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Appendix B

Two-dimensional gravity modelling of the Mole Granite

Introduction

This appendix describes the two-dimensional gravity modelling procedure which was used to investigate the geometry of the Mole Granite. The computer program coded by Lawton (1978) was employed for this purpose. The program was written on the basis of work conducted by Talwani *et al.* (1959).

The gravity profiles which were examined in the modelling were constructed from the established gravity stations on the Bouguer gravity anomaly maps published by the BMR (1970).

A polynomial fitting procedure was adopted for removing the regional gravity from the observed Bouguer anomalies. The models were calculated and compared with the observed residual anomalies. The model used is the one that best resembles the observed residual anomalies profile.

The construction of the Bouguer anomaly profiles over the Mole Granite

Three profiles of Bouguer gravity anomalies were drawn from the known gravity stations on gravity maps H56/B2-2, H56/B2-5, H56/B2-5, and H56/B2-6 (BMR, 1970). Figure B1 shows the lines of the profiles and relative location of the Mole Granite. The Bouguer gravity anomaly profile of each line is shown as solid line in Figures B2(a), B3(a), and B4(a) respectively.

Figure B1 Illustrating the location of the Mole Granite and the position of Bouguer Anomaly gravity stations.

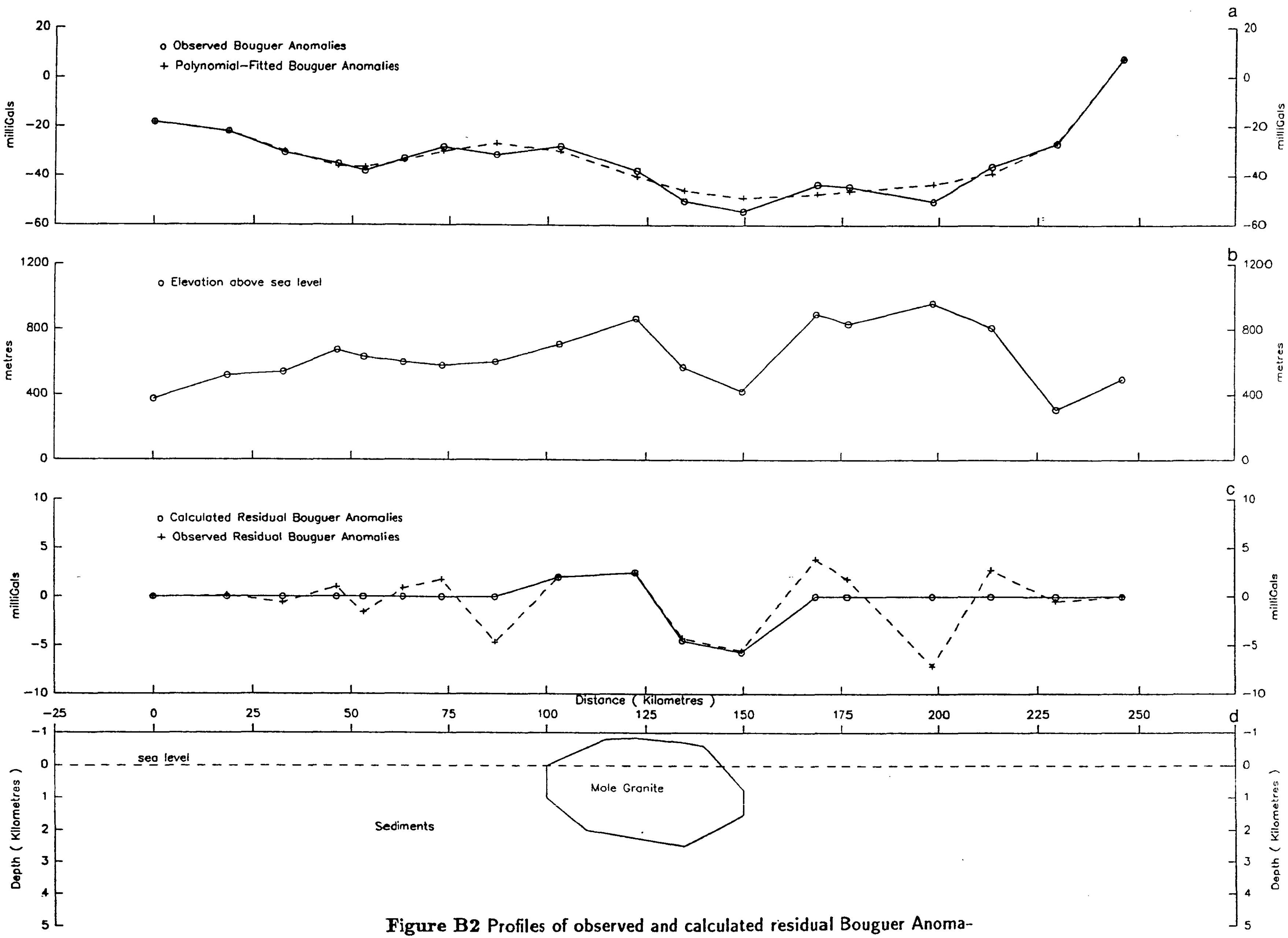


Figure B2 Profiles of observed and calculated residual Bouguer Anomalies of the Mole Granite at *LINE-01*.

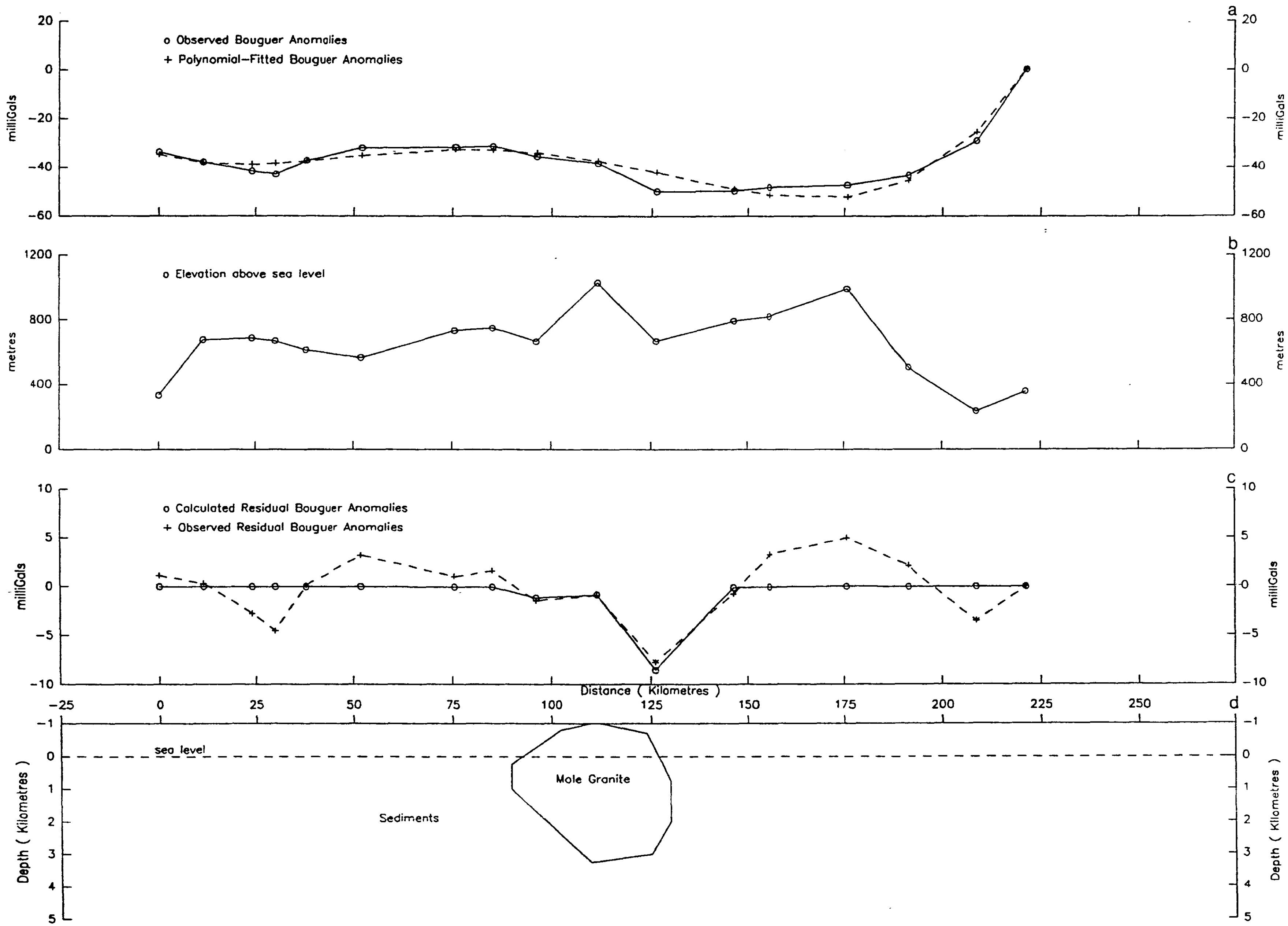


Figure B3 Profiles of observed and calculated residual Bouguer Anomalies of the Mole Granite at *LINE-02*.

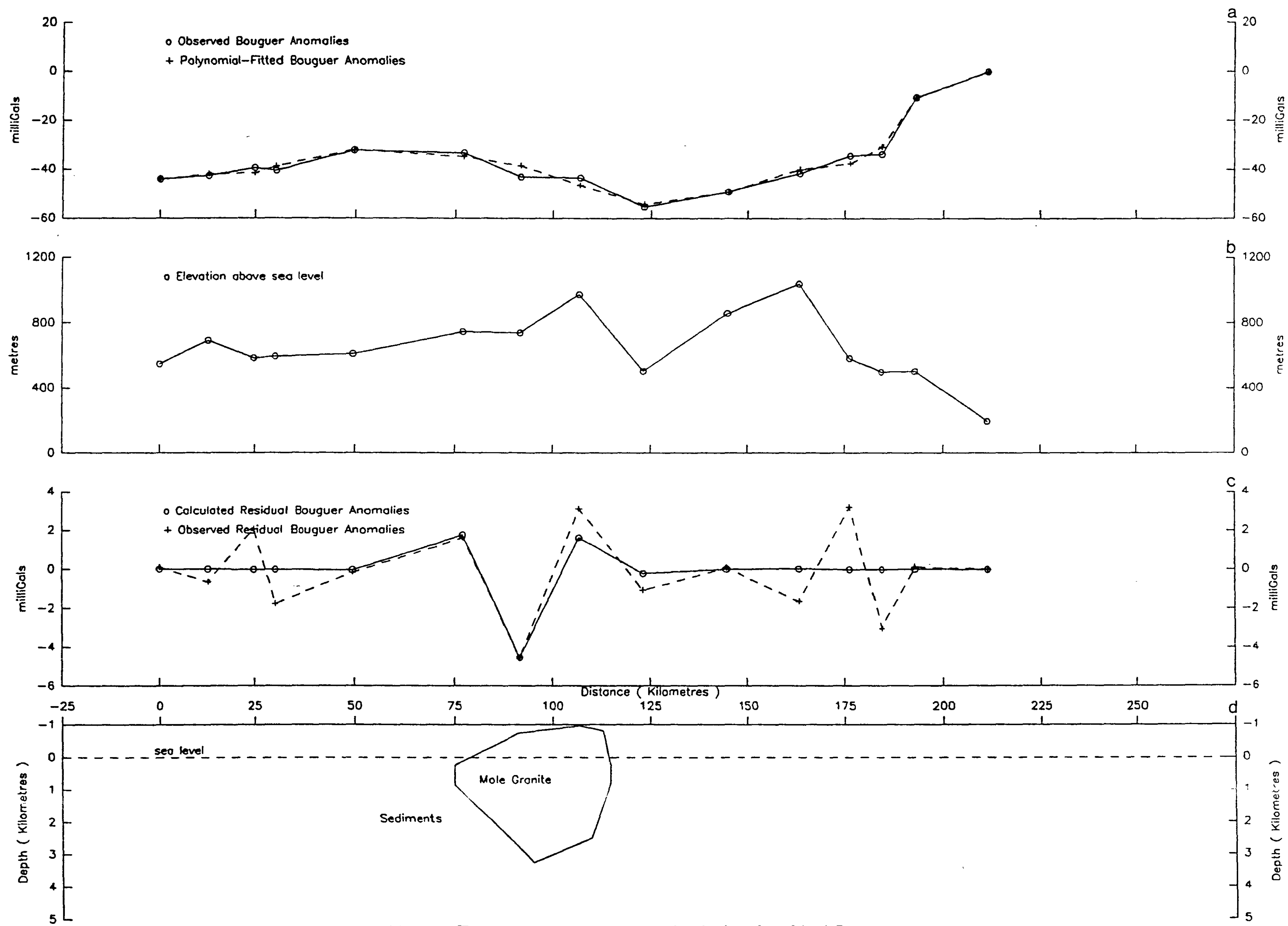


Figure B4 Profiles of observed and calculated residual Bouguer Anomalies of the Mole Granite at *LINE-03*.

The procedure of modelling

The removal of the regional gravity from the observed Bouguer anomalies was performed prior to the modelling. A polynomial fitting routine of the 6th order from the Numerical Algorithm Group (NAG) library on the DEC-20R computer system was incorporated to obtain the residual of the Bouguer gravity anomalies.

A density-contrast value of -200.0 Kg m^{-1} between the Mole Granite and the surrounding sedimentary rocks was assumed for determining the models.

The computer program which was used permits a free selection of polygonal geometric shapes to be calculated in the modelling procedure; however, only models with a certain geometric form will fit or closely fit the observed residual anomalies.

The selection of the geometric forms was made by utilizing the topographic information to define the upper portion of the granite. The bottom part of the granite was progressively determined using a trial-and-error procedure until the calculated model best resembled the observed profile of the Bouguer anomalies over the body of the Mole Granite. Figures B2(b), B3(b), and B4(b) depict the topographic profile of line *LINE-01*, *LINE-02*, and *LINE-03* respectively.

Results of the modelling

Results of the modelling for each line *LINE-01*, *LINE-02*, and *LINE-03* are shown in Figures B2(c) and (d), B3(c) and (d), and B4(c) and (d) respectively. Figures B5, B6, and B7 detail the geometric shape of the cross section of the Mole Granite in lines *LINE-01*, *LINE-02*, and *LINE-03* in respective order.

Conclusions

The two-dimensional gravity modelling presented in this appendix gives an approximate view of the geometry of the cross section of the Mole granite on each given line profile *LINE-01*, *LINE-02*, and *LINE-03*.

It was found from this modelling that the maximum thickness of the Mole Granite is not more than 4.0 kilometres. The granite dips are shallower in the south-west area than in the area to the north-east of the outcropped body of the Mole Granite. This may have caused a wider area of contact metamorphism in the south-west compared with the area in the north-east.

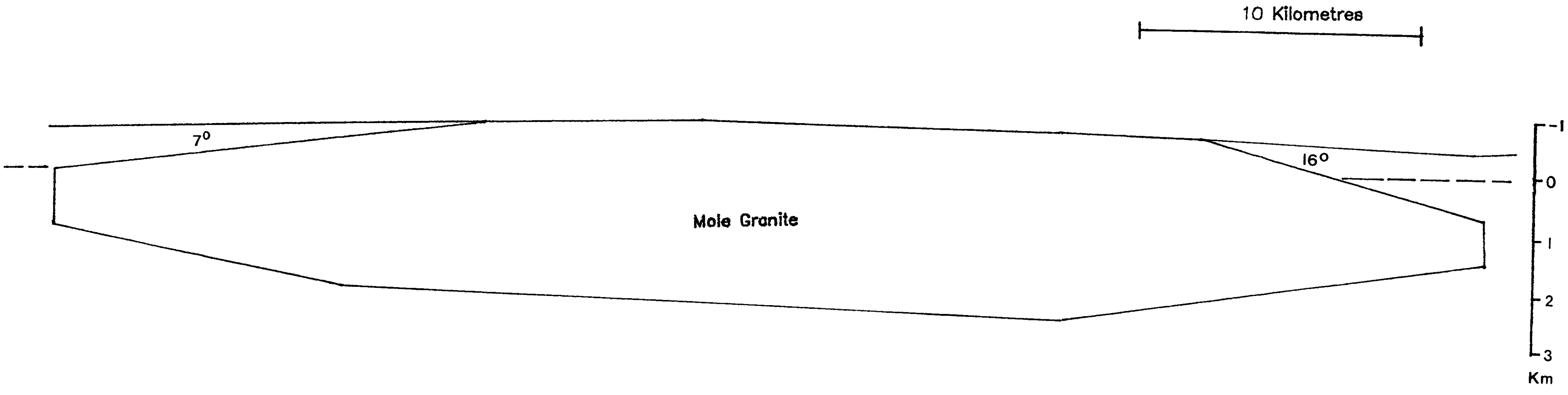


Figure B5 Diagram showing detail of modelled cross section of the Mole Granite at *LINE-01*.

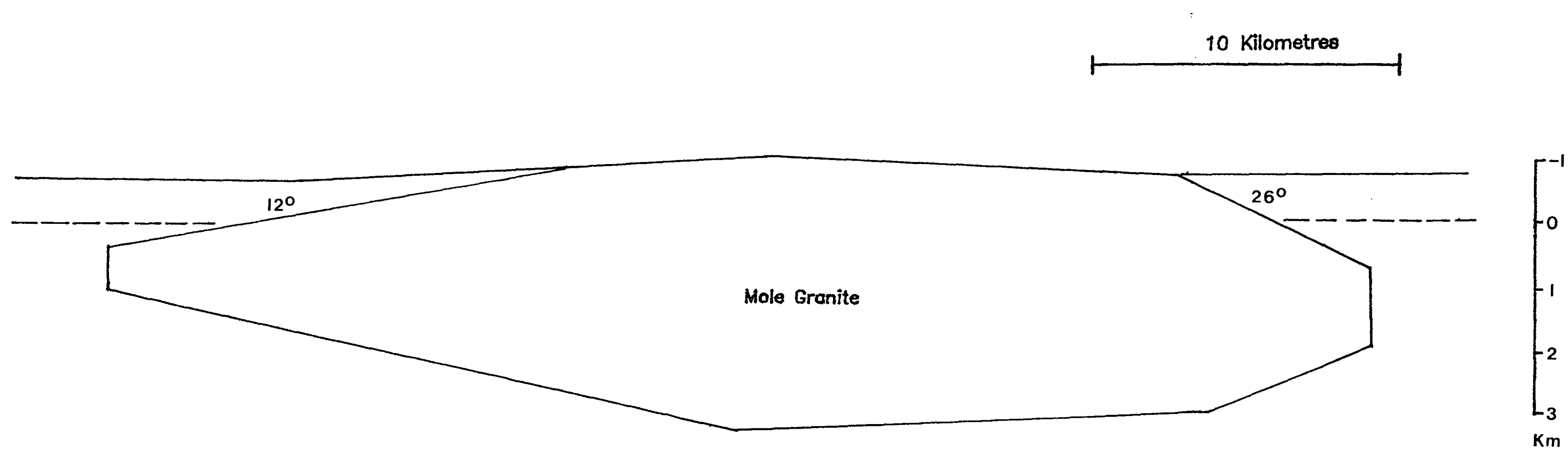


Figure B6 Diagram showing detail of modelled cross section of the Mole Granite at *LINE-02*.

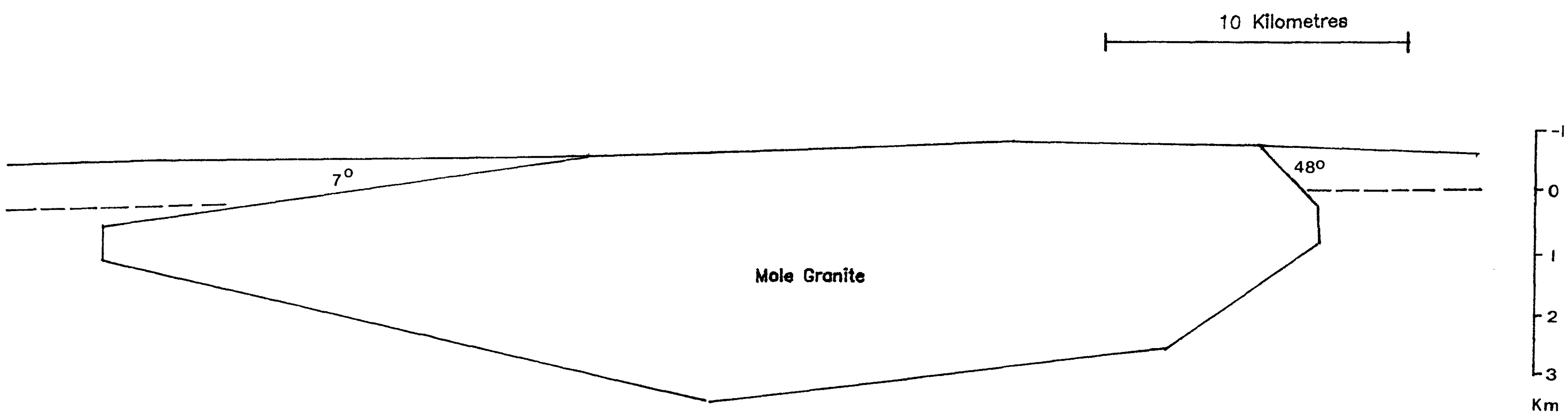
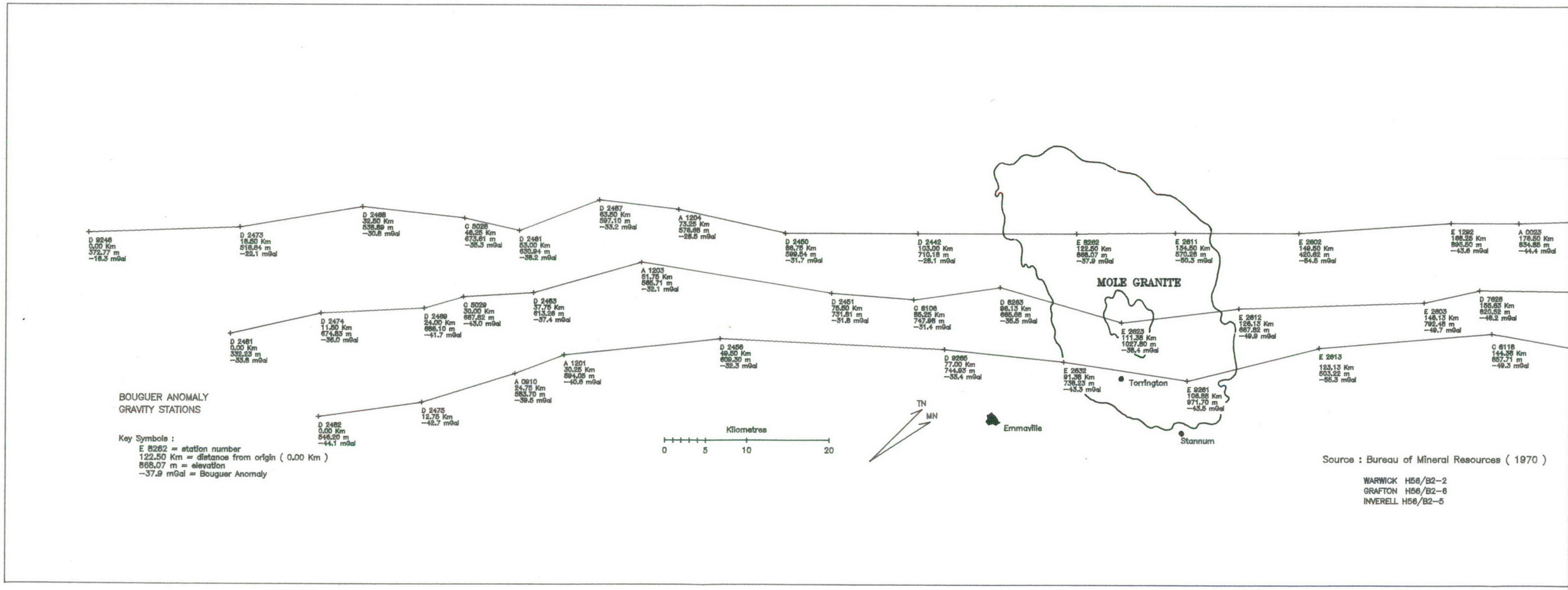
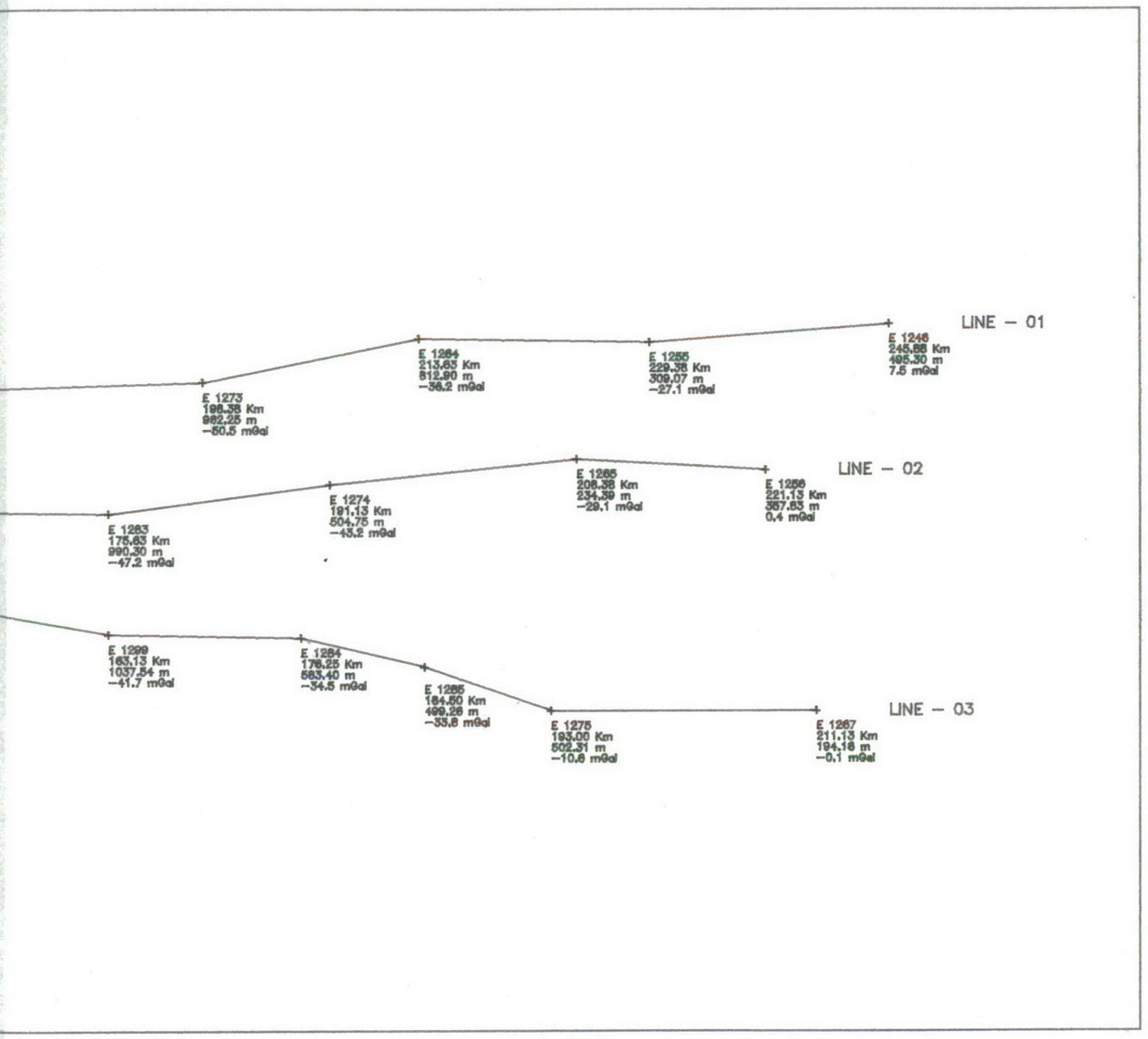


Figure B7 Diagram showing detail of modelled cross section of the Mole Granite at *LINE-03*.


D 9246 0.00 Km 372.77 m −16.3 mGal
D 2473 16.50 Km 516.64 m −22.1 mGal
D 2468 32.50 Km 536.89 m −30.8 mGal
C 5028 46.25 Km 673.61 m −35.3 mGal
D 2461 53.00 Km 630.94 m −38.2 mGal
D 2467 63.50 Km 597.10 m −33.2 mGal
A 1204 73.25 Km 576.68 m −28.5 mGal
D 2450 86.75 Km 599.54 m −31.7 mGal
D 2442 103.00 Km 710.18 m −28.1 mGal
E 8262 122.50 Km 868.07 m −37.9 mGal
E 2611 134.50 Km 570.28 m −50.3 mGal
E 2602 149.50 Km 420.62 m −54.5 mGal
E 1292 168.25 Km 895.50 m −43.6 mGal
A 0023 178.50 Km 834.85 m −44.4 mGal
D 2481 0.00 Km 332.23 m −33.8 mGal
D 2474 11.50 Km 674.83 m −38.0 mGal
D 2489 24.00 Km 886.10 m −41.7 mGal
C 5029 30.00 Km 667.82 m −43.0 mGal
D 2483 37.75 Km 613.26 m −37.4 mGal
A 1203 51.75 Km 565.71 m −32.1 mGal
D 2451 75.50 Km 731.81 m −31.8 mGal
C 6106 85.25 Km 747.98 m −31.4 mGal
D 8263 96.13 Km 885.68 m −35.5 mGal
E 2623 111.38 Km 1027.80 m −38.4 mGal
E 2612 126.13 Km 667.82 m −49.9 mGal
E 2603 146.13 Km 792.48 m −49.7 mGal
D 7626 155.63 Km 620.52 m −48.2 mGal
D 2482 0.00 Km 546.20 m −44.1 mGal
D 2475 12.75 Km −42.7 mGal
A 0910 24.75 Km 583.70 m −39.5 mGal
A 1201 30.25 Km 594.05 m −40.6 mGal
D 2456 49.50 Km 609.30 m −32.3 mGal
D 9265 77.00 Km 744.93 m −33.4 mGal
E 2632 91.38 Km 738.23 m −43.3 mGal
E 9261 106.88 Km 971.70 m −43.5 mGal
E 2613 123.13 Km 503.22 m −55.3 mGal
C 6118 144.38 Km 857.71 m −49.3 mGal
MOLE GRANITE
Torrington
Stannum
Emmaville
TN
MN
Kilometres
0
5
10
20
BOUGUER ANOMALY
GRAVITY STATIONS
Key Symbols :
E 8262 = station number
122.50 Km = distance from origin (0.00 Km)
868.07 m = elevation
−37.9 mGal = Bouguer Anomaly
Source : Bureau of Mineral Resources (1970)
WARWICK H56/B2-2
GRAFTON H56/B2-6
INVERELL H56/B2-5



E 1273
198.38 Km
982.25 m
−50.5 mGal
E 1264
213.63 Km
812.90 m
−38.2 mGal
E 1255
229.38 Km
309.07 m
−27.1 mGal
E 1246
245.88 Km
495.30 m
7.5 mGal
LINE – 01
E 1283
175.63 Km
990.30 m
−47.2 mGal
E 1274
191.13 Km
504.75 m
−43.2 mGal
E 1265
208.38 Km
234.39 m
−29.1 mGal
E 1256
221.13 Km
357.63 m
0.4 mGal
LINE – 02
E 1299
163.13 Km
1037.54 m
−41.7 mGal
E 1284
176.25 Km
583.40 m
−34.5 mGal
E 1285
184.50 Km
499.26 m
−33.8 mGal
E 1275
193.00 Km
502.31 m
−10.8 mGal
E 1267
211.13 Km
194.18 m
−0.1 mGal
LINE – 03