non-unique. This means that for a given gravity response, there are an infinite number of density models that fit the response. The number of alternative models for an anomaly is diminished primarily by using the known geology, petrophysical rock density measurements, drilling information and the interpreter's knowledge of what is geologically feasible or probable. Optimism and over-simplification are the human element, especially in complicated geological environments.

The report on seismic and gravity survey over the Storeys Creek Mine (Schoenharting and Yakunin, 1972) suggests that approximate depths to high speed refractors (granites) is expected to be between 150m – 220m.

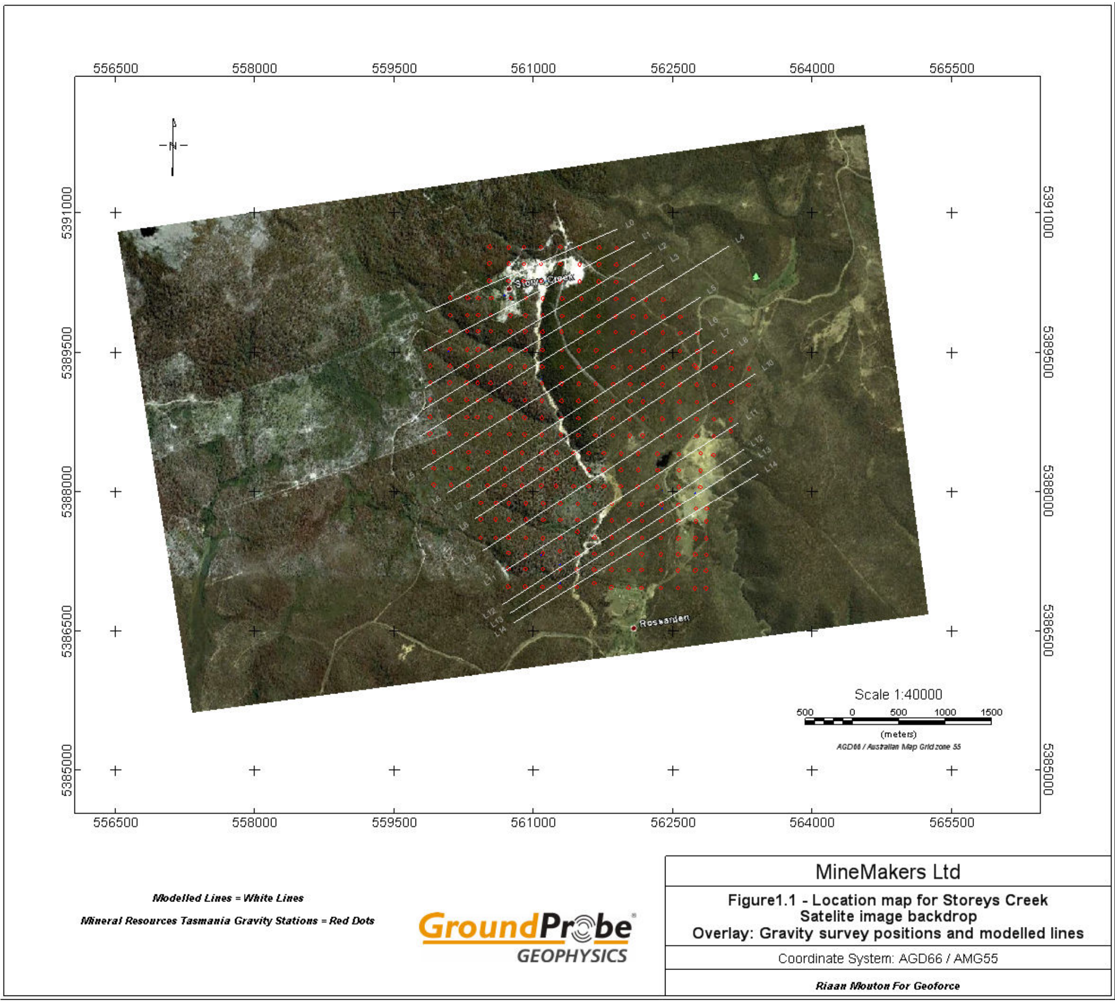

Figure 1-1 – Aberfoyle - Storeys Creek location map with gravity survey area

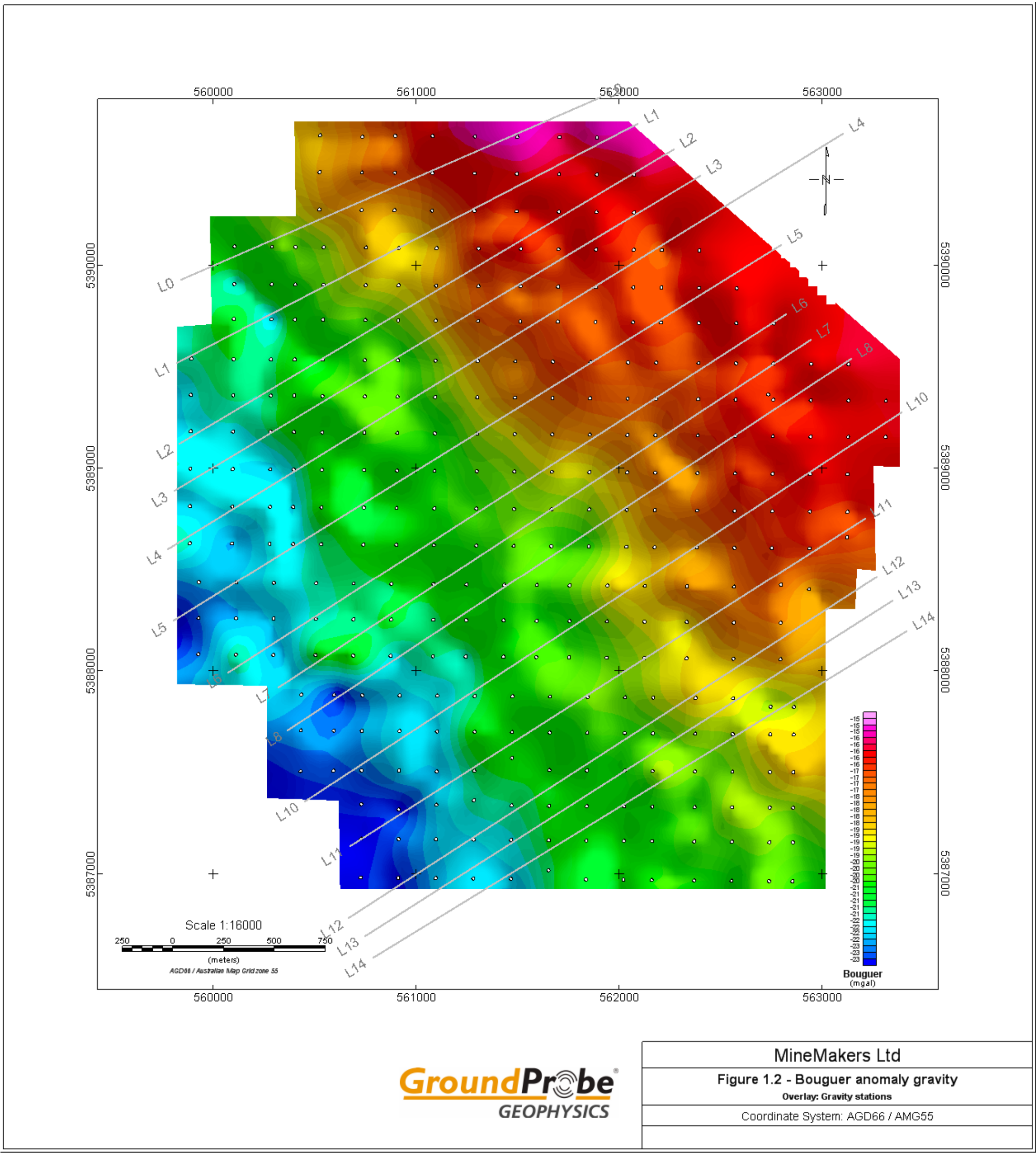

Figure 1-2 – Aberfoyle - Storeys Bouguer anomaly map showing model sections.

Table 1.1 – List of modelled lines (AMG66 zone 55)

		Start of Line		End of Line	
Line	Description	Easting	Northing	Easting	Northing
L0	Storeys Creek control section	559840	5389932	561904	5390828
L1	Storeys Crk south	559820	5389521	562087	5390698
L2	Storeys Crk south 2	562266	5390574	559832	5389120
L3	Golf Course West - north section	559806	5388888	562396	5390444
L4	Golf Course West	559777	5388601	563101	5390648
L5	Golf Course W. - south model section	559802	5388246	562795	5390100
L6	Egan North	560073	5387993	562820	5389758
L7	Egan Section	560319	5387919	562943	5389632
L8	Egan South	560365	5387707	563142	5389539
L10		560448	5387359	563387	5389274
L11		560672	5387137	563208	5388751
L12	Aberfoyle North	560665	5386783	563266	5388465
L13	Aberfoyle Control section	560748	5386694	563343	5388346
L14	Aberfoyle South	560787	5386589	563412	5388196

1.1 Geology

The Ben Lomond granite pluton intrudes the folded Silurian Mathinna Beds. Subsequent erosion has exposed and planed the Mathinna, creating an unconformity that was covered by marine sediments in the Permian. These were overlain by lacustrine sandstones and siltstones in the Triassic, and the whole sequence was intruded in the Jurassic by massive dolerite sills and plugs. In the Aberfoyle – Storey's creek area the main granite/Mathinna Beds contact trends NNW while local faulting and vein systems trend largely northeast or northwest.

1.2 Petrophysical data

A summary of the geological units found in the Rossarden-Storeys Creek region and their petrophysical properties follows in Table 1.3. This data is largely extracted from two papers by Leaman, namely "***Gravity survey of the Rossarden-Storeys Creek region***" and "***Assessment of selected features in the 2007 magnetic surveys of North East Tasmania***". Included in this table are the densities reported in the "***Seismic and Gravity Survey for Cominco Exploration***" over the Rossarden Area (1972). The values taken from this report are indicated in **brackets [ ]** and results from measurements taken at the time when these surveys were conducted. The report concluded that density contrasts of approximately 30 kg/m^3 between Permian sediments and Silurian Mathinna rocks and ~60-200 kg/m^3 between Mathinna and granite. The latter density contrast diminishes with increasing quartzite content within the Mathinna.

Density measurements of the granite/aplite at level 9-11 of the main shaft (Storeys Creek) were reported (Leaman, TR19-55-81) to be 2590 kg/m^3. Leaman also suggested that realistic density values for the Mathinna sediments are of the order of 2700 – 2820 kg/m^3. As a result an average value of 2750 kg/m^3 was used for modelling since Leaman mentioned that such a value would give approximately equal weight to quartzite and pelite. However, the effect of possible weathering should also be considered.

The Tasmanian Department of Mines measured bulk densities of the same rock types and these are reported in Table 1.2.

Rock	**Sub**	**Magnetic Susceptibility (x10^{-3} SI)**	**Density (bulk) - kg/m^3**
Mathinna Beds	Silurian quartzite Slates , greywackes	- -	2620 2720 **2670 (average)**
Devionian Granite	-	-	2620
Permian formation	Sandstone		2370

Table 1.2 – MRT list of rock properties

Lithologies	**Sub**	**Magnetic Susceptibility (x10^{-3} SI)**	**Density (bulk) - kg/m^3**
Mathinna Beds	Slate (dolomitic)	-	[2760 – 2860]
	Silurian quartzite	-	[2630 – 2670]
	Shale	0.16	2690 – 2820
	siltstone and mudstone	0.40	2790 - 2820
	Sandstone	0.06	–2690-2820

	Metamorphosed Mathinna	2.1	–2650-2700
Devonian Granite	Storeys Creek 1	0.02	2600 - 2620
	Storeys Creek 2	0.0185	2620 (average)
	-	-	[2630 – 2650]
Permian formation	- Fossilized sandstone (weathered) Siltstone	- -	2370 – 2550 [1900] [2360 – 2460]
Dolerite	-	-	2900 (average)

Table 1.3 – Rock properties summary (after Leaman)

1.3 Geophysical data

The gravity and magnetic data were downloaded from the Mineral Resources of Tasmania (MRT) webpage. The gravity data was the tasres.ba residual data corrected for the isostatic gravity field using the recently updated Mantle2010. Soon after starting the project, it was recognised that the Aberfoyle-Storeys Creek gravity data were actually incorrectly located with respect to the rest of the database. This problem was apparently rectified by MRT, but it is difficult to double check the location information without the original survey report. A detailed description (article) of the gravity survey conducted by Leaman and Moore over the Aberfoyle - Storeys Creek area is available on the MRT webpage (see reference to article TR19-55-81).

The fully corrected Aberfoyle gravity data are good quality in that they are internally consistent and do not show any clear levelling errors or terrain errors. There appears to be a slight levelling error between the Aberfoyle data and the regional gravity data: For some closely duplicated stations, there is up to 0.7mgal difference between the Aberfoyle data and gravity reading from other surveys.

Magnetic data were initially included in the modelling, but it was found to simply add complexity. This is because the granite is essentially non-magnetic, and therefore the magnetics only map changes in the magnetisation of the Mathinna, which occurs sporadically due contact metamorphism. The magnetic data indicates that magnetic Mathinna and dolerite are not important in the area under investigation.

2 Method

The work builds upon the original gravity interpretation by D.E. Leaman in 1974. Leaman's report '*Gravity Survey of the Rossarden-Storys Creek Region*' (TR19_55_81, 1974) is a well thought out, thorough interpretation report, especially considering the relatively unsophisticated computers, modelling methods, and graphical tools available at the time. Leaman is an acknowledged expert in Tasmanian gravity modelling, and his report should be read in conjunction with this report as it has a great deal of additional information.

2.1 Leaman interpretation

D.E. Leaman's work involved four main stages:

1) Determine the regional gravity gradient in order to estimate the approximate attitude of the granite contact.
2) Calculate residual gravity maps to *qualitatively* highlight distinct anomalies caused by granite cupolas.
3) Quantitatively model two 'control' sections using the geological information from the Aberfoyle and Storeys Creek mines to provide rudimentary quality control.
4) Produce a 'depth to basement' map showing interpreted likely cupolas.

In total, Leaman modelled three sections across the granite -Mathinna boundary: The Storey's Creek Control section, the Storey's Creek East Section, and the Aberfoyle Control Section.

2.2 DC Shift

The main limitation of Leaman's method was that the DC shift (broad amplitude trend in the gravity response due to very large scale crustal structures) was not recorded or apparently rigorously applied, probably because the importance of DC shift was generally not fully understood. The effect of arbitrarily applying a different DC shift to each modelling section is to either over compensate or under compensate for the proportion of granite in that section. For example, reducing the DC shift increases the ratio of granite (low density) to Mathinna (high density). Increasing the DC shift causes the reverse. This means that if the DC shift is not applied relatively uniformly, the depth to granite basement will vary widely from one section to the next.

This interpretation used a DC shift of -18 mgal on L0 (Storeys Creek Control Section), grading linearly to -18.9 mgal on L13 (Aberfoyle Control section). This shift was chosen to optimise the fit to two constraints: Firstly, the DC shift should minimise the difference between the observed and modelled gravity responses *over outcropping granite.* Secondly, the DC shift should increase southwards to reflect that fact that there is a second granite pluton to the south of Line13 affecting the regional response in addition to the bulk of the Ben Lomond pluton.

2.3 Modelling Method

For this project the following assumptions were made:

- Where possible, negative mass anomalies are attributed entirely to granite cupolas *not* low density quartzose Mathinna, low density fault zones in the Mathinna, or Permian rocks.
- The Mathinna density used for modelling is 2750 kg/m^3.
- The granite density used for modelling is 2590 kg/m^3.
- Permian and weathered granite/Mathinna density is 2400 kg/m^3.
- Dolerite (density 2900 kg/m^3) is uncommon in the survey area, and is generally is used to explain the mass variations.

Leaman's general approach of qualitatively interpreting the residual Bouguer anomaly maps to highlight mass deficiencies, and the quantitatively modelling the complete Bouguer anomaly is efficient and technically sound. This report builds on this approach using modern techniques to achieve the same basic outcomes.

The main changes over Leaman's method are the more rigorous DC shift, and the use of upward continuation rather than frequency filters to calculate the residual Bouguer anomaly maps. The modelling was done using 2D GMSys profile modelling embedded in Oasis Montaj.

The approach taken for this report is summarised as follows:

1) Grid the complete Bouguer anomaly data on a 50x50m grid.
2) Upward continue the gridded data to 500m.
3) Produce a residual grid through subtracting the upcon500m data from the complete Bouguer anomaly grid.
4) Extract the 3 profiles of gravity data that exactly duplicate Leaman's modelled sections.
5) Estimate the DC shift used by Leaman for each section.
6) Model the section using 2590 kg/m3 for the granite and 2750 kg/m3 for the Mathinna.
7) Compare the models so produced with Leaman's models.
8) Extract additional selected sections across, north, and south of the major interpreted cupolas.
9) Estimate a new, uniformly varying DC shift that is internally consistent from section to section and allows the observed field over the exposed granite to be relatively closely matched at both Storeys Creek and Aberfoyle.
10) Iteratively adjust models to match the new DC shift.

3 Qualitative interpretation results

Figure 3.2 shows Bouguer residual gravity map after removal of the regional gradient based on the upward continuation to 500m. Ten residual anomalies are apparent. The strongest anomaly is -1.4 mgal Anomaly 8 on the western boundary. The remainder of the anomalies are ~-0.6 mgal, with the exception of Anomaly 6, which is a positive 1.4 mgal residual anomaly.

The sections for modelling the complete Bouguer anomaly are chosen so that at least one section crosses each of these 10 anomalies, and two sections bracket each of the major anomalies at Storeys Creek, Aberfoyle, Golf Course West, and Egans. These models are presented in Appendix 3 and discussed in the next section

It should be noted that the residual anomalies do not in any way reflect the depth of the contact as the regional gradient removed is local and structurally controlled and therefore not absolute. In addition, the regional gradient is derived from a sloping interface (the granite contact) and thus depth information can only be obtained from the total Bouguer anomaly. The importance of the residual map attaches to the clarity with which it delineates contact irregularities, above or below the normal level of the contact, and thus it can more easily provide a guide for future drilling.

Figure 3.2 is directly comparable to Leamans residual anomaly map (Figure 3.1 adapted from Figure13 TR19_55_81), which was produced by removing the regional gradient based on a 900m aperture wavelength filter. The anomalies are labelled 1 through to 10 on both maps for ease of comparison. The main changes from Leaman's residual map are Anomaly 9 and Anomaly 10, both of which are much stronger and better developed, primarily due to the different methods used for calculating the residual.

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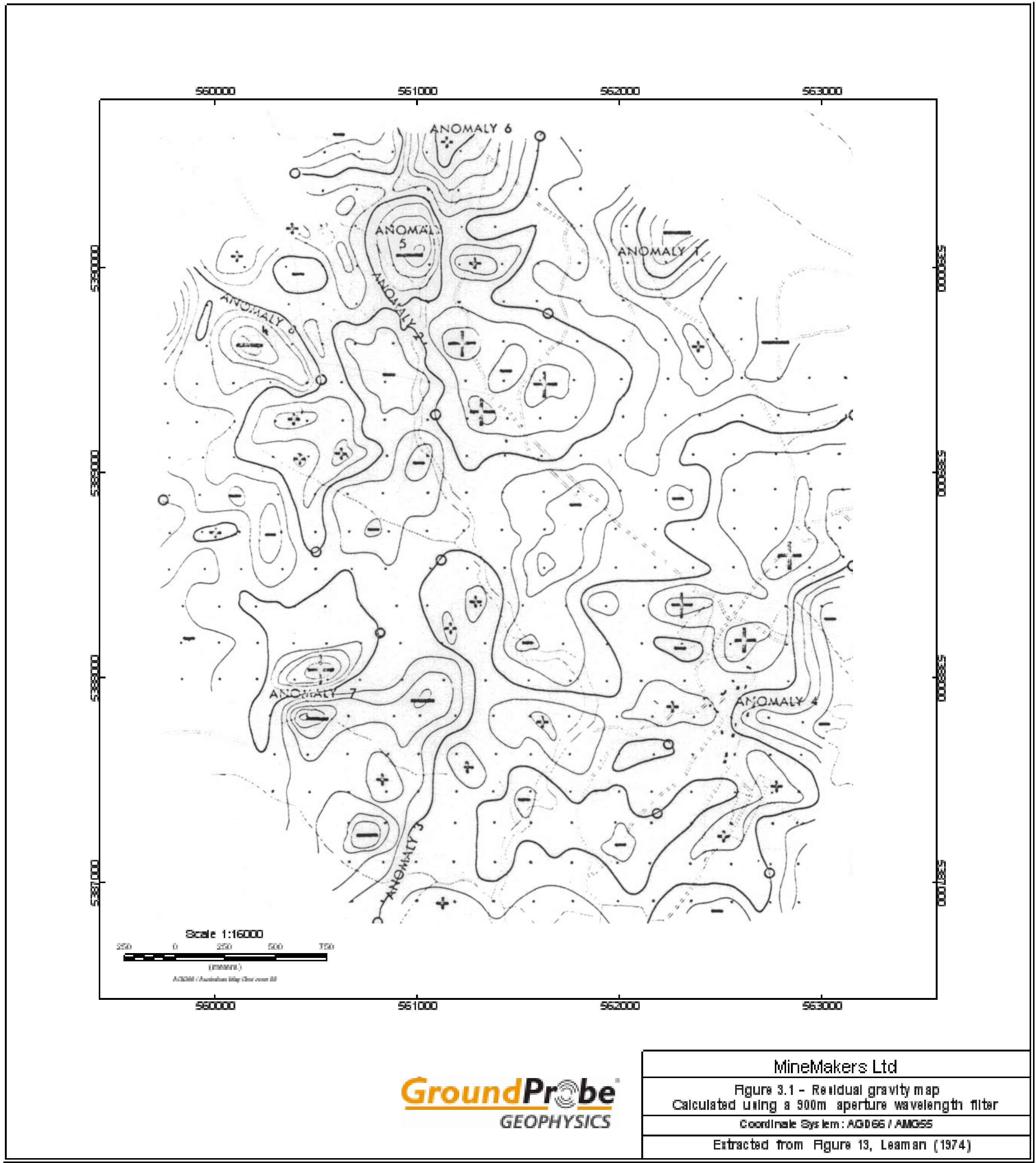


Figure 3-1: Leaman's residual gravity map, reproduced and modified from TR19_55_81

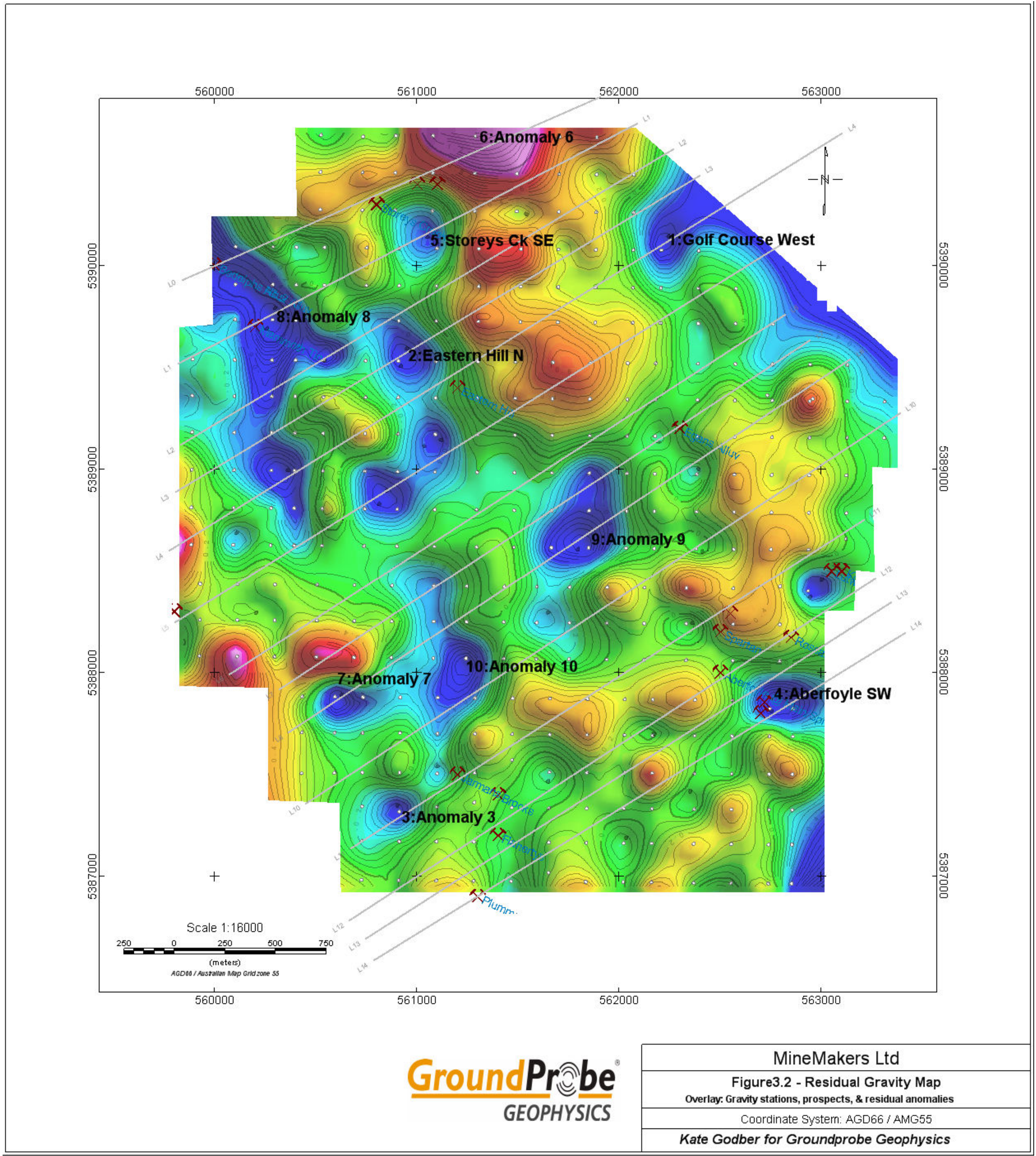


Figure 3-2: Residual gravity map showing identified residual anomalies and modelling sections.

4 Quantitative modelling results

The model sections are available in Appendix 3. The model results over the major anomalies identified in Figure 3.2 are presented below..

4.1 Anomaly 1: Golf Course West

Golf Course West is a –0.6 mgal anomaly on the northeastern boundary of the gravity survey area, located approximately 1300m east of Storeys Creek Mine. Three model sections (L2, L3 and L5) and the control section Storeys Creek East (Model L4) were modelled using a DC shift of -18 mgal. The control section L4 compares closely with Leaman's models over the same section.

The modelling, which evidently was conducted on the basis that the observed variations are largely due to variations in granite topography and not variations in the Mathinna density,, indicates that the Golf Course West anomaly is caused by a large, relatively shallow cupola, bounded on the northeast and southwest by >1.0km deep troughs filled with dense Mathinna beds. When the alternate explanations are investigated in the modelling, ,the broad regional gravity field still requires a deep, broad embayment of granite projecting up under the Golf Course West anomaly to match the observed gravity response. However, the small scale inflections superimposed on this broad field are not matched unless a relatively near surface, low density zone is incorporated under Golf Course West. This low density zone may be a granite cupola, but equally may be a thick section of low density Mathinna (quartzite) or a broad zone of weathered, altered Mathinna + granite.

The fact that the Golf Course West anomaly is only partially covered by gravity stations further degrades the reliability of the gravity models. Simply put, the gravity field around Golf Course West is only partially defined by a few widely spaced stations, so it is impossible to ascertain if the negative is indeed caused by an abrupt local apophysis, or instead is just the flank of some larger regional structure.

Assuming that the 'cupola-biased' gravity models for Golf Course West are relatively close to the true geology, then the Golf Course West Anomaly is a very interesting target. Additional gravity extending the survey covered to the north east, and infilling the existing coverage to 100m, would greatly improve the confidence. Furthermore, shallow drilling would soon indicate whether the Mathinna deviates significantly from the 2750 kg/m^3 (50% pelite, 50% sandstone) assumed in the gravity models.

4.2 Anomaly 2: Eastern Hill North

Eastern Hill North anomaly, so called because of the proximity to the Eastern Hill prospect, is a -0.7mgal gravity anomaly ~750m south of Storeys Creek. Three model sections cover the eastern Hill anomaly: Line 4 (Figure 3.8), Line 3 (Figure 3.7) and Line 2 (Figure 3.6). These sections are modelled used a -18.0 mgal DC shift.

The most distinct feature of Eastern Hill anomaly is the very sharp eastern boundary that transitions rapidly to a strong residual gravity *high*. The modelling indicates that this steep boundary is possibly related to steeply bounded, thick trough of Mathinna. A thick patch of Mathinna is required to match the relative residual gravity high, while the steep gravity gradient requires that the boundary is almost vertical, with a throw of over 1000m. The modelling results are supported by Leaman's interpretation of the depth to basement, reproduced in Appendix 4.

Anomaly 2 has a moderate priority, because even though it does not have the pre-requisite characteristics of the anomaly due to an apophysis, it lies exactly on the trend of shallow granite pinnacles extending from Aberfoyle to Storeys Ck. There is also a great deal of quartzite veining mapped in this area, which is encouraging evidence for mineralisation.

4.3 Anomalies 3, 7, 8 and 10

Anomalies 3, 7, 8 and 10 are related to small, abrupt, near surface (<100m) mass deficiencies, possibly associated with low density weathered rocks. These anomalies all occur in areas where the granite is a shallow plateau either at surface, or very close to surface, and are therefore given a low priority.

Anomaly 3 (Figure 3.1) is directly related to a major NNE-trending fault and the anomaly distribution is consistent with south-side-down displacement with an estimated throw of 150m. Leaman suggested that a broad spine of granite near surface may exist north-west of the fault.

4.4 Anomaly 4: Aberfoyle SE

Anomaly 4 is -0.6 mGal anomaly extending from just south of Aberfoyle Mine towards the east and west, and is the main gravity anomaly caused by the Aberfoyle Cupola. Model sections L11, L12, L13 and L14 cross and bracket this anomaly.

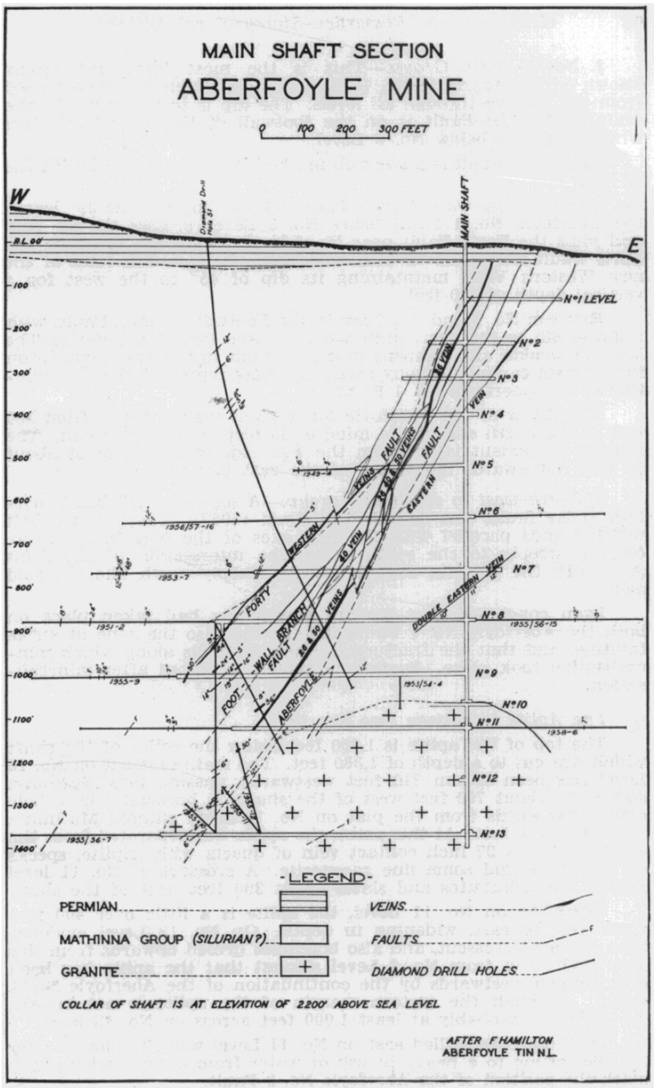


Fig. 13.—Main shaft section of Aberfoyle Mine.

Modelling constraints were obtained from A.H. Blisset's report on the Aberfoyle mine (please refer to Figure 13 from Blisset report, reproduced on the right). In summary, Blisset reported that the Aberfoyle cupola is first intersected on No. 11 Level in the Main Aberfoyle shaft, approximately ~300m below surface. It is at least 150m wide at this point, widening with depth. On No. 13 Level (350m deep), the cupola is at least 300m across, and is probably bounded in the east by the Aberfoyle No. 3 Fault, and west by the Aberfoyle No. 1 fault. The only other intersection of the aplite was in borehole S3, drilled from the surface at a point 300m ESE of the Main shaft. S3 entered the aplite at a vertical depth of 1470feet (490m) - that is about 30m below and 70m east of the intersection on the No. 13 Level in the mine.

The modelling found that, while creating a generally good fit between model and data, the 'sharpness' of Anomaly 4 was difficult to match using Blisset's depth constraints and a Mathinna density of 2750 kg/m^3. This suggests that the reportedly quartz-rich Mathinna and/or mine working may contribute to an overall lower density Mathinna group in this area. A similar discrepancy is found at the Storeys Creek gravity model. Whether this is related to the increased quartzite content, the effect of the mine voids, or some other variable in not known.

Model section L13 duplicates Leaman's Aberfoyle Control section, with similar results: Leaman's steep cupola 'Model 3' (Figure 17, Leaman, D.E., 1974)) was considered to be the best fit to the data. This compares well with the model section L13 results, which shows a deep trough of Mathinna on the eastern and western sides of a narrow granite apophysis. Neither model supports a broad apophysis or an isolated aplite 'blob'.

Robinson (1956) contoured the top of the aplite on No. 10 Level and his plan suggests an irregular elongation in an east to west direction. This is consistent with the gravity modelling, which suggests that the aplite extends WNW and ESE of the main Aberfoyle Shaft (please refer to Figure 5-1).

Blisset suggests that the northern boundary may have an important bearing on the continuation of economic mineralisation northwards. About 1 km northwest of the concealed aplite, a few poor exposures of quartz-porphyry are noted. It is possible that this aplite dyke may represent the northward extension of the concealed aplite. This provides further supporting evidence for testing the northwestward extension of the Aberfoyle cupola. Accordingly, the northwestern extension of the Aberfoyle Cupola has a high priority.

4.5 Anomaly 5: Storeys Ck SE

The Storeys Creek SE anomaly is a 400m x 200m -1 mGal anomaly located ~ 250m southeast of the main Storeys Creek mine area. The anomaly is directly under model section L1, and bracketed by the Storeys Creek Control section (L0) and model section L2.

The gravity modelling on L0, L1 and L2 incorporated the information from the Storeys Creek shaft, which intercepts the granite cupola at 175m. As was the case at Aberfoyle, it was found that the granite either has to be much closer to surface than the mining and drilling indicates (unlikely), or the Mathinna beds in this area are less dense that the average 2750 kg/m^3. The latter inference is supported by the fact that there appears to be a positive correlation between the more quartzitic Mathinna (=less dense) and the granite intrusions. Model section L1 uses a decreased Mathinna density to match the model gravity response to the observed gravity.

Anomaly five has a low priority because it is probably caused by the same cupola that is mined by the Storeys Creek mine.

4.6 Anomaly 6

Anomaly 6 is a positive mass anomaly located on the northern boundary of the survey area, modelling under section L0. The anomaly is not fully covered by the gravity survey, so the true extent and therefore location is not certain. However, given the weak magnetic association of the presence numerous dolerite dykes and sills in nearby drill holes, it is likely that Anomaly 6 is related to an accumulation of dolerite at depth. Anomaly 6 has no prospectivity for tin mineralisation associated with granite under the current working hypothesis.

4.7 Anomaly 9

Anomaly 9 is a broad -0.65mgal residual anomaly in the centre of the survey area. It is considerably more apparent in the upward continuation residual (Figure 3.2) than the 900m aperture filter residual (Figure 3.1).

Model sections L6, L7 and L8 over Anomaly 9 suggest that, if the anomaly is caused by granite, then the granite is a large, broad cupola extending from model section L8 northwards to model section L6. However, there are several equally plausible geological explanations for the low gravity: Namely, altered fault zones and/or quaternary sediments both have densities close to 2400kg/m^3, sufficiently low to cause the observed response. This alternate hypothesis is supported by the mapped geology, which shows large scale fault structures immediately adjacent to the residual anomaly.

Accordingly, anomaly 9 is allocated a moderate priority. Any further testing should focus on ascertaining the likelihood that the anomaly is caused by a granite cupola versus the alternative, which is a fault zone or thick (50m) zone of Quaternary sediments.

5 Cupola targets

The modelled sections are sufficiently close together to allow a rough 3D reconstruction of the Mathinna-granite interface. A 2D plan view of this surface is presented in Figure 5.1, followed by a 3D perspective in Figure 5.2.

The 3D Mathinna-granite reconstruction shows clear cupolas at Aberfoyle, Storeys Creek and Golf Course west, and more subtle ridge-like features under Anomaly 9 and Eastern Hill north. In agreement with Leaman's observations, the granite / Mathinna Beds contact trends NNW but it is likely that a set of faults in a NW-SE direction as well as in a NE-SW direction may be closely related to the main vein systems recorded by MRT.

The five cupolas (in approximate order of prospectivity) are listed below and presented in Figure 5.1 and 5.2:

1) **The Aberfoyle cupola**
2) **Anomaly 9 target**
3) **Golf Course West**
4) **Eastern Hill target**
5) **Storeys Creek cupola**

X	Y	RL	Desc
562627.8	5388027	450	1: Aberfoyle cupola
561751.4	5388670	620	2: Anomaly 9 target
560899.5	5389645	680	4: Eastern Hill target
560966.9	5390270	570	5: Storeys Creek Cupola
562211	5390104	550	3: Golf Course West

Table 5.1 – List of possible Cupola targets

**Note – Coordinates are given in AGD66 / AMG55S.*

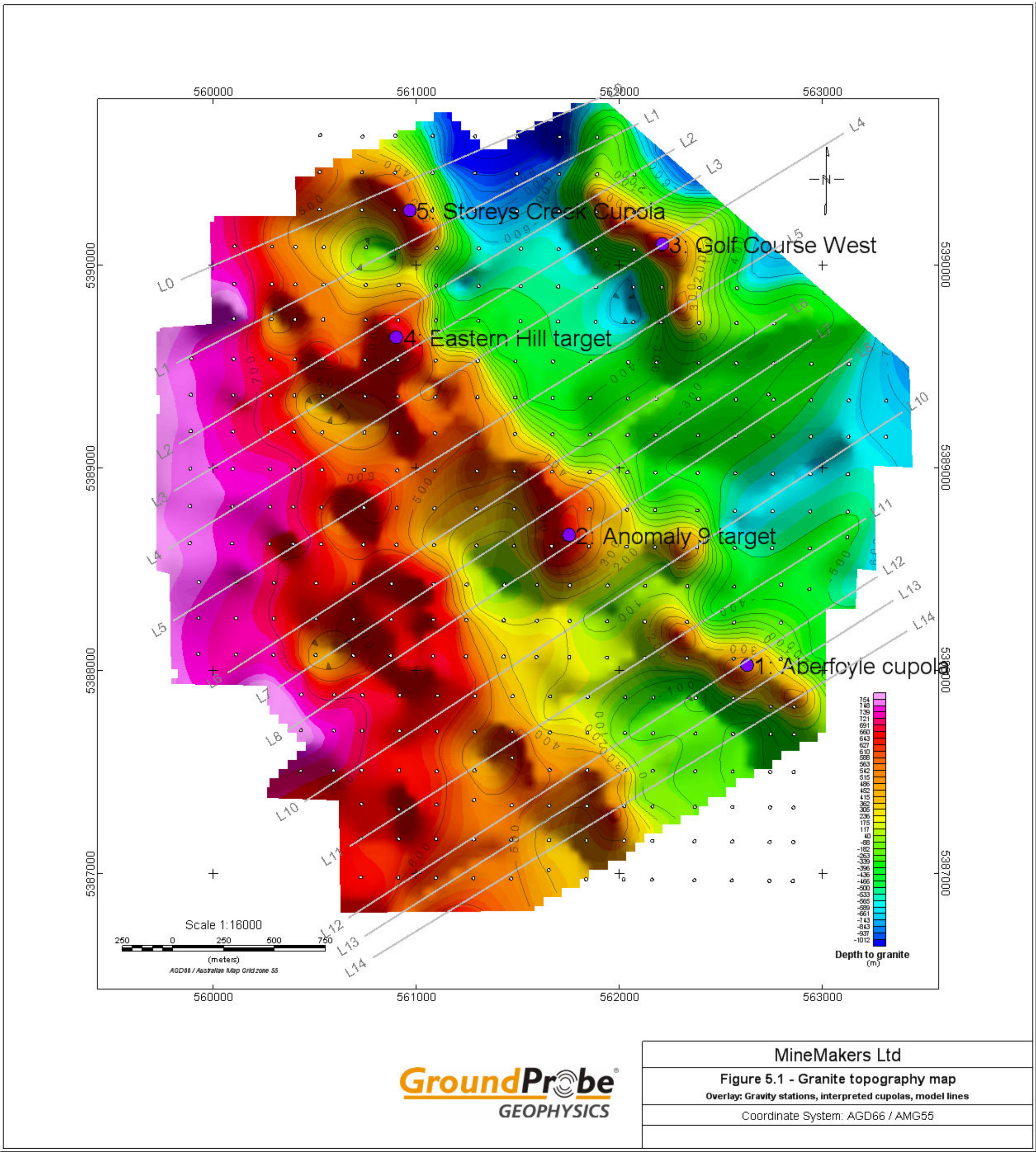


Figure 5-1: Map of the interpreted granite topography showing the major cupola targets, gravity stations, and modelling sections from which the granite topography grid is derived.

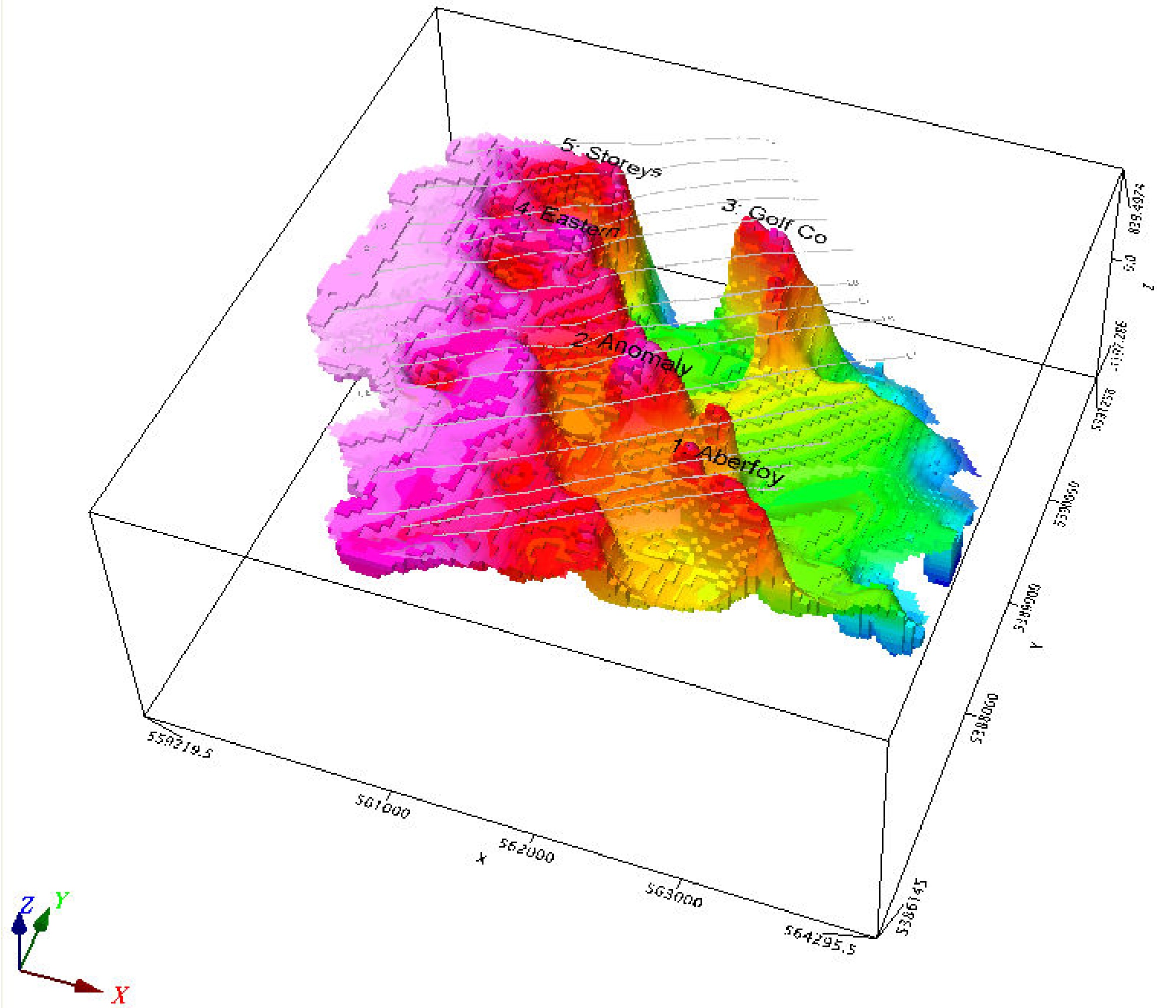


Figure 5-2: 3D map of the interpreted granite topography showing identified cupolas.

6 Discussion

The first stage of this project was to replicate and test the original gravity modelling work by D.E. Leaman in 1974. Leaman's interpretation generally holds up under scrutiny, with one large caveat. The 'DC Shift' element to gravity modelling (essentially the regional offset caused by large, mantle scale features) was not explicitly recognized in 1974, and therefore not rigorously applied. Broadly speaking, the effect of underestimating the DC shift is to increase the volume of granite in that section, though it does not greatly affect the fine scale granite topography. Overestimating the DC shift has the opposite effect. Increasing the DC shift to match that implied by Leaman's Aberfoyle modelling requires much more extreme topographical variations (e.g. cupolas in the order of 2km high superimposed on very deep granite) to match the observed inflections in the gravity response. It is more likely that Leaman overestimated the DC shift by ~1mgal for the Aberfoyle section. Reducing the DC shift to -18.7 mgal means much extreme variations in the granite topography, and more consistency with the DC shift from the northern section.

There is clearly scope for significant error, not just in the DC shift, but also in the assumed petrophysical properties. For example, it is well established that on hand specimen scale, the Mathinna can vary in density from 2650 to 2830 kg/m^3, roughly conforming to the ratio of quartzite to pelite in the sample. If, for example, large fractions of the Mathinna are 2650 kg/m^3, which is significantly less dense than the assumed 2750 kg/m^3, then the 'granite cupolas' under Anomaly 9, Golf Course West, Eastern Hill North and Egan may in fact be zones of quartzitic Mathinna. The truth is probably somewhere between these two extremes: There is some evidence that granite cupolas may preferentially intrude brittle quartzite Mathinna zones, and the combined effect is a larger negative gravity response. Finally, it is conceivable that low density caused by altered rocks along large faults zones may produce gravity lows of a similar order to those produced by low density granite cupolas.

The main limitations of this work can be summarised as follows:

- The interpretation is obviously heavily biased towards using cupolas to explain the observed gravity anomalies because that is the exploration model in use.
- Golf Course West is not completely covered by the gravity survey, and therefore the models are inaccurate.
- Anomaly 9 and Eastern Hill north form a ridge of interpreted shallower granite parallel to known regional faulting, and therefore may by fault related offsets in granite topography rather than true 'cupolas'
- Low density Mathinna may be used as an alternate source for most of the observed gravity anomalies (excepting Aberfoyle), with similarly good data-model fit.

Other geophysical options have not been exhausted, mostly due to the lack of exploration at the prospect in recent, more geophysically advanced, years. Leaman states that the electrical properties of the major rocks types (Mathinna and Granite) are very similar, and therefore cannot be expected to show a good electrical response. This is true with respect to resistivity, but sulphide mineralised granite/Mathinna/quartz vein sets may be expected to have a good *chargeability* contrast. This contrast, if strong, would make Induced Polarisation an ideal exploration tool. Modern IP surveys can yield reliable 3D information up to 500m below surface. The first stage for testing the applicability of IP would be to arrange some simple petrophysical tests on a suite of samples.

7 Conclusions and recommendations

In summary, the gravity modelling suggests five granite cupolas under Aberfoyle, Golf Course West, Storeys Creek, Eastern Hill North and Anomaly 9 (west of Egans prospect). This validity of this modelling, however, entirely hinges on the accuracy of the estimated bulk Mathinna density of 2750 kg/m^3. One of the primary aims of drilling, therefore, should be to gain an understanding of the Mathinna density over the target anomaly.

Recommendations are as follows:

- Petrophysical testing

Geophysical exploration methods have greatly increased in depth of penetration and accuracy over the past decade. Rather than drilling the proposed targets 'blind' on the assumption that any cupola so discovered will have associated mineralisation, an alternative option is to explore directly for that mineralisation using surface geophysics. For example, if petrophysical tests show a good chargeability contrast between mineralisation and host rock, then induced polarisation is a widely used, cost effective, simple method to test directly for sulphide mineralisation.

- Anomaly 9

Anomlay 9 is a ridge of shallower granite along strike from Aberfoyle. It is comparatively shallow to drill, but the local fault patterns suggest that it may be a fault bounded wedge of granite rather than a classic cupola. Surface geophysics and/or drilling are recommended to test whether this anomaly is caused by fresh granite, faulted granite, or low density weathered Mathinna.

- Eastern Hill North

Eastern Hill North is spatially linked to mapped vein systems and weak surface mineralisation. It is comparatively shallow to drill, but as for Anomaly 9, the local fault pattern suggests it may be a fault bounded wedge of granite, or even a broad, low density fracture zone. Surface mapping and followed by drilling to intersect the granite-Mathinna interface is recommended.

- Aberfoyle Northwest

Aberfoyle northwest is the along strike extension to the Aberfoyle aplite cupola. Both Blisset and Robinson suggest that the Aberfoyle cupola is elongated in the northwest-southeast direction. An aplite dyke outcropping along strike to the of the Aberfoyle cupola provides further encouragement for investigating the potential along strike from the Aberfoyle mine.

- Golf course west

The incomplete gravity data over Golf Course west significantly degrades the quality of the gravity models, and therefore confidence for drill testing. Provided petrophysical measurements confirm that the mineralisation is chargeable, surface IP is recommended prior to drilling. Additionally, extending the gravity coverage towards the northeast would help improve the confidence in the models.

- Storeys Creek

No further exploration is recommended at Storeys Creek.

8 Disclaimer

The interpretations contained in this report are based on the training and experience of the author and information passed on during the course of the investigation. As with all geophysical data, multiple interpretations are possible. The client is advised to consider information from all available sources prior to making a decision on how to proceed.

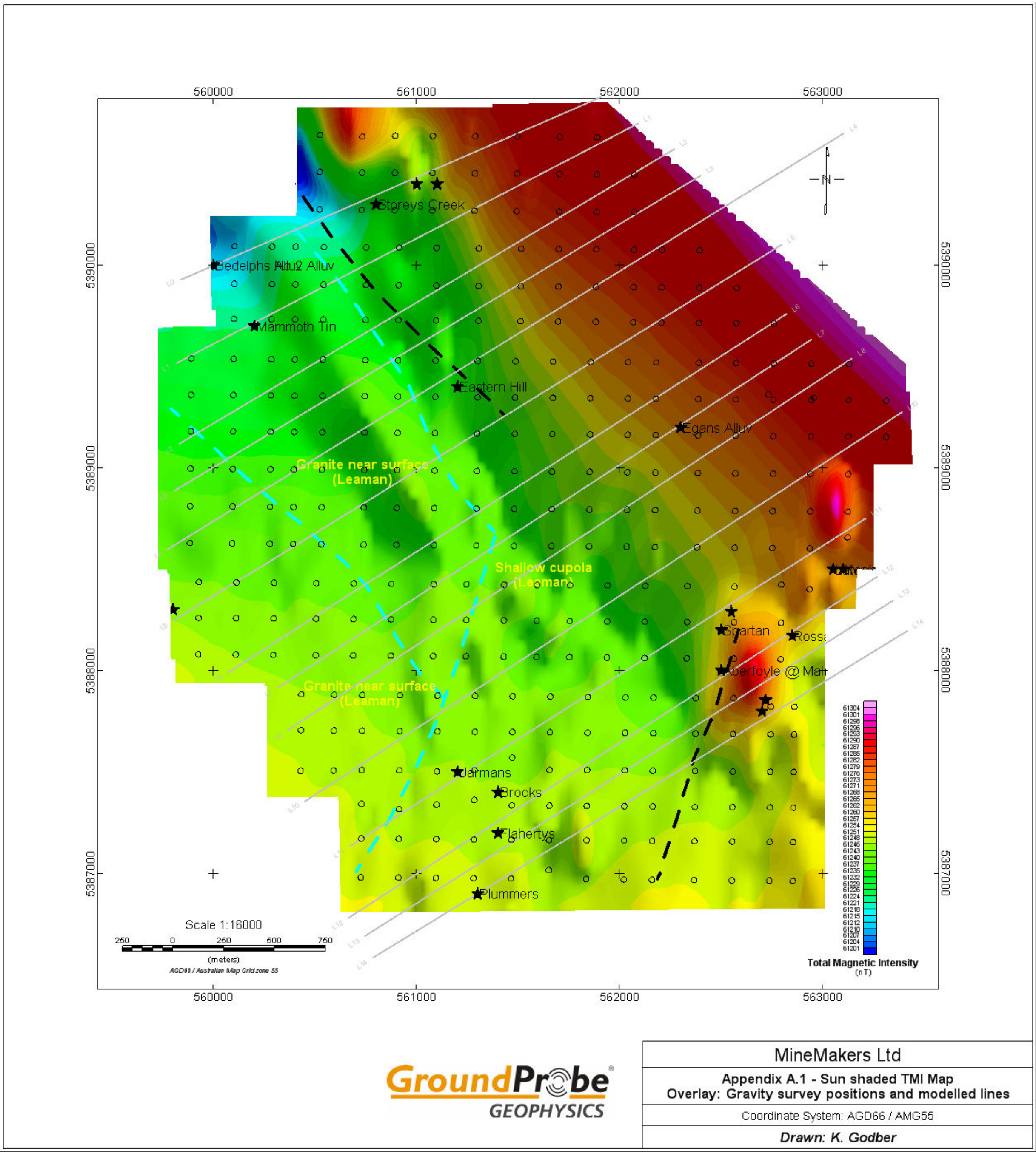
Kate Godber

Senior Geophysicist

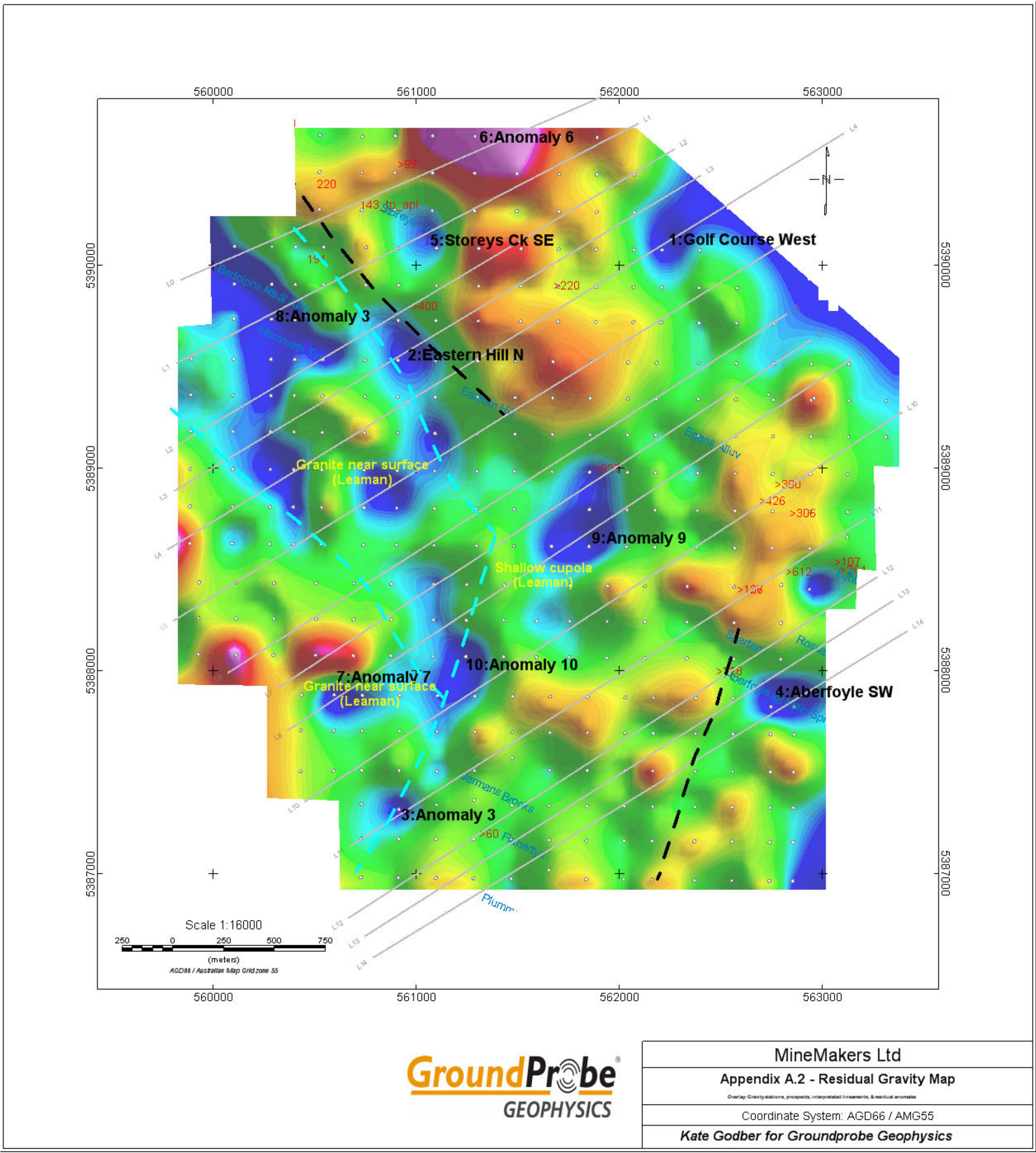
9 List of References

1) ***Seismic and gravity survey for Cominco Exploration – Rossarden Area Tasmania***; Schoenharting, G and Yakunin, A.; 1972.
2) ***The geology of the Rossarden – Storeys Creek District***, Blissett, A.H.; Bull.geol.Surv.Tasm.46; 1959.
3) ***Gravity survey of the Rossarden – Storeys Creek region***; Leaman, D.E.; TR19_55_81, 1974
4) ***Assessment of selected features in the 2007 magnetic surveys of North East Tasmania***", Leaman, D.E., available from www.mrt.tas.gov.au
5) ***Regional geophysics of the Alberton-Mangana goldfield, Northeast Tasmania;*** Roach, M and Richardson, R; Exploration Geophysics (1995) 26, p 92-99.

Appendix A1 – Total magnetic intensity map (Aberfoyle - Storeys Creek)



Appendix A2 – Residual Gravity Map (Aberfoyle - Storeys Creek)



Appendix A3 – Modelled sections

Figure 3.4: Line 0 – Anomaly 5 (Storeys Creek control section) and Anomaly 6

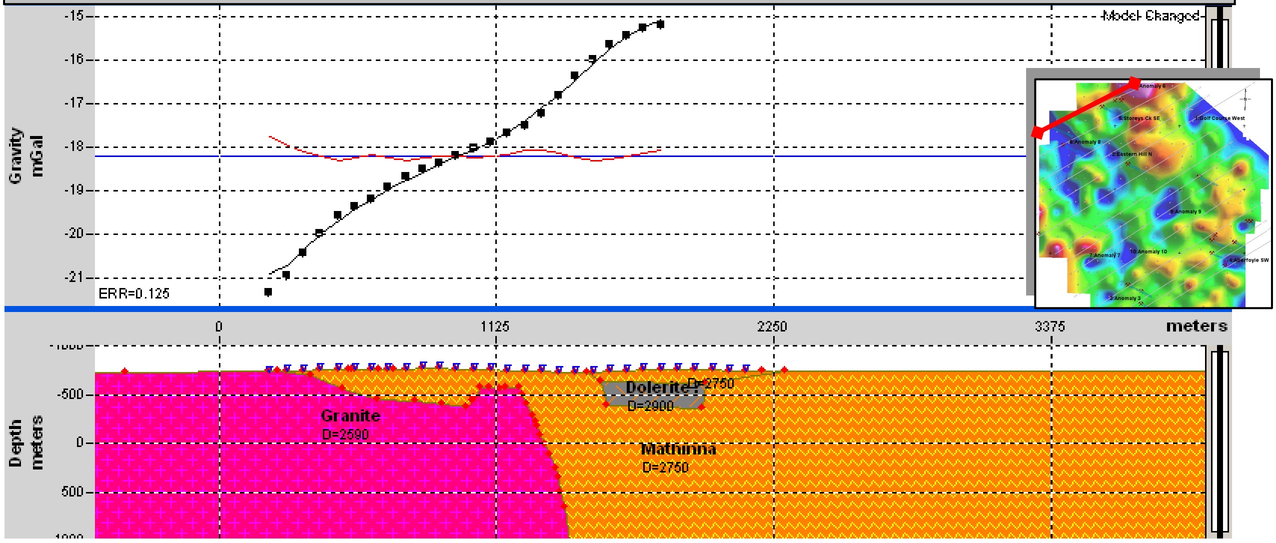


Figure 3.5: Line 1 – Anomaly 5 (Storeys Creek South section)

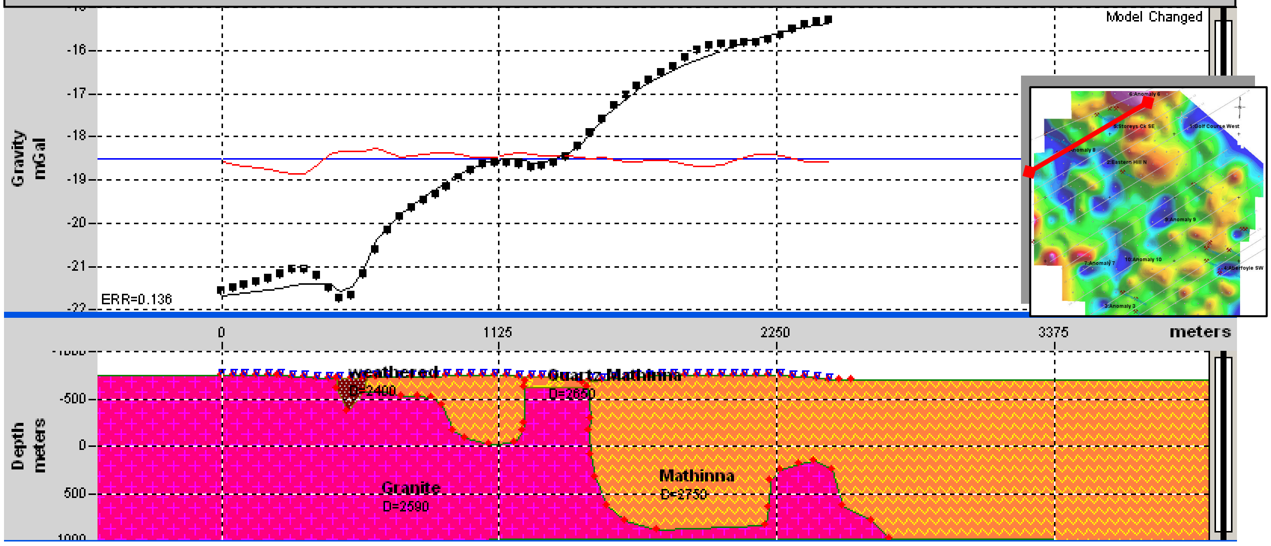


Figure 3.6: Line 2 – Anomaly 5 (Storeys Creek South section 2)

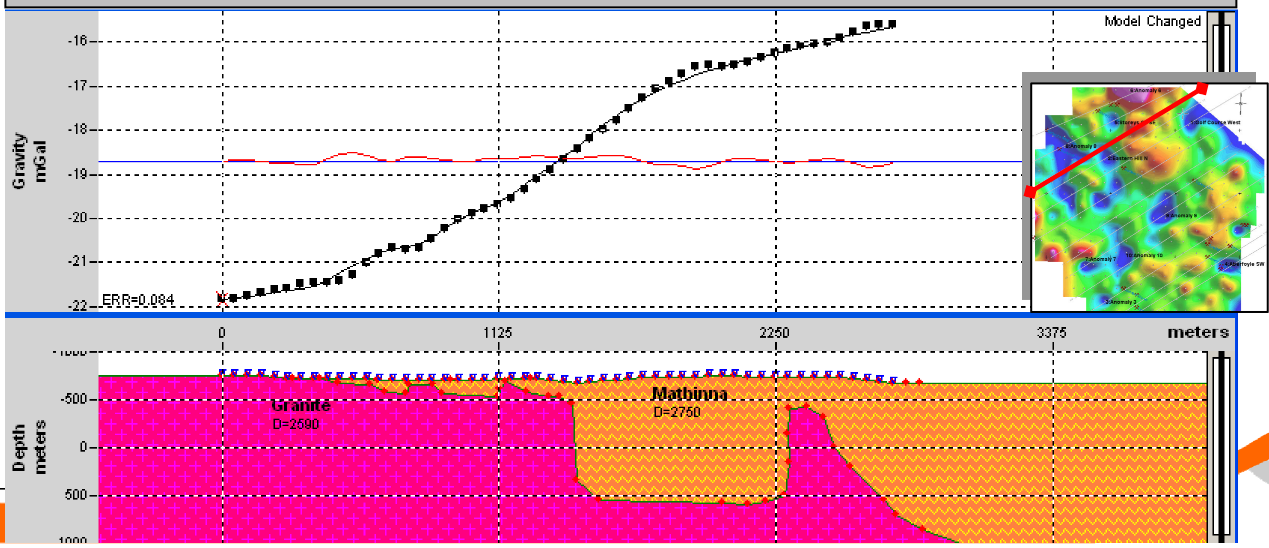


Figure 3.7: Line 3 – Anomaly 1 (Golf Course W – north section) and Anomaly 2 (Eastern Hill)

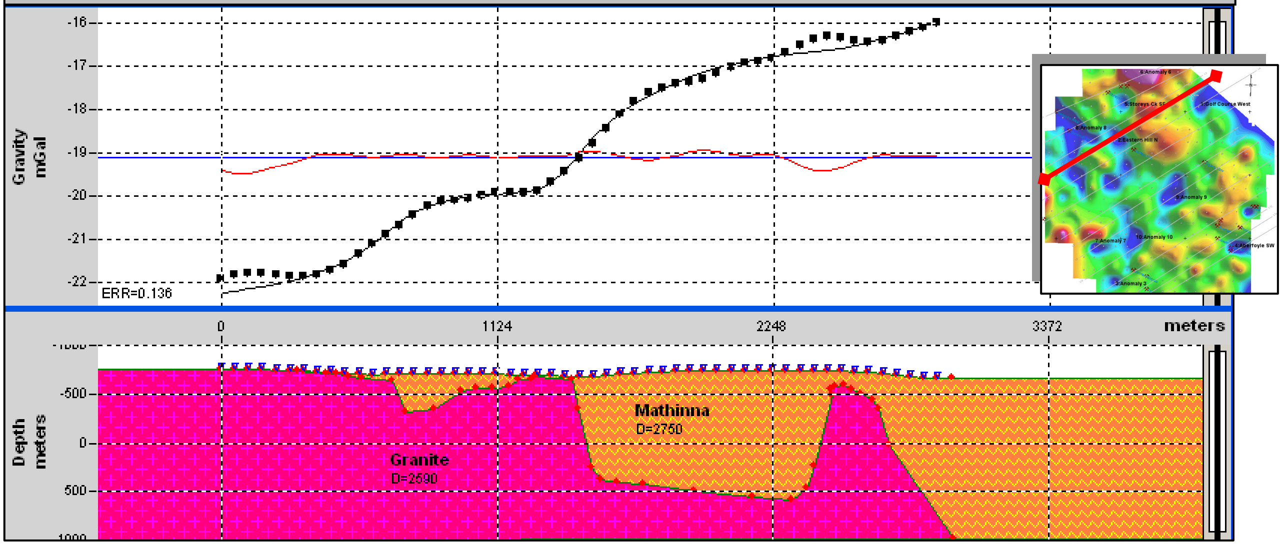


Figure 3.8: Line 4 – Anomaly 1 (Golf Course West) and Anomaly 2 (Eastern Hill-south section)

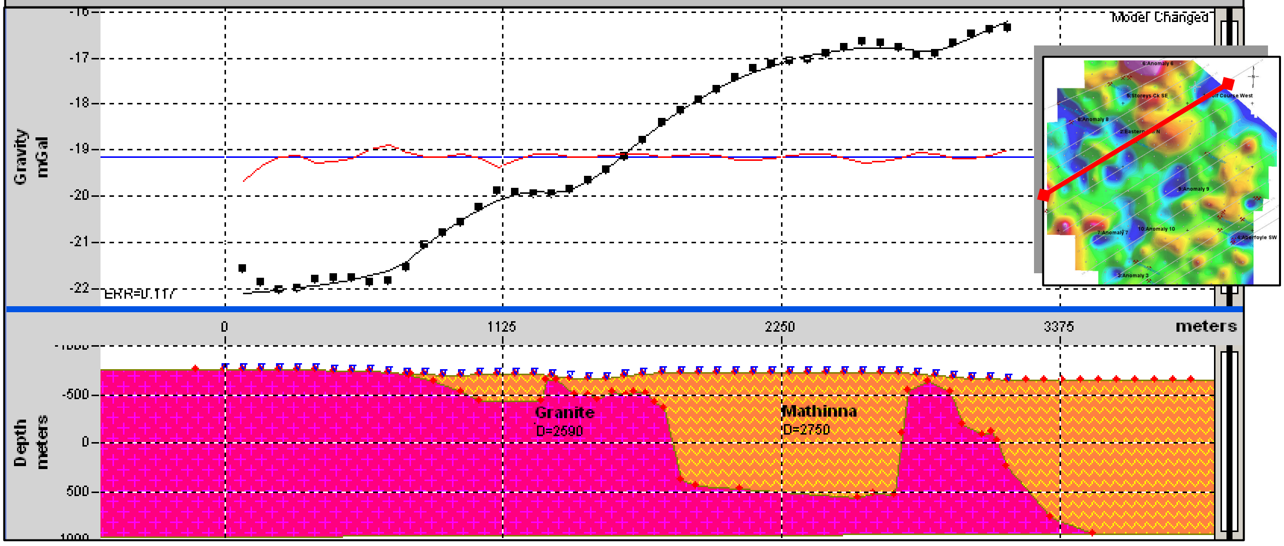


Figure 3.9: Line 5 – Anomaly 1 (Golf Course West – south model section)

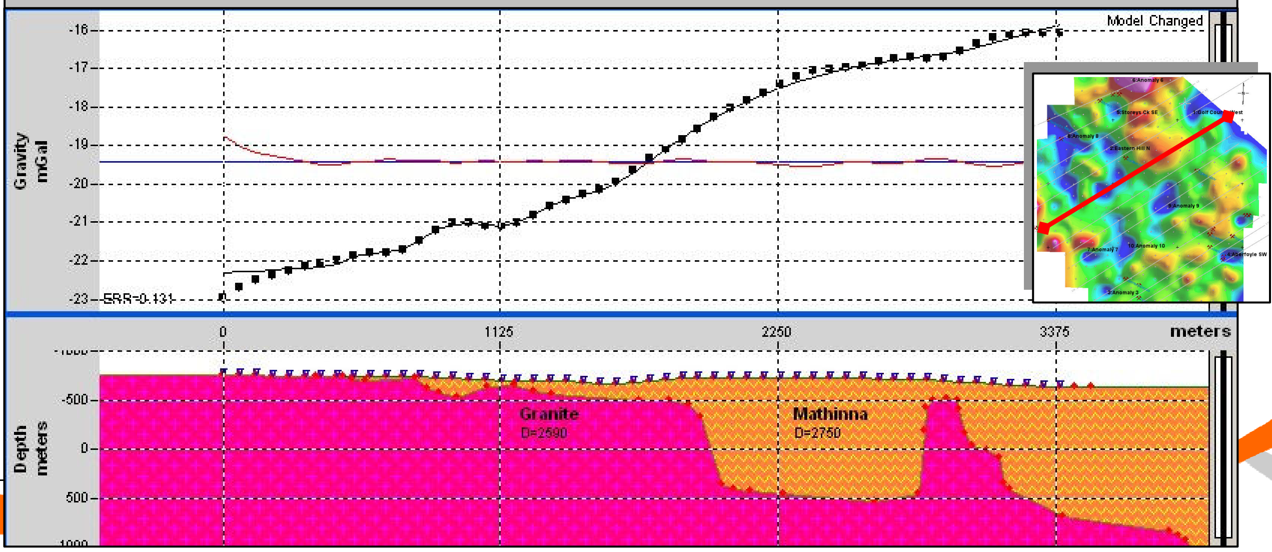


Figure 3.10: Line 6 (Egan North Section)

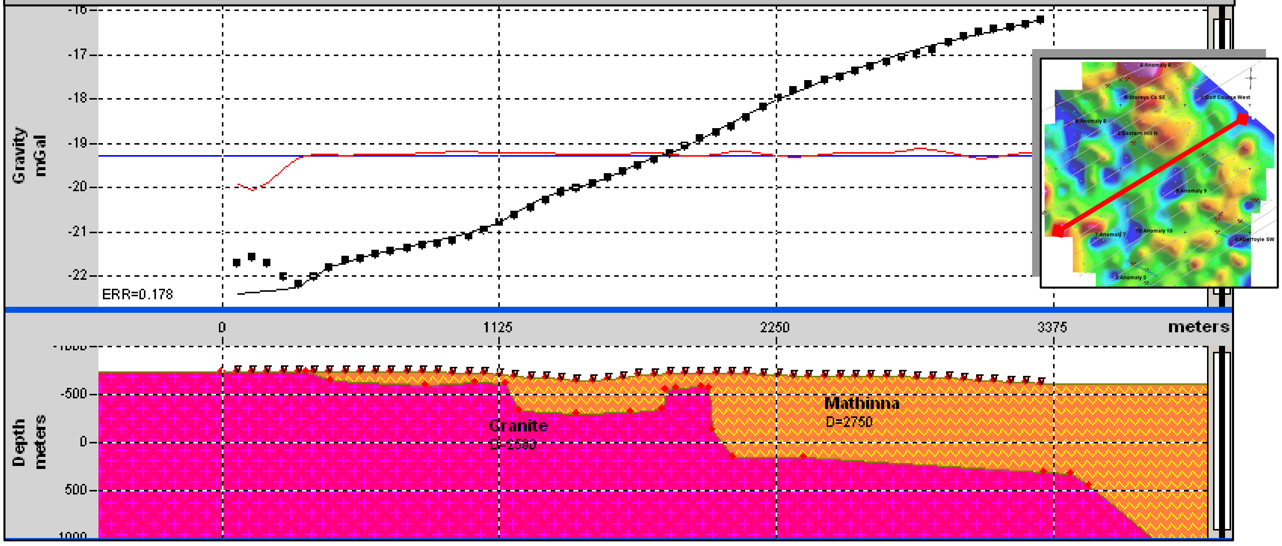


Figure 3.11: Line 7 – Anomaly 9 (Egan Section)

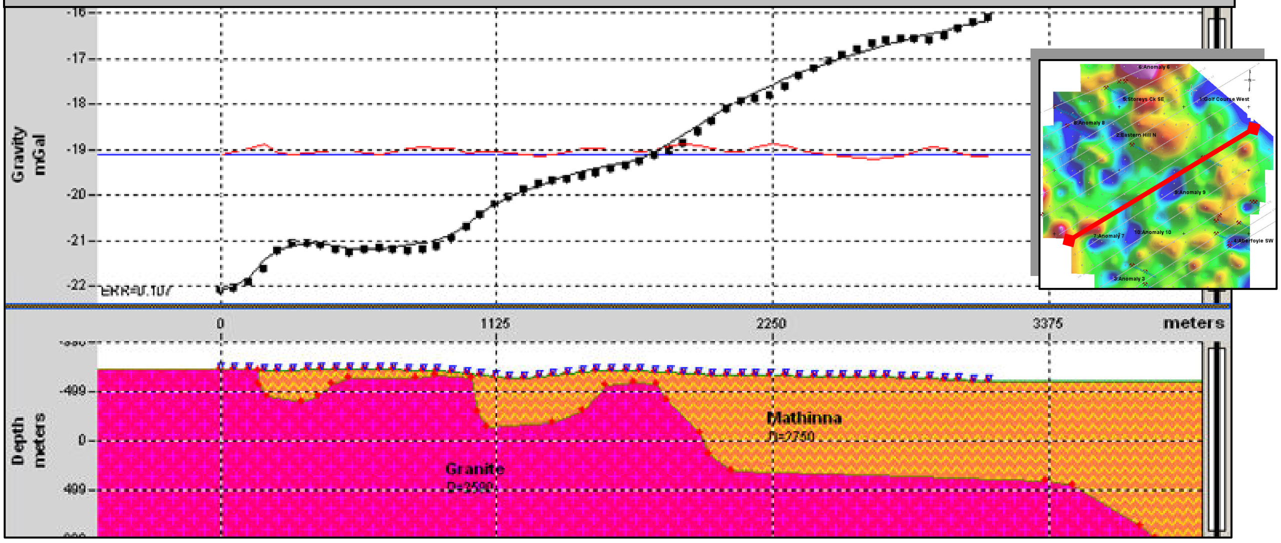


Figure 3.12: Line 8 – Anomaly 9, 7 and 10 (Egan south model section)

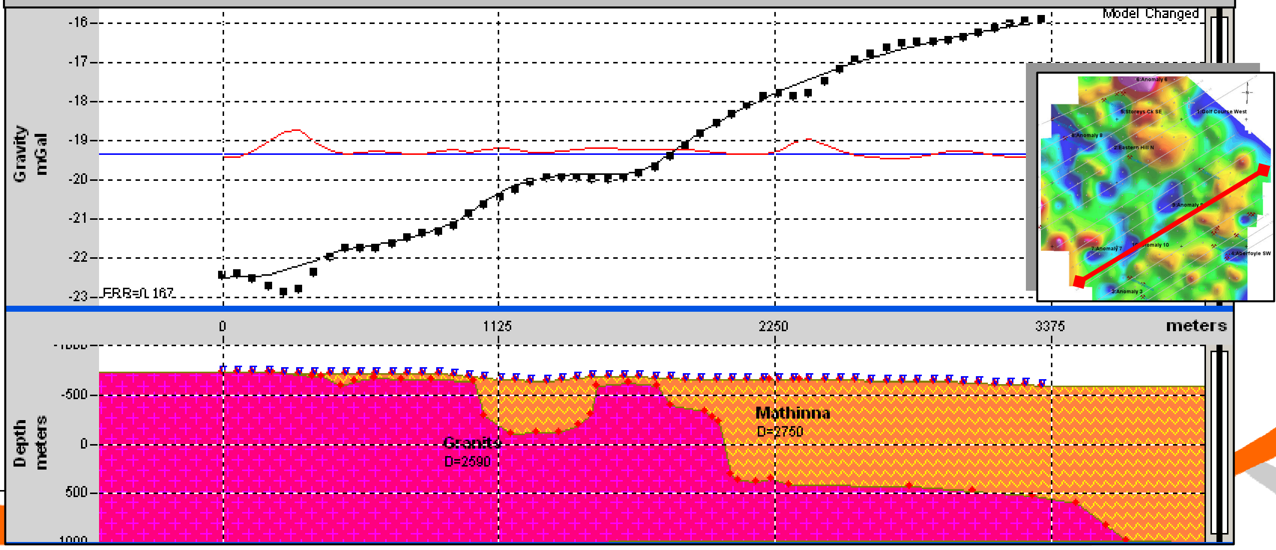


Figure 3.13: Line 10 – Anomaly 10

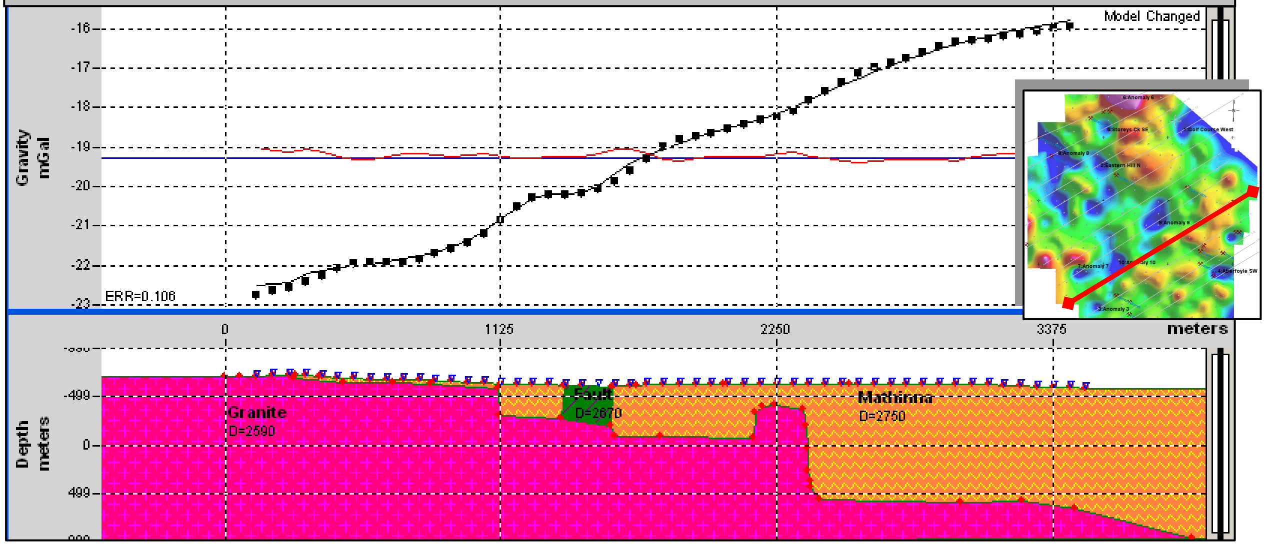


Figure 3.14: Line 11 – Anomaly 3

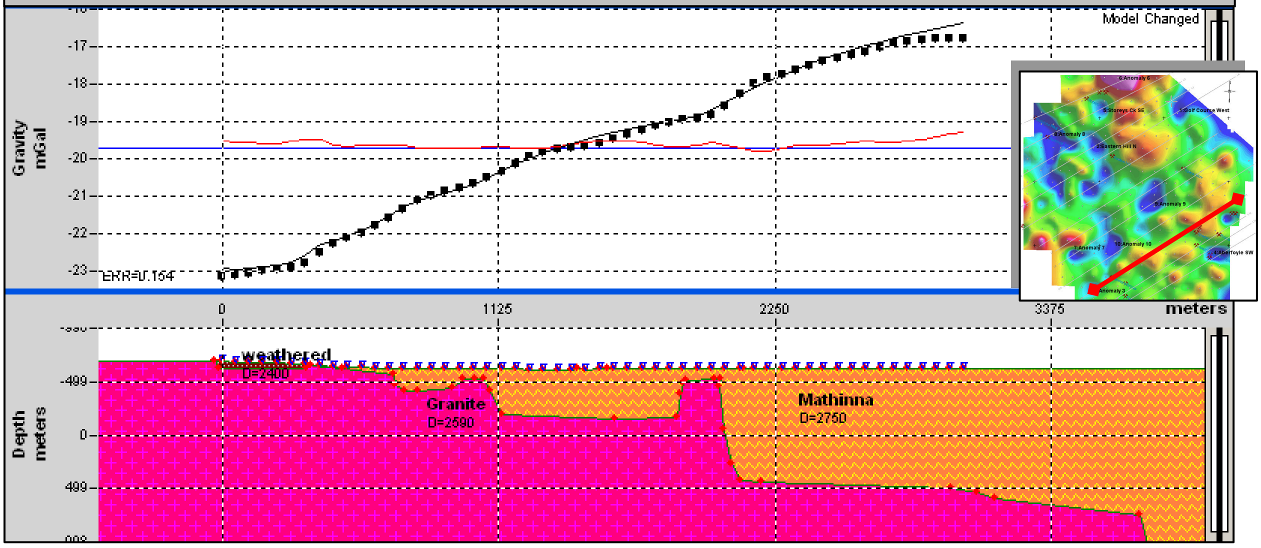


Figure 3.15: Line 12 – Anomaly 4 (Aberfoyle North section)

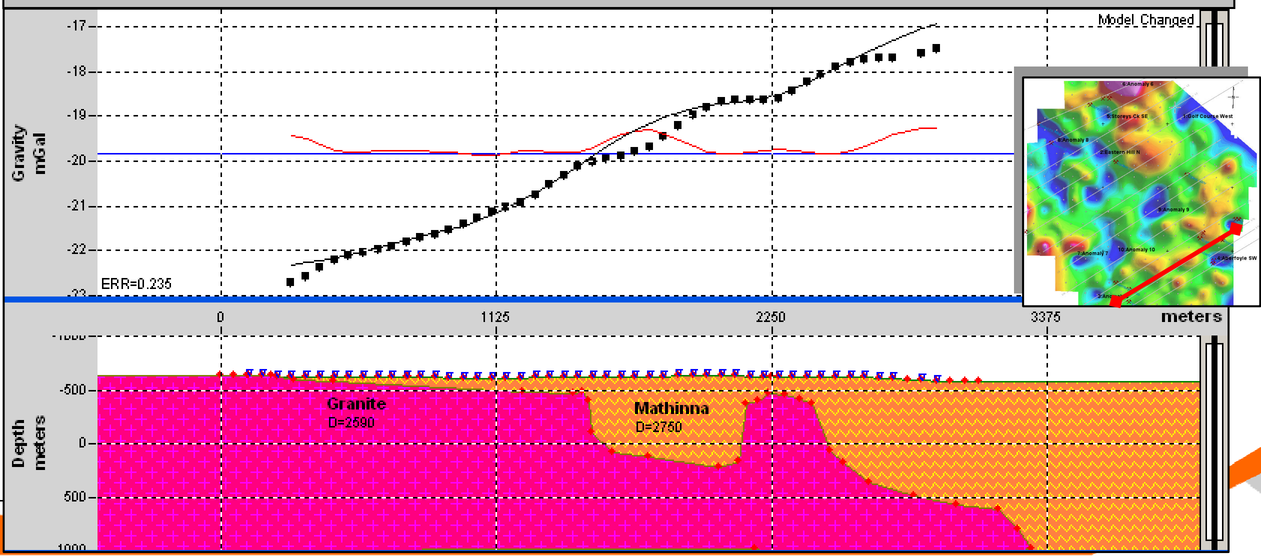


Figure 3.16: Line 13 – Anomaly 4 (Aberfoyle Control Section)

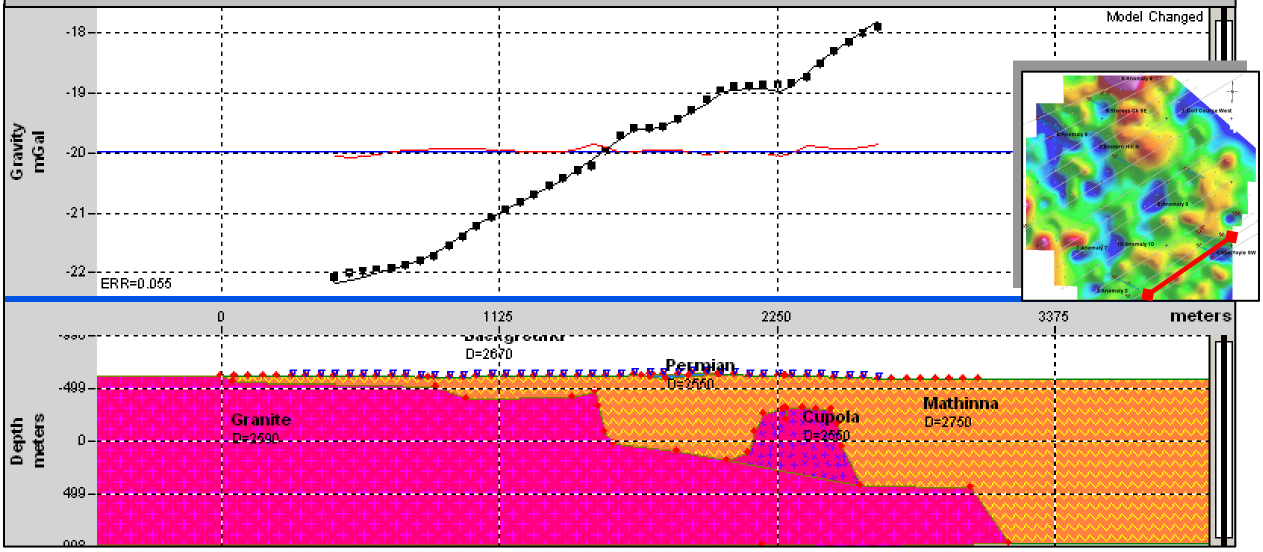
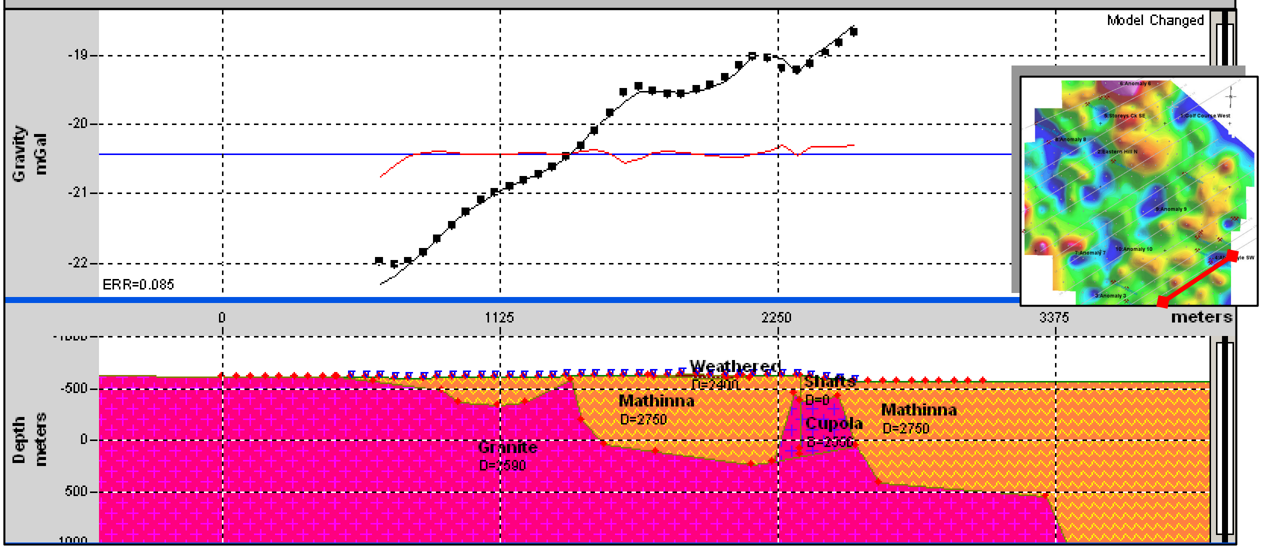


Figure 3.17: Line 14 – Anomaly 4 (Aberfoyle south section)



Appendix 4

Relevant maps from Leaman, D.E., 1974, *Gravity Survey of the Rossarden-Storeys Creek region*, TR19_55_81, available from MRT website.

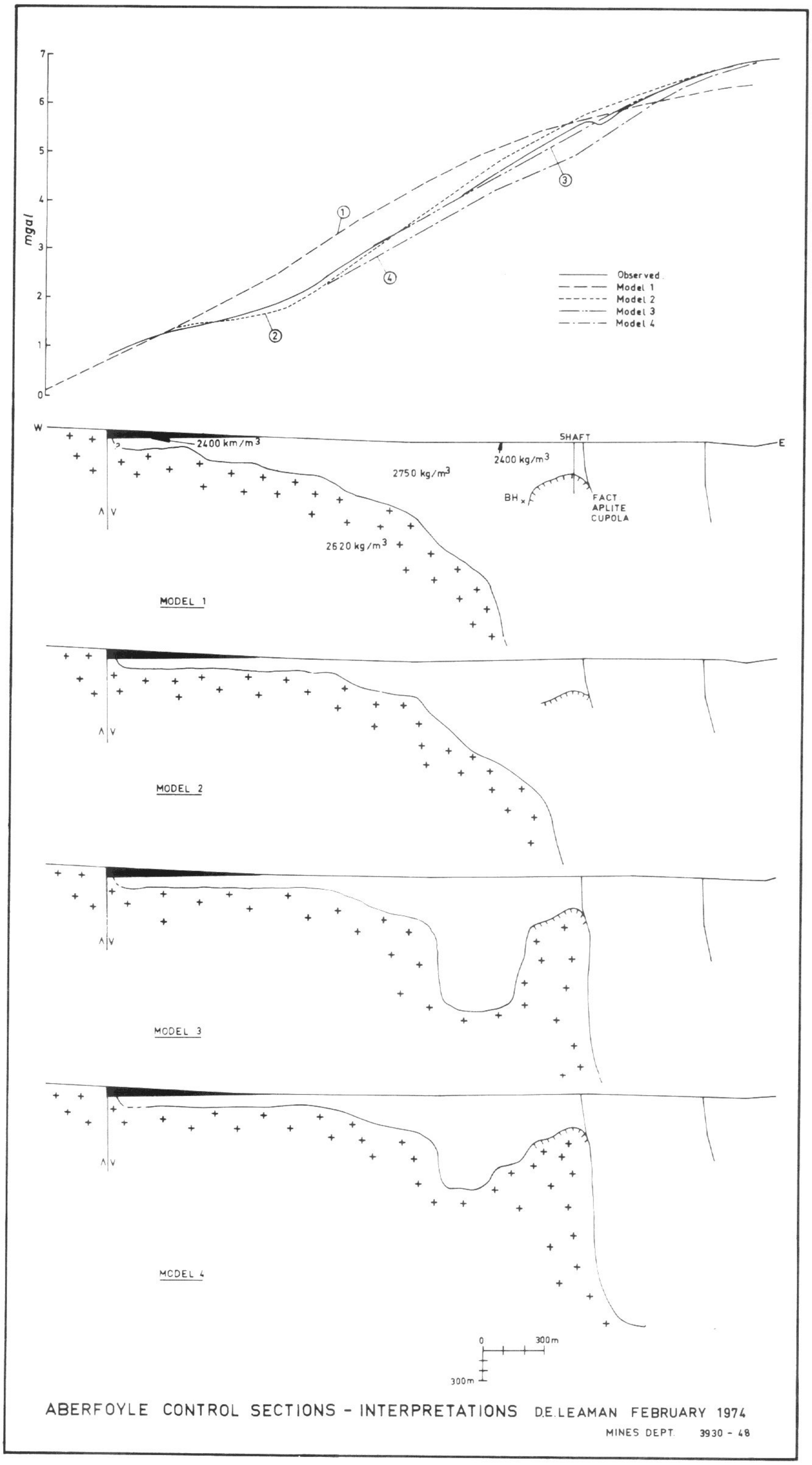


Figure A4.1 – Aberfoyle Control Section: Proposed subsurface structure models derived from gravity data over Aberfoyle Mine (reproduced from Report TR19_55_81, Figure 17)

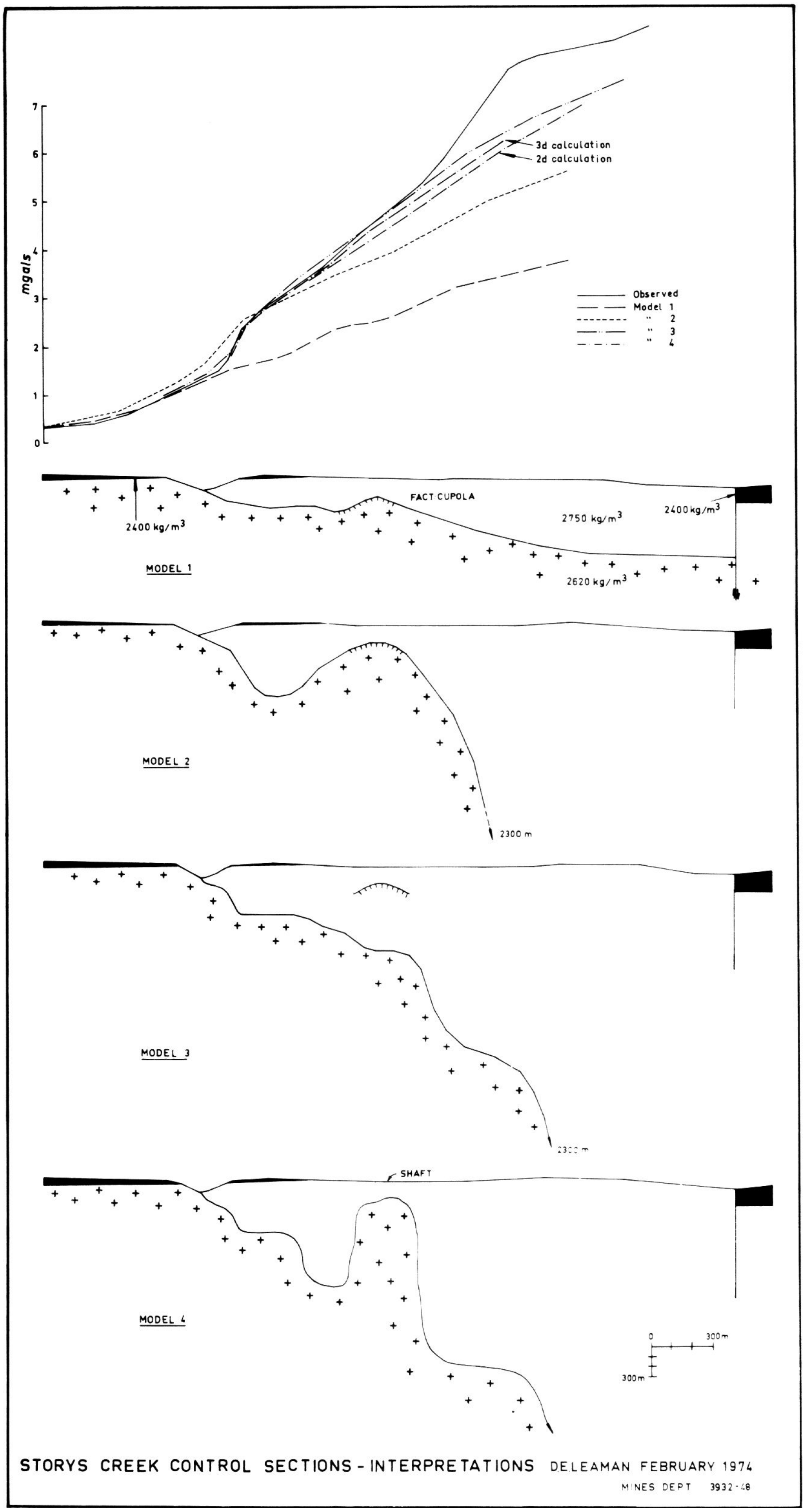


Figure A4.2 – Storeys Creek Control Section: Proposed subsurface structure models derived from gravity data over Storeys Creek (reproduced from Report TR19_55_81, Figure 18)

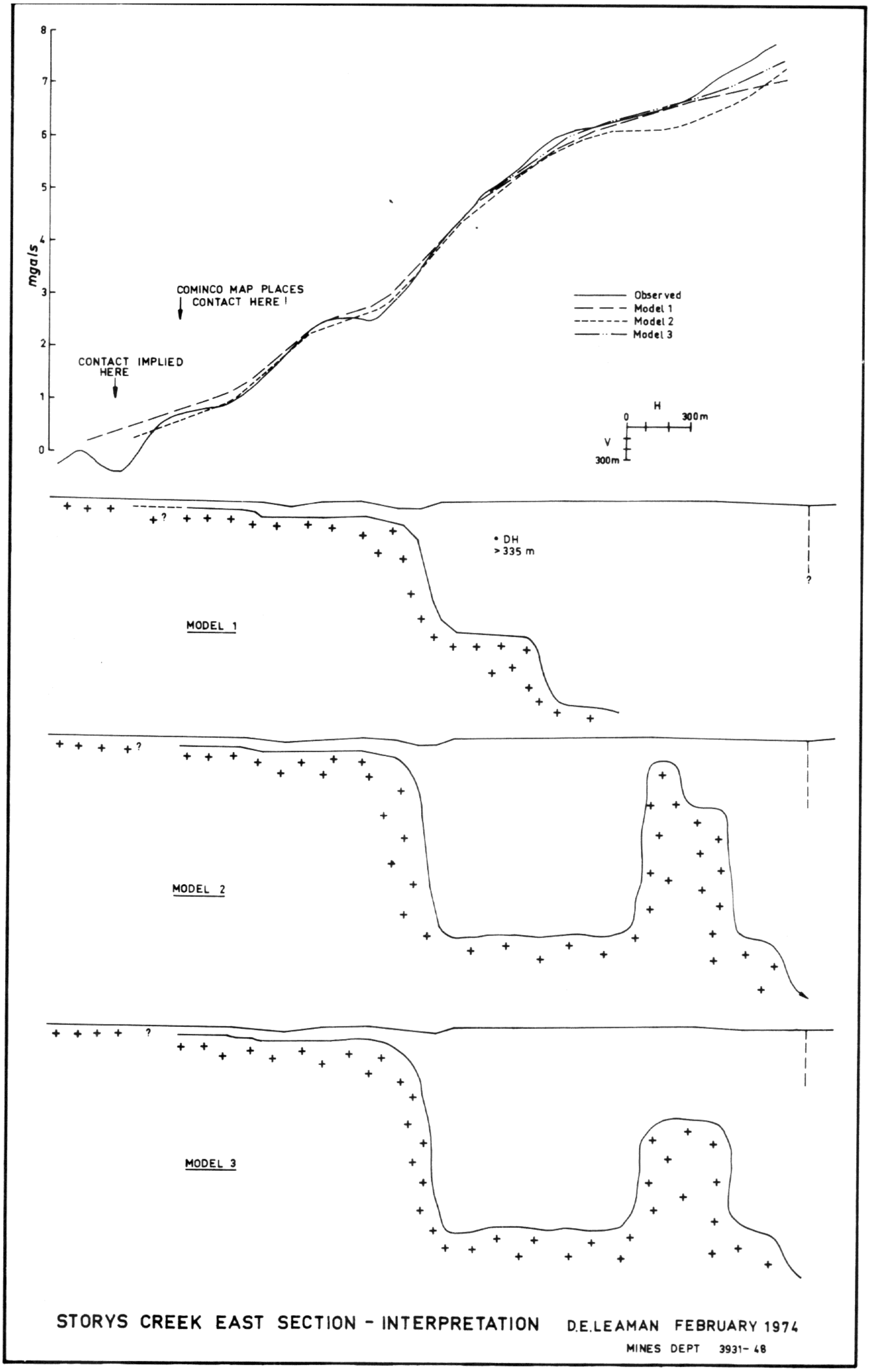


Figure A4.3 – Storeys Creek East Section: Proposed subsurface structure models derived from gravity data over Storeys Creek East Section (from Leaman Report, Figure 19, TR19_55_81)

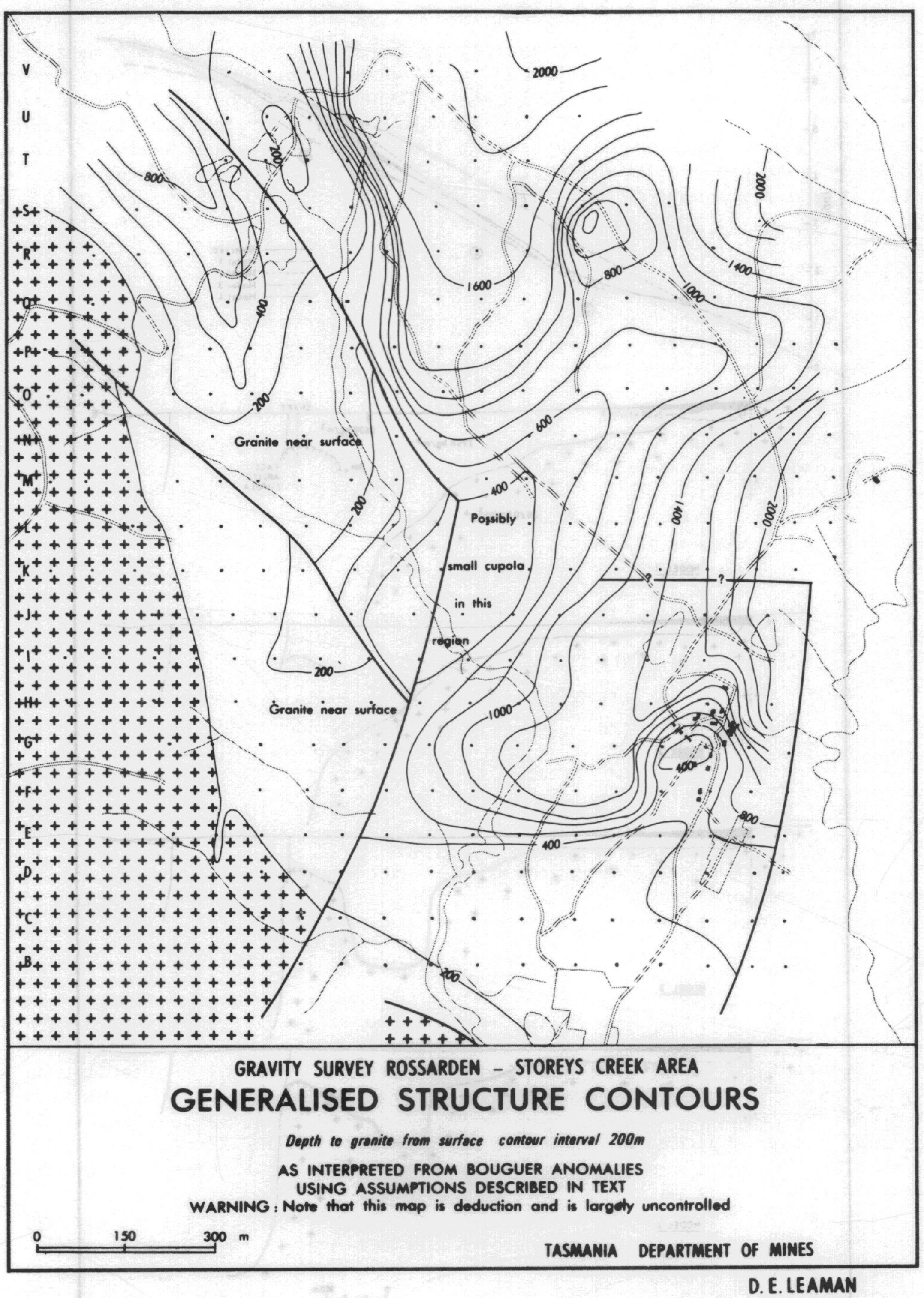


Figure A4.3 – Generalised structure contours proposed for the Rossarden – Storeys Creek Area (from Leaman Report, Figure 16, TR19_55_81)

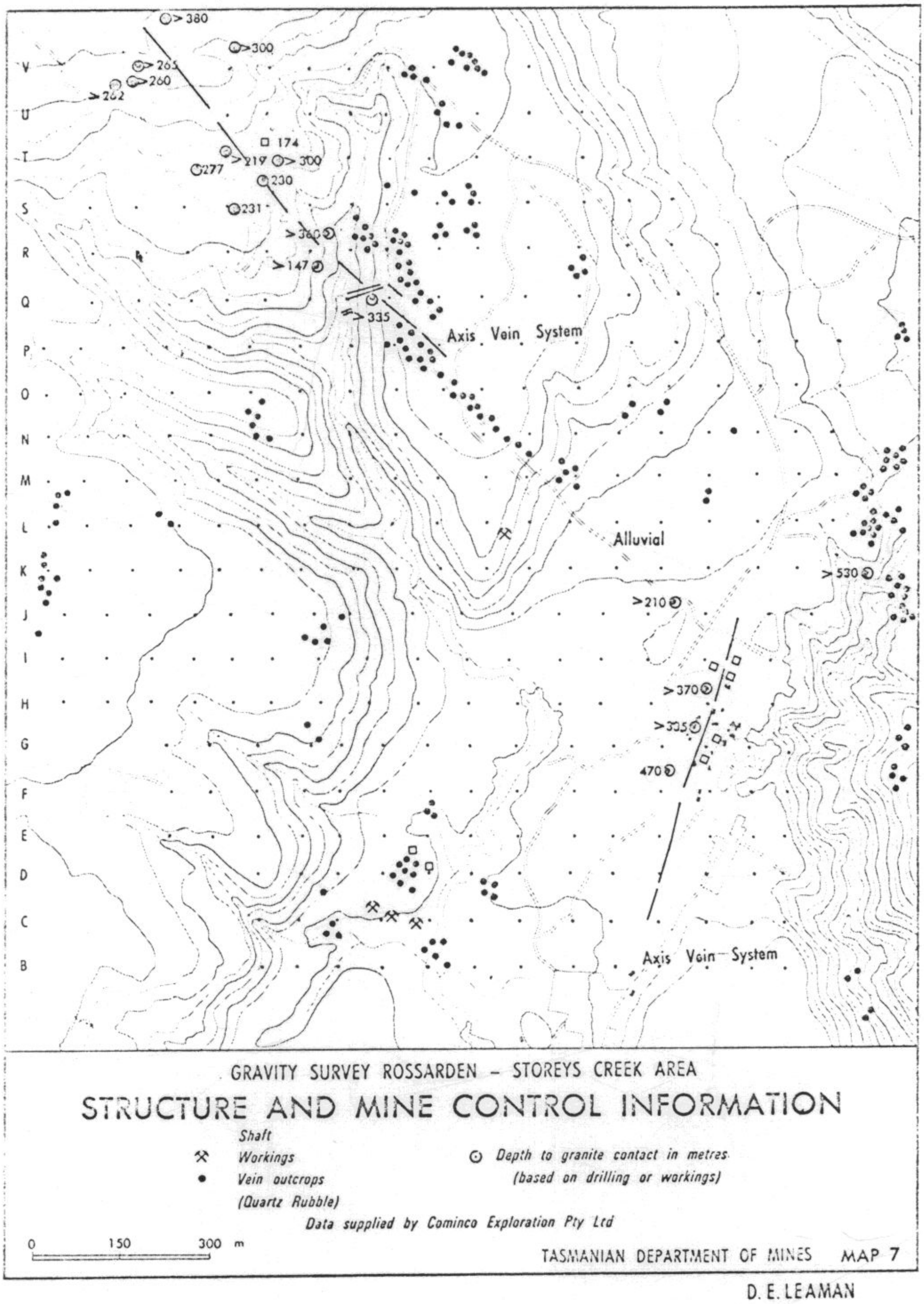


Figure A4.4 – Structure and mine control information for the Rossarden – Storeys Creek Area (MRT report, Map 7, UR1974_14)