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DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1973/86

GORMANDALE GRAVITY SURVEY, GIPPSLAND, VICTORIA 1960-61

by

F.J.G. Neumann & G.F. Lonsdale

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PLATES

FOREWORD

The Bouguer anomaly maps in this Record are contoured at closer spacing than is strictly justified by the gravity measurements, and are thus somewhat subjective. It is not BMR policy to prepare contour maps in this way, but this report was written many years ago and is issued now to place the findings of the survey on record.

SUMMARY

This Record describes a semi-detailed gravity survey by the Bureau of Mineral Resources, Geology and Geophysics in the Gormandale area south of the Latrobe Valley, Gippsland, Victoria, during the period December 1960 to January 1961.

The purpose of the survey was to obtain more complete gravity coverage on a potential coal structure along the southern margin of the Latrobe Valley brown coal basin.

The results of the survey confirmed distinct negative gravity anomalies associated with a trough-like structure northwest of a zone of steep gravity gradients caused by the Rosedale Fault and Monocline. North of Gormandale a gravity 'high' gives expression to a higher-standing block of basement rocks.

Southeast of Gormandale relatively low gravity readings are indicative of a sinken area trending northeast.

To further illustrate the results of the survey the Bouguer anomaly curve measured on a line running northwest across the area investigated is correlated with the relevant structure and topography of the Latrobe Valley coal basin.

1. INTRODUCTION

Gravity surveys have been conducted by the Bureau of Mineral Resources, Geology & Geophysics (BMR) in the Latrobe Valley of Gippsland, Victoria, since the year 1948, mainly to investigate the structure of the brown coal measures as an aid to drilling (Neumann, 1957).

In the year 1958 a detailed gravity survey was carried out in the area of the Baragwanath Anticline along the southern margin of the Latrobe Valley southeast of Rosedale for the purpose of delineating more accurately Bouguer anomaly features disclosed by earlier, less detailed surveys (Neumann, 1960).

Late in 1960 the State Electricity Commission of Victoria requested additional work south of Rosedale and north of Gormandale in order to further investigate the area west of the Baragwanath Fault Block. This survey was carried out in December 1960 and January 1961 by G.F. Lonsdale, Geophysicist, assisted by A. Distel, a university vacation student. The area surveyed between Rosedale and Gormandale extends six miles north by seven miles east, and is shown in Plates 1 and 3.

During the course of the survey 208 new gravity stations were read at quarter-mile intervals along fire breaks, bush tracks, and the few available roads in the area, using a Worden gravity meter. In order to provide gravity control for the readings, ties were made to five stations established near the area on previous surveys.

The marking, levelling, and surveying of station locations was carried out by the Brown Coal Investigation Branch of the State Electricity Commission, located at Traralgon.

For further technical detail relating to the conduct of the field work and the equipment used in the field, the reader is referred to the Appendix.

2. GEOLOGY

The geology of the Latrobe Valley Tertiary basin has been recently described in detail by Gloe (1960), setting out the new concept of the stratigraphy and structure of the Latrobe Valley Coalfield based on information obtained from geophysical work and drilling mainly since 1954.

Tertiary sediments deposited in the valley of the Latrobe River are bordered in the north by Palaeozoic complexes of mainly Silurian to Lower Carboniferous age and by metamorphics, intruded by granite.

South of the Palaeozoic outcrops, Tertiary sediments overlie Jurassic rocks, which are mainly arkosic sandstones. These Mesozoic beds, according to results from the Wellington Park No. 1 Bore, thirty miles east of Rosedale (Ingram, 1962) are still present 12 000 feet below the surface.

After extensive geophysical investigations including aeromagnetic and marine seismic surveys recently conducted over Bass Strait and adjoining seas, the Gippsland Tertiary Basin, is now recognized as an embayment adjacent to a basin of major dimensions, which extends from the Australian mainland east and southeast into the 'Gippsland Bay' northeast of Bass Strait (Baker, 1963).

The Tertiary sequence in the Latrobe Valley consists mainly of unconsolidated sediments including clay, sand, and commercially important brown coal seams of great thickness, and thickens easterly. In the eastern portions of the Gippsland Basin near Lake Wellington, continental Tertiary beds are overlain by marine beds of Oligocene and Miocene age, resulting in a total thickness of Tertiary deposits in the vicinity of 4000 feet.

To the south, the main depositional area of the Latrobe Valley Coalfield is bounded by the Strzelecki Ranges of eastern Victoria. The structure pattern of these ranges includes a huge block of Jurassic rocks formed by the association of doming with extensive faulting (Edwards, 1942). Faulting also controls the margins of the coal basin. The Yallourn Fault and Monocline terminate the deeper portions of the coalfield to the west and to the north, while the Rosedale Fault and Monocline occur near the southern margin of the basin.

It is now recognized that these two major tectonic features developed since the early part of the Tertiary period. As vertical movements continued, Jurassic and early Tertiary deposits have been faulted, while later Tertiary beds deposited over faults are monoclinally folded and/or gently warped into flexures.

Because of vertical movements over long periods certain structures within the coal basin can be described as faults or as monoclines, e.g. 'Rosedale Fault', and 'Rosedale Monocline', depending on the geological age of the strata referred to.

Doming in the coal beds also frequently occurs in the Latrobe Valley region, local domes having probably been formed by volcanic action which occurred after the end of the coal deposition period.

Two miles north of the Rosedale Monocline lies the gravimetrically indicated axis of a syncline, which forms one of the deepest depressed portions of the Latrobe Valley Basin; for this the name 'Rosedale Trough' is suggested. This trough has become known from gravity results as well as from drilling to extend eastwards into the 'Lake Wellington Trough' (Webb, 1961).

Consequently the thickest Tertiary deposits in the Gippsland Basin extend from the Traralgon Syncline (Gloe, 1960) four miles south of Traralgon to the area south of Rosedale, where the 'Rosedale Trough' occurs, and thence into the area near Wellington Park No. 1 Bore south of Lake Wellington.

South of the Rosedale Monocline thinner Tertiary deposits are suggested to overlie Jurassic arkosic sandstone contained in the Baragwanath Fault Block (Lonsdale, 1963). These thinner Tertiary beds are commercially important owing to the possible presence of brown coal of good quality at relatively shallow depth.

Within the main coal basin north of Rosedale a group of thick brown coal seams containing soft coal with relatively high water content is blanketed by a layer of loose gravel and sand of varying thickness.

Five seams of an aggregate coal thickness of 1570 feet were intersected two miles north of Rosedale in Rosedale No. 1 Bore, drilled in 1960. This bore bottomed at a total depth of 5836 feet in Jurassic beds after penetrating 2345 feet of Tertiary coal measures (Smith, 1960).

Mainly beneath the coal beds but also on tectonic terraces accompanying the lower portions of the Strzelecki Ranges, Tertiary basalt occurs; its lateral extent under the coal formation is still unknown. For this reason at localities where drilling data are unavailable, the 'commercial' basement beneath the coal measures can be assumed to be formed either by basalt of Eocene age, named 'Older Basalt of Victoria', or by Jurassic beds.

The general structural setting of the area covered by the 1960-61 Gormandale Survey is shown in Plate 1 within the frame of the major tectonic features of the Latrobe Valley Tertiary Basin and the Strzelecki Ranges. The locations of deeper bores drilled in the area concerned in search for coal and petroleum are also shown on this map.

3. DESCRIPTION OF GRAVITY RESULTS

The results of the 1960-61 Gormandale gravity survey are depicted as Bouguer anomaly contours in Plate 2, together with the results from previous gravity surveys. These previous surveys include semi-regional work over the whole of this area in 1951 and the very detailed Melton Park survey in 1953. A near-surface rock density of 1.9 g/cm^3 has been used in the reduction of the gravity results.

The pattern of Bouguer anomaly contours obtained as a result of the 1960-61 survey is also shown within the regional anomaly picture in Plate 3. This map covers a much wider area than Plate 2 as it includes all the Warragul 4-mile Sheet.

Gravity anomaly contours represented in Plates 2 and 3 are based on relative values referred to an arbitrary gravity datum. The value of the nearest Pendulum Station No. 2, established by BMR at Yarram has been revised in 1962, giving an observed gravity value of 980 022.4 milligals. From the Bouguer anomaly values shown on Plates 2 and 3 approximately five milligals must be subtracted in order to obtain values referred to the international system.

In the area of the Gormandale survey the gravity anomaly contours indicate a general northeasterly trend (Plate 2).

Low gravity values occur in the northwest portion of the survey area, being terminated to the southeast by an outstanding feature in the anomaly pattern. This is a broad strip of rapid gravity variation between the +5 and -10 milligal contours in the southwestern portion of the survey area and a similar variation between the -5 and -20 milligal line near the northeastern corner of Plate 2.

The steepest gravity gradient, expressed by closest spacing of the gravity contours, is 25 milligals per mile, in that part of the survey area crossed by the Traralgon to Gormandale road.

The trend on which the maximum gradient occurs is northeast, extending from the western margin of the area investigated to near station AP15, after which it becomes more east-northeast of midway between stations R77 and RO43 and then north-northeast to a point between RO33 and RAH. Farther east of station RAH the northeast trend direction is resumed.

That part of the trend between AP15 and a point midway between RO33 and RAH, in which the northeasterly direction is disturbed, will be referred to later in the text as the 'disturbed portion' of the gradient trend. In this 'disturbed portion', in particular between the RO27 and RO33, the gravity gradient also shows some flattening.

The strip of steepest gravity gradients forms the northwestern boundary of an elongate gravity 'high', which in the survey area is subdivided into two culminations: a major one near the Traralgon to Gormandale Road, and a smaller one east of the Rosedale to Willung Road. Between these two culminations lies an area of lower gravity anomaly values, between stations 61/77 and RO50. This area of lower gravity readings forms a southeasterly extension of the 'disturbed portion' of the zone of strongest gravity gradient, referred to above.

The gravity coverage over the southwestern gravity culmination is more detailed than that over the northeastern one. The former has been shown to have an asymmetric form, the gradient bounding the 'high' to the southeast being less steep than that bounding the 'high' to the northwest. This less steep gradient (the steepest known gradient here is 10 milligals per mile) also has a northeasterly trend and separates the 'high' from a northeast elongated gravity 'low', which is suggested on present knowledge to be symmetrical in form.

It is of interest to note that the valley of Merrimans Creek, which follows a northeasterly direction in the south of the survey area before turning to the southeast near station WLO27, does not coincide with the axis of this elongate gravity 'low' but rather with the gradient which bounds it to the northwest.

East of Willung is an elongate gravity 'high', extending easterly for five miles beyond the eastern edge of Plate 2.

4. INTERPRETATION OF GRAVITY RESULTS

Past gravity experience in the Latrobe Valley of Gippsland suggests that the Bouguer anomaly pattern mainly represents structural deformities in the base of Tertiary sediments of about 1.9 g/cm^3 density overlying a basement of about 2.5 g/cm^3 density. Consequently the structural deformities may be assumed to coincide with the topographical relief of the basement.

The elongate gravity 'high' trending northeast across the survey area can thus be interpretated as being caused by a higher-standing block, most probably mainly formed by Jurassic 'basement' rocks, for which the name 'Gormandale Block' is proposed. This block implies a westerly extension of the Baragwanath Fault Block (Neumann, 1960).

The steep gravity gradient which terminates the Gormandale Block to the northwest is indicative of a fault or steep monocline. This structure is known to be a monocline (the Rosedale Monocline) from the results of bores put down into the Tertiary sediments in the survey area by the SEC. However, the underlying Jurassic sandstones are almost certainly faulted. The monocline may be regarded as coinciding with the steepest portion of the gravity gradient and hence the middle of the monocline is suggested to coincide with the -5 milligal contour from the southwest of the survey area as far as station A15. To the northeast of this peg the monocline appears to cut across the gravity contour trend to R143, to the northeast of which the position of the monocline appears to be indicated approximately by the -10 milligal contour.

The disturbed portion of this gradient with its associated flattening and the adjacent depression in the gravity high region noted earlier possibly indicate a sunken area intersecting the high-standing block and the monocline. This may be an erosional or tectonic feature of Tertiary date.

Northwest of the Rosedale Monocline the low gravity values indicate a region of thick Tertiary sediments contained in a relatively deep portion of the Latrobe Basin, for which the name 'Rosedale Trough' is suggested.

The gentle gradient which bounds the high-standing Gormandale Block to the southeast suggests a gentle downfold or small-scale step-faulting, possibly associated with some tilting of the block down to the southeast, leading to an area of thicker Tertiary sediments represented by the narrow elongate gravity 'low' in the southeast of the survey area. The comparable steepness and trend directions of the gradients bounding this elongate 'low' suggest a graben.

It is possible that this gravity 'low' has developed as a result of the suggested tilting of the Gormandale Block and that the direction of the Merrimans Creek Valley is in some way caused by the various phases of tilting movements.

As described above there is a close relation between the course of Merrimans Creek and the predominating northeast trend in the Bouguer anomaly contours (Neumann, 1960). The course of Merrimans Creek follows the gravity contours northeast up to a point south of Rosedale, after which it cuts abruptly across the gravity anomaly pattern by taking an easterly and southeasterly course.

Physiographically the valley cut out by Merrimans Creek is steep-sided, suggesting that it is relatively young. In contrast to this there is a broad valley in the hilly area, including extensive swamps, which extends east-northeasterly from near station WL027, where the present course of the creek changes direction.

The combined facts disclosed by gravity and physiography suggest the possibility that Merrimans Creek originally continued on to the present course of the Latrobe River and that the abrupt change in the direction of the creek's course has been caused by stronger tilting movements having taken place to the southeast of Willung than to the west.

Immediately east of Willung is a gravity 'high' extending east-northeast, which has been interpreted as indicative of a separate ridge or smaller anticline superimposed on the main Baragwanath Fault Block (Neumann, 1960).

Cross-section ABCD (Plate 4) has been drawn to further illustrate the relation between Bouguer anomaly, topography, and geology. The north-western end A of this section is tied to the Yallourn Monocline as disclosed by drilling for coal near Tyers township. There, bores sited on the basis of the geophysical results have intersected, under a layer of gravel beds, a seam of relatively hard brown coal of lower water content, dipping south-easterly. Along the northern basin margin the outcrops of this Latrobe Seam, as it is named, are concealed under relatively thin overburden from its occurrence in the Yallourn North Open-Cut to Rintouls Creek, a distance of nine miles (Gloe, 1960).

The drilling for coal eastwards from the Yallourn North Open-Cut along the Yallourn Monocline has been guided by gravity data from surveys by BMR during 1954 and 1955. The position of this commercially important monocline north of the Latrobe River is indicated over its whole extent by a maximum gravity gradient disclosed in the Bouguer anomaly curve shown in Plate 4.

The strike direction of the monocline is immediately evident from the trend of steepest gravity gradients expressed in the picture of gravity anomaly contours shown in Plate 3.

The gravity anomalies show the monocline to gradually lose its intensity east of Rintouls Creek, and this coincides with the splitting up and virtual disappearance of the Latrobe Seam in this particular area (Gloe, 1960).

In the area south of the Latrobe River the section CD of the cross-profile is five miles farther east than section AB, in order to illustrate the tectonic relation between the 'Gormandale Block' and the associated sunken areas as defined by gravity data. The cross-section ends to the southeast near Carrajung.

The interpretation of the gravity data along the section lines AB and CD has been carried out by computing approximately the depth to the basement beneath the coal beds, using the two-layer formula:

$$g' = 12.77 \times d' \times h$$

where g' = the gravity effect in milligals due to the upper layer,

d' = the density contrast between the upper and the lower layer, and

h = the thickness in kilofeet of the upper layer.

The monoclinal warping and the variation in thickness in the Tertiary beds in Cross-section AB near the northern margin of the coal basin can be fairly accurately assumed by using the information from drilling of numerous bores in the area around Tyers township. These bores can be correlated with the sequence of coal measures intersected in the Boola Boola oil exploration well. This well is one mile east of line AB, but for the purpose of gravity interpretation has been projected onto the line of the cross-section.

The Boola Boola well bottomed at 1830 feet in coal measures. For the evaluation of the gravity curve the reasonable assumption has been made, that Tertiary beds at the Boola Boola well are 1900 feet thick. In addition, the following rock densities have been assumed:

Coal measures	2.0 g/cm^3
Jurassic rocks	2.6
Palaeozoic complex of mainly metamorphic rocks	2.75

With the thickness of the Tertiary beds and dipping angles occurring with the Latrobe Seam fairly well known and with the densities of the various layers adopted as mentioned, the gravity variations along the line of the cross-section AB can be sufficiently explained.

This interpretation includes the existence of thick coal seams almost horizontally bedded in the deeper portions of the coal basin, terminated northwesterly by a monoclinal flexure referred to above. It further suggests that the overlying younger coal seams near the margin of the basin are less steeply inclined than the Latrobe Seam and that concealed outcrops of the younger seams occur beneath the subhorizontal overburden cover of recent gravel.

In this western part of the Latrobe Valley, Jurassic beds extend from the deeper parts of the coal basin across the monoclinal feature of the basin margin into the foothills of the Eastern Highlands of Victoria, wedging out northwestwards upon the Palaeozoic basement and thickening to the southeast.

It is of interest to note that analysis of the gravity anomaly curves at various sections across the Yallourn Monocline several miles apart leads invariably to the assumption of a layer of intermediate density (2.6) between the denser bedrock (2.75) and the low-density coal measures (approx. 2.0). The presence of this intermediate layer must be postulated in order to explain satisfactorily the shape of the gravity anomaly curve and the gravity gradient across the monoclinal flexure.

Geological evidence obtained by drilling the Rosedale No. 1 and Wellington Park No. 1 wells supports the assumption of Jurassic beds thickening easterly beneath the brown coal measures. Rosedale No. 1 bottomed at a total depth of 5836 feet, and Wellington Park No. 1 bottomed at 12001 feet, both still in Jurassic beds.

The relative Bouguer anomaly value at the site of the Boola Boola well is -8 milligals. The corresponding value measured at Rosedale No. 1 is -18 milligals. Consequently the Bouguer anomaly at the Rosedale location is 10 milligals lower than that at Boola Boola.

Assuming a uniform density of 2.0 g/cm^3 throughout the Tertiary layer, the thickening in the Tertiary beds from about 1950 feet at the Boola Boola well to 2345 feet established by drilling at the location of the Rosedale No. 1 well would be quite insufficient to explain the gravity variation measured between the two bore sites.

On the other hand the thickening easterly in the Jurassic beds of 2.6 g/cm^3 density underlain by Palaeozoic metamorphics of 2.75 g/cm^3 density easily explains the measured difference.

Alternatively a variation in the bulk density of the Tertiary beds with densities of the coal measures decreasing from 2.0 g/cm^3 at the Boola Boola well to (say) 1.8 g/cm^3 at the Rosedale well could be assumed in order to account for the decrease by 10 milligals easterly in the gravity anomaly values. However this assumption would leave unsolved the problem of explaining the gravity effect which must be caused by the Jurassic rocks rapidly thickening easterly as indicated by drilling.

Using the formula quoted above, the suggested throw in the Tertiary beds which occur in the Section CD to the north and south of the Rosedale Fault can be approximately determined as being in the range from 2200 to 2500 feet.

This result is based on the assumption of a density contrast of 0.8 to 0.9 between the Tertiary beds of 1.7 to 1.8 g/cm^3 density and Jurassic rocks of 2.6 g/cm^3 density, and using the measured gravity gradient of 25 milligals per mile.

In comparison with the average gravity gradient produced by the Yallourn Monocline, the gravity variation along the line CD of the section across the Rosedale Fault and Monocline is much more impressive. The steep gradient of 25 milligals per mile requires as an explanation some important tectonic feature and leads principally to the assumption of a considerably larger throw along the Rosedale Fault than on the Yallourn Monocline.

It is impossible to accurately determine from gravity data alone the depth to the Jurassic rocks whose presence is suggested under the coal beds in the area of the Gormandale Block. Drilling would be needed also to reveal the thickness of coal seams in the Tertiary sequence above the basement layer of the block area.

However, it can be estimated from the gravity data that younger, less dense formations may have a thickness of about 1700 feet in the graben suggested by the low gravity values south of Gormandale, thinning to zero southeasterly towards Carrajung.

5. CONCLUSIONS

An important result of the gravity interpretation is the suggested presence of a northeast-elongated block, the relatively high standing 'Gormandale Block', indicating a western extension of the large Baragwanath Fault Block.

The Gormandale Block is bounded to the northwest by the Rosedale Monocline and Rosedale Fault respectively, the position of which has been clearly delineated in the survey area by an impressive trend of steepest gravity gradients. Gravity data suggest the existence of a small sunken area, possibly an erosional feature, cutting into the 'Gormandale Block' and possibly reducing the slope of the monocline in the north-central part of the area investigated.

Northwest of the Rosedale Monocline, the gravity pattern indicates an area of thick Tertiary sediments for which the name 'Rosedale Trough' is suggested.

A northeast-elongated graben is suggested to explain the relatively low gravity readings southeast of Gormandale. This sunken structure is visualized as being separated from the Gormandale Block by a gentle downfold or small-scale step-faulting. Some tilting of the Gormandale Block down to the southeast can be concluded from the gravity values, and this tilting may also have contributed to the forming of this structure.

Along the line of section passing southeast across the survey area the gravity anomaly curve has been used to estimate the variation in the thickness of Tertiary sediments in the Latrobe Valley Basin. It is estimated that these sediments are about 3000 feet thick in the Rosedale Trough. Tertiary deposits are suggested to be relatively thin over the Gormandale Block, and Tertiary or younger sediments thicken to about 1700 feet in a sunken structure south of Gormandale.

Doming of local extent is likely in the Tertiary Beds overlying the Gormandale Block. This could be of importance in the search by the State Electricity Commission for better-quality coal in this particular area.

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APPENDIX

STAFF, EQUIPMENT, AND SURVEY STATISTICS

STAFF

BMR

G.F. Lonsdale,	Geophysicist, Party Leader
A. Distel,	University vacation student (Field Assistant)
SEC of Victoria,	Brown Coal Investigation Branch, Traralgon (Vic.).
L.C. Heron,	Surveyor in charge of topographic surveying, preparation of base plans etc.

EQUIPMENT

(a) Worden Gravity-Meter No. 140, Calibration Factor 0.11090 milligals per scale division.

Comment on Performance:

The rate of the time-drift of the meter remained within reasonable limits. At the most an hourly drift rate from one to two scale divisions was derived from continuous checks throughout the duration of the survey. Base stations were reoccupied approximately every hour.

(b) Two Askania Microbarometers No. 531306 and 531308

Comment on Field Procedure:

Along several traverses it was decided to supplement the pegged and levelled stations with additional gravity readings on intermediate stations. Two microbarometers were used to measure altitudes on seventeen additional stations.

In order to correct for natural pressure variations, Microbarometer No. 531308 was read every ten minutes at a base, whilst No. 531306 was used on new stations and also at stations of known altitude for the purpose of tying the barometrically measured elevations to known altitudes

(c) Land-Rover - C.89824

This vehicle was entirely adequate for the purpose of the survey, which includes rough bush tracks in hilly areas.

SURVEY STATISTICS

Commenced field work at Gormandale	9 December 1960
Completed field work	25 January 1961

Note:

The field readings taken on the area covered by the Gormandale survey were completed within a period of 14 actual work ng days. There were several interruptions of the field work owing to the gravity work simultaneously done on a regional survey of Eastern Victoria. A major break occurred during the Christmas holiday season.

Total number of new gravity stations established during the course of the Gormandale survey 208

Number of reoccupied stations of earlier surveys 5

LOCATION

38°00' WARRAGUL 39°00' 145°30' 147°45' REFERENCE TO AUSTRALIA STANDARD 4 MILE MAP SERIES

SCALE

4 0 4 8 12 MILES

LEGEND

- Major Fault or Monocline geologically known
- Major Fault or Monocline geophysically indicated
- Smaller Fault or Monocline geophysically indicated
- Anticlinal Axis indicated by gravity
- Synclinal Axis indicated by gravity
- Structure Form Line, based on gravity
- Doming indicated by gravity High
- MOE Reference to Australia Standard one-mile map series
- Direction of dipping in outcropping beds
- MOE Place name
- 5112' Deep Bore, with total depth in feet

GEOLOGICAL OUTCROPS:

- Recent and Tertiary Sediments
- Tertiary Basalt
- Jurassic, Arkosic Sandstone
- Palaeozoic

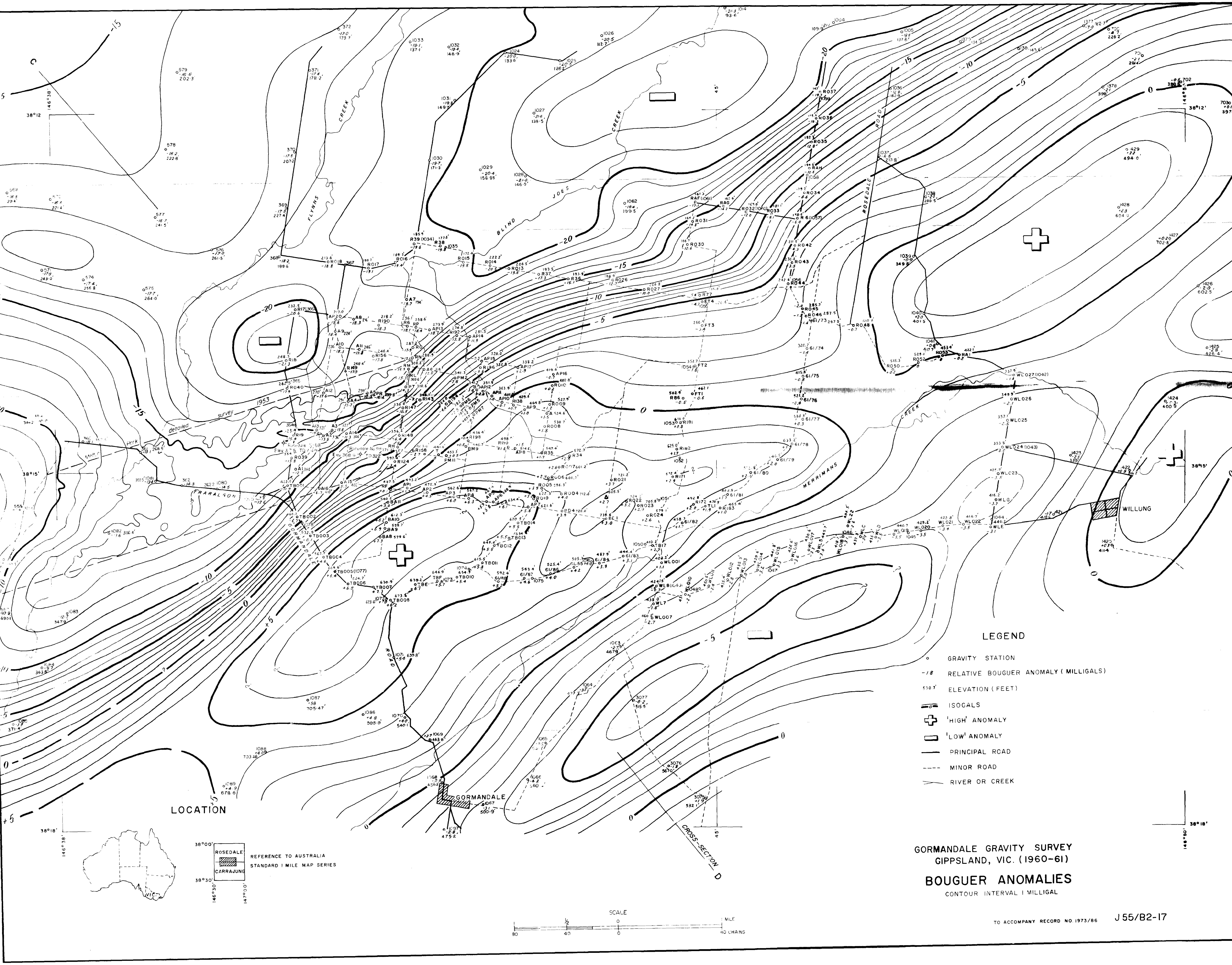
GORMANDALE GRAVITY SURVEY GIPPSLAND, VIC. (1960-61)

STRUCTURAL PLAN OF STRZELECKI RANGES AND ADJOINING AREA

TO ACCOMPANY RECORD NO.1973/86

J55/B2-19-1

PLATE 2


GORMANDALE GRAVITY SURVEY
GIPPSLAND, VIC. (1960-61)
BOUGUER ANOMALIES
CONTOUR INTERVAL 1 MILLIGAL
LEGEND
GRAVITY STATION
RELATIVE BOUGUER ANOMALY (MILLIGALS)
ELEVATION (FEET)
ISOGALS
'HIGH' ANOMALY
'LOW' ANOMALY
PRINCIPAL ROAD
MINOR ROAD
RIVER OR CREEK
LOCATION
REFERENCE TO AUSTRALIA
STANDARD 1 MILE MAP SERIES
ROSEDALE
CARRAJUNG
SCALE
MILE
CHAINS
TO ACCOMPANY RECORD NO. 1973/86
J55/B2-17
GORMANDALE
WILLUNG
CROSS-SECTION D
FLYNNS CREEK
BLIND JOES CREEK
MERRIMANS CREEK
ROSEDALE ROAD
TRARALGON
1953 detailed survey
38°12'
38°15'
38°18'
146°38'
146°45'
146°50'

AUSTRALIA 1:253,440

WARRAGUL

VICTORIA

PLATE 3

SJ 55-10

(BASED ON J55/B0-16)

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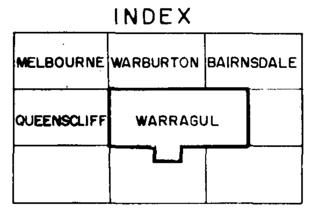

Projection: Transverse Mercator, Australia Series, Zone 7

Control and detail after Royal Australian Survey Corps 4-mile strategic series map of the same name. Gravity data from detailed and semi-detailed surveys

GORMANDALE GRAVITY SURVEY
GIPPSLAND, VIC. (1960-61)

BOUGUER ANOMALIES

PLAN OF STRZELECKI RANGES AND ADJOINING AREA

4 0 4 8 12 16 MILES

10 0 10 20 30 KILOMETRES

Contour interval 1 milligal

TOPOGRAPHY

- Built-up area
- Homestead
- Railway
- MOE 1" to 1 mile gravity map area
- Principal road
- Minor road
- Track

GRAVITY

- Isogals
- 'High' anomaly
- 'Low' anomaly

Gravity anomaly contours shown are based on relative Bouguer anomaly values referred to an arbitrary datum.
To convert to International values (density = 2·67) subtract from values shown, (9·13+0·01×h) milligals where 'h' is the station altitude in feet above Sea Level.

For the calculation of Bouguer anomalies 1·9 g/cm^3 has been adopted as an average rock density.

Geophysical field data from BMR and Robert H. Ray Co surveys (1948-1961)

Elevation control by State Electricity Commission of Victoria and Department of the Interior levelling.

Department of National Development
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

TO ACCOMPANY RECORD NO. 1973/86

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Note : In the Latrobe River Coal Basin the thickness of post-Palaeozoic sediment (Tertiary and Jurassic Beds) has been determined by means of the universal formula :

$\triangle g = 12{\cdot}77 \times \sigma \times h$, where

$\triangle g$ = Gravity Variation in milligals,

σ = Density contrast between sediments and metamorphic basement,

h = Thickness of sediments in kilo-feet

Legend

- Coal, intersected
- Coal, suggested
- Gravel
- Basalt

GORMANDALE GRAVITY SURVEY

GIPPSLAND, VICTORIA (1960-61)

CROSS-SECTION FROM TYERS COALFIELD TO CARRAJUNG

CORRELATION OF GRAVITY, GEOLOGY AND TOPOGRAPHY

½ 0 ½ 1 ½ MILES 2

VERTICAL SCALES AS SHOWN

TO ACCOMPANY RECORD NO. 1973/86

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