K. ROCHOW
(Fenelope Rochow)

W. KENDALL - GRAVITY INTERP. W. OTWAY BASIN

Rept. Bk. No. 728
G.S. No. 3507

# DEPARTMENT OF MINES
# SOUTH AUSTRALIA

GEOLOGICAL SURVEY

EXPLORATION DIVISION

## A GRAVITY INTERPRETATION OF THE WESTERN OTWAY BASIN BETWEEN CAPE JAFFA, SOUTH AUSTRALIA AND WARRNAMBOOL, VICTORIA

by

G.W. Kendall
Geophysicist
EXPLORATION GEOPHYSICS SECTION

S.R. 11/5/123

5th August, 1966

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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| Plan No. | Title | Scale |
|---|---|---|
| 66-361 | Locality Plan | 1" = 200M. |
| L66-53/6 | Bouguer Anomaly Map | |
| L66-54/6 | Composite Regional Gravity effect | 1" = 4m. |
| L66-55/6 | Residual Gravity Contour Plan | 1" = 4m. |
| L66-56/6 | Composite Gravity Interpretation Map | 1" = 4m. |
| 66-507 | Bouguer Anomaly Profiles and Interpretation | 1" = 4m. |
| 66-508 | Beachport Gravity Anomalies Interpretation | 1" = 4m. |
| 66-509 | Geological Cross Sections and Gravity Profiles | 1" = 4m. |

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SOUTH AUSTRALIA

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S.R. 11/5/123

# A GRAVITY INTERPRETATION OF THE WESTERN OTWAY BASIN BETWEEN CAPE JAFFA, SOUTH AUSTRALIA AND WARRNAMBOOL, VICTORIA


## ABSTRACT

From Bouguer Anomaly Maps of the western onshore portion of the Otway Basin, a Residual Gravity Map has been constructed from which the subsurface Geological structure is interpreted to give good agreement with known Geology.

The area is one of complex gravity features in which a major increase of regional gravity towards the coast is interpreted as being from intra-basement, and in which several Bouguer anomalies are interpreted as intra-basement intrusions.


## INTRODUCTION

The area interpreted is the western portion of the Otway Basin between Cape Jaffa in South Australia and Warrnambool in Victoria, covering an onshore area of approximately 9,000 square miles (Location Plan 66-361). The area consists essentially of a broad peneplain gently rising to the northwest with the natural surface broken by a series of calcareous sand dunes and a few volcanic cones.

Four Bouguer Anomaly Maps, with Bouguer anomaly contour intervals at 2 milligals, are used for the interpretation. The one inch to four mile scale maps covering the area are PORTLAND, HAMILTON, PENOLA and part of NARACOORTE (i.e. A name in Upper Case, underlined, defines a 4 mile or 1:250,000 Military sheet area extending over 1° of Latitude and 1½° of Longitude). These maps are contoured from Gravity Stations established by S.A. Department of Mines (S.A.), Alliance Oil Development (S.A.), Beach Petroleum (S.A.), Frome Broken Hill (Vic.), and Planet Oil

Only two wells in the area under consideration have so far drilled into basement. Pretty Hill No. 1 in the eastern part of the area went into ?Cambrian diabase at 7874 feet, probably on a local basement high, and Casterton No. 1 in the northern edge of the basin went into ?Ordovician slates at 8,000 feet after passing through nearly 2,000 feet of Upper Jurassic sands, gravels, mudstones and basaltic flows. Other wells of note in the area are:-

Beachport No. 1 which bottomed at 3,963 feet in Lower Cretaceous

Geltwood Beach No. 1 which bottomed at 12,301 feet in Lower Cretaceous.

Mt. Salt No. 1 which bottomed at 10,004 feet in Upper Cretaceous

Penola No. 1 which bottomed at 4,958 feet in Lower Cretaceous.

Kalangadoo No. 1 which bottomed at 9,049 feet in slightly metamorphosed sandstones and shales of unknown age.

Eumeralla No. 1 which bottomed at 10,308 feet in Lower Cretaceous.

## PREVIOUS GEOPHYSICAL WORK AND EXPLORATION

As previously noted the area has been well covered with reconnaissance and detailed gravity surveys by various organizations between 1950 and 1966.

More recently (1960-1966), reconnaissance and detailed seismic surveys have been completed in the area. Only in the eastern part of the area have reliable basement reflections been mapped. Intermediate horizons, though, have been mapped in detail. The seismic refraction method appears to be the only reliable method of mapping basement. Basement is mapped by the latter method near Kalangadoo and south of Lucindale by Alliance Oil Development Aust. N.L. and south of Kingston S.E. by the S.A. Department of Mines. Comprehensive offshore seismic reflection work has also been completed by Haematite Explorations Pty. Ltd.

The South Australian portion of the basin was covered by aeromagnetics in 1955 by Adastra Hunting Geophysics Ltd. for the S.A. Department of Mines, the results of which were computed by the Computers of the Exploration Geophysics Section of the S.A. Department of Mines. A reinterpretation of the area was executed by Compagnie Generale de Geophysique in 1965 for the Department of Supply, Commonwealth of Australia.

## INTERPRETATION

### Regional Effect

Interpretation of the area between Robe and Portland is complicated by anomalous high gravity readings in the deepest part of the basin as indicated by wells, seismic and aeromagnetic results.

A basic regional gradient of plus 1 milligal per 8 miles is interpreted in a S62$^{o}$E direction. This regional when subtracted from the Bouguer values north and northeast of the Penola gravity trough gives a residual map with gravity highs and lows sympathetic with basement highs and lows.

Correlating basement depths from seismic refraction results south of Kingston S.E., near Kalangadoo and from seismic reflection results north of Portland with the gravity profiles, it is noted that the basic regional gradient also persists south of the Penola Trough. Complications exist south of the Penola trough in that there is also a 1 milligal per 1.2 miles gradient increasing southward from an axis of flexure which passes through the gravity low north of Robe, the Penola gravity trough and near the Victorian towns of Branxholme and Myamyn. This gradient is added to the basic regional gravity gradient to form a composite effect which is shown on plan No. L66-54/6, which also shows the axis and the direction of the gravity gradients.

### Residual Gravity

The composite regional gravity effect is subtracted from the Bouguer anomaly map to form a residual contour plan (Plan No. L66-55/6) with the zero contour, north of Kalangadoo, being equivalent to 12,000 feet below sea level.

From this map the points to note are the Kalangadoo high, the Beachport highs, the decrease of gravity values south of Mount Gambier, the 'Dartmoor Ridge' which is not as pronounced as previously thought and the two highs north of Dartmoor.

## Interpretation of Anomalies

The 1 milligal per 1.2 miles gravity gradient increasing towards the coast was interpreted without reference to the off-shore seismic results. When the axes of flexure of this gravity gradient were extended seawards an agreement with the seismic results was noted as shown on Plan No. L66-56/6. The seismic survey lines completed by Haematite Explorations Pty. Ltd. shown on this plan are the only offshore survey lines which extend far enough from the coast and locate the reflection events, the depths of which are given on Plan No. L66-56/6. North of line SS23 only basement reflections at depths of about 10,000 feet are located. It is interpreted that the reflection event as mapped on plan No. L66-56/6 swings to the S.W. where it is parallel to the intra-basement line of flexure passing north of Robe. The 10,000 feet contour between SS23 and SS25 is nearly parallel to the intra-basement line of flexure through the Penola Trough. The correlation between the intersections of the lines of flexure and the change in direction of the 10,000 feet contour between SS25 and SS26 can be clearly seen. The 10,000 feet contour through SS26, SS27 and SS34 is nearly parallel to the intra-basement line of flexure north of Portland. Thus the 1 milligal per 1.2 miles gravity gradient is interpreted as expressing the dip of the offshore reflection event. Using the dip of the reflection event, the gravity gradient and the lines of flexures, the depths to this interface are contoured dipping northeastwards to a maximum depth of over 50,000 feet below sea level at the intra-basement line of flexure. A density of 0.10gm/cm$^3$ contrast is calculated to give the 1 milligal per 1.2 miles gradient or from a section of density 2.77 gm/cm$^3$. The density of the latter sections and all sections in the interpretation are based on the assumption that the density of the basement is 2.67 gm/cm$^3$.

Since there is a lack of subsurface control in the area fro drilling, the gravity effects of certain generalized geometric forms are used in the interpretation. A sphere, a vertical cylinder in which the bottom of the cylinder is at an infinite depth, and the gravity effect of a fault, are used in the interpretations.

The Beachport gravity highs are interpreted on Plan No. 66-508. The anomalies are interpreted individually from profiles C-C' and D-D' (see L66-55/6) and then as one from the profile X-X'. From profile X-X' the Beachport highs are interpreted as being from three masses. An intrusive mass of density 3.00 gm/cm$^3$, possibly basalt, in the form of a cylinder, with the top of the cylinder at 31,700 feet below sea level, is interpreted east of Beachport. Just north of Beachport the large gravity values are interpreted as being from a mass in the form of a vertical cylinder with a hemisphere on top. This form is split into two units, a sphere of density 2.90gm/cm$^3$, and the remainder, a vertical cylinder with a hemisphere removed from the top. The latter unit is interpreted as a vertical cylinder with equivalent volume, that is, with the top of the cylinder two thir of the radius of the sphere below the centre of the sphere. The density of the cylinder is 3.00gm/cm$^3$. The composite gravity effect of the three masses gives a gravity profile in good agreement with the residual gravity profile. There are only a few gravity stations actually on the line of section, the profile being interpreted from stations near the line of section.

The two anomalies north of Dartmoor which are in line with the Beachport anomalies are also interpreted as intra-basement intrusives in the form of spheres of density 2.90gm/cm$^3$ centred about a depth of 31,700 feet and rising to about 10,000 feet below sea level.

All the previous anomalies are regarded as intra-basement anomalies, with a density contrast of 0.23 gm/cm$^3$, the remaining anomalies being regarded as basement anomalies with a density contrast of 0.24 gm/cm$^3$.

The structural boundary of the basin is interpreted to vary from steep faults to stepped faults and monoclines depending upon the closeness of the gravity contours. The Mesozoic sediments overlap the structural boundary so that in most cases the structural boundary is not indicated on the surface.

The gravity high south of Lucindale agrees quite well with the seismic results, the seismic giving 3,100 feet and the gravity 3,200 feet below sea level for depth to basement.

Between Lucindale and Naracoorte the gravity low is interpreted as being due to a local reduction in basement density causing an anomalous low where aeromagnetic results and seismic reflection results indicate a rise in basement.

The broad gravity high NW of Penola is interpreted as being a basement high. Seismic reflection lines and refraction 'depth probes', although not actually over the high, indicate the basement high which is calculated from gravity values to be at about 4,000 feet below sea level.

Between the latter high and the high south of Lucindale the basement is calculated to reach 10,000 feet below sea level.

The gravity trough north of Robe and the NW-SE trending Penola trough are interpreted as being basement lows with a maximum depth below sea level of over 14,000 feet.

The gravity high ESE of Robe has poor gravity control but appears to be of the same order as, and in line with, the gravity high south of Lucindale which gives a basement high of

3,200 feet below sea level. An aeromagnetic anomaly is also centred over the anomaly with the form of a basement high as shown in plan No. 66-507. The aeromagnetic anomaly is interpreted as equivalent to a sphere with its centre at 9,300 feet below flight level or approximately 8,700 feet below sea level. Using the Lucindale gravity high, with basement depth of 3,200 feet below sea level, as correlation the radius of the sphere is 5,500 feet. This equates to a magnetic susceptibility contrast of $52 \times 10^{-5}$ c.g.s., which is a reasonable value for basement structures in the area.

In the onshore area between Portland and Port Fairy seismic reflection results indicate basement dipping southward from the northern boundary of the basin, and do not appear to locate the gravity high east of Myamyn as a basement high. The gravity residual map indicates that basement depth is actually deeper than the reflections indicate in the northern part of the area. This could be due to the seismic reflections not being from the basement, as shown from the gravity, or that the density contrasts of sediments and basement are such as to give the anomalous deeper gravity basement.

A definite interpretation of this area cannot be completed until more subsurface, especially basement, geology is known in the area. The Myamyn gravity high is left as a basement high, although this could also be interpreted as being due to an intra-basement intrusion, until more definite subsurface evidence is forthcoming. Pretty Hill Well No. 1 in this area reached basement at 7,874 feet where gravity indicates basement at just over 12,000 feet below sea level. This anomaly is interpreted as a local basement high which, possibly because of the small number of gravity stations in the area, is not located on the Bouguer Anomaly map. Eumeralla No. 1 bottomed in Lower Cretaceous at 10,308 feet where basement is calculated at just over 12,000 feet below sea level.

The area described above and the area north of the Penola and Robe gravity troughs are all outside a regional basement high. This basement high sweeps round through Beachport, Kalangadoo, to a point just north of Dartmoor and then southwards around Dartmoor, and appears, to some extent, to be in sympathy with the line of flexure of the intra-basement feature. Two faults interpreted on the northern flank of the basement high, north of Kalangadoo, are also parallel to the intra-basement line of flexure. Calculation of depths to basement along the basement high, from gravity values, are complicated near Beachport and north of Dartmoor, by gravity effects from intra-basement features which hide the basement gravity effects.

On the south flank of the Beachport, Kalangadoo, Dartmoor basement high there is a hingeline. South of this hingeline the Lower Cretaceous dips more steeply and the thickness of the Upper Cretaceous section increases markedly. North of the hingeline the thin Upper Cretaceous section wedges out seven miles north of Kalangadoo. The hingeline is interpreted as passing about three miles north of Geltwood Beach No. 1 well and about seven miles SW of Kalangadoo and then extending towards Dartmoor.

The hingeline also divides the area into two different areas for gravity interpretation. On the northern side of the hingeline there is a Tertiary section of 2.20gm/cm$^3$ and a lower Cretaceous section of 2.43 gm/cm$^3$. On the southern side of the hingeline there is an increasing Tertiary section of density 2.20gm/cm$^3$ plus an increasing thickness of Upper Cretaceous of density 2.34 gm/cm$^3$ and an approximately constant thickness of Lower Cretaceous sediments of density 2.43 gm/cm$^3$. The basement underlying the sediments has an assumed density of 2.67 gm/cm$^3$ from which all the above section densities are calculated.

To determine the approximate depth contours of the basement on the southern side of the hingeline, the gravity effect of the Upper Cretaceous is removed, resulting in basement depths of over 19,000 feet below sea level as shown in Plans No. L66-56/6 and 66-509. No definite depth of the basement in this area can be calculated until basement is actually pinpointed by a deep well. Wells in this area are Kalangadoo No. 1 which, on the above interpretation, would have reached basement at about 10,000 feet below sea level, Geltwood Beach No. 1 which would have reached basement at about 12,700 feet below sea level and Mt. Salt which would have reached basement at about 19,000 feet below sea level.

The section below the Mesozoic in Kalangadoo No. 1 well of slightly metamorphosed sandstones and shales of unknown age is assumed to be also present beneath the Lower Cretaceous sediments north of the hingeline. The basement defined by gravity is below the above section and probably corresponds to the upper surface of the rock sequence forming the Padthaway Ridge. The sequence consists of more strongly metamorphosed sediments intruded by granite.

## Agreement with Seismic and Aeromagnetic Results

As previously noted Seismic Refraction methods appear to give the only reliable basement configuration. Where reliable refraction results have been obtained there is direct correlation with the gravity results. The deep ?basement reflections as mapped over the basin and offshore are of very poor quality and especially in the southern part of the basin in South Australia, both on the offshore reflections only appear to follow the general trend of the basement, as they seem to be from an horizon above the basement, possibly an horizon caused by compaction at depth.

Quite good agreement is obtained with Aeromagnetic and gravity, the gravity method being the more critical.

## CONCLUSIONS

It is considered that north of the Beachport-Kalangadoo-Dartmoor basement high, gravity highs and lows are in sympathy with basement highs and lows. Basement structure on the basement high itself is partly obscured by intra-basement features.

Gravity anomalies south of the hingeline on the southern flank of the basement high are the result of different combinations of increase in thickness of Tertiary, Upper Cretaceous, Lower Cretaceous sediments, or variations in the basement profile.

## ACKNOWLEDGEMENTS

Special appreciation is expressed to Mr. K. Rochow for his considerable help in the geology of the area.

G.W. Kendall
Geophysicist
EXPLORATION GEOPHYSICS SECTION

**GWK:AGK:SMA**
5.8.1966

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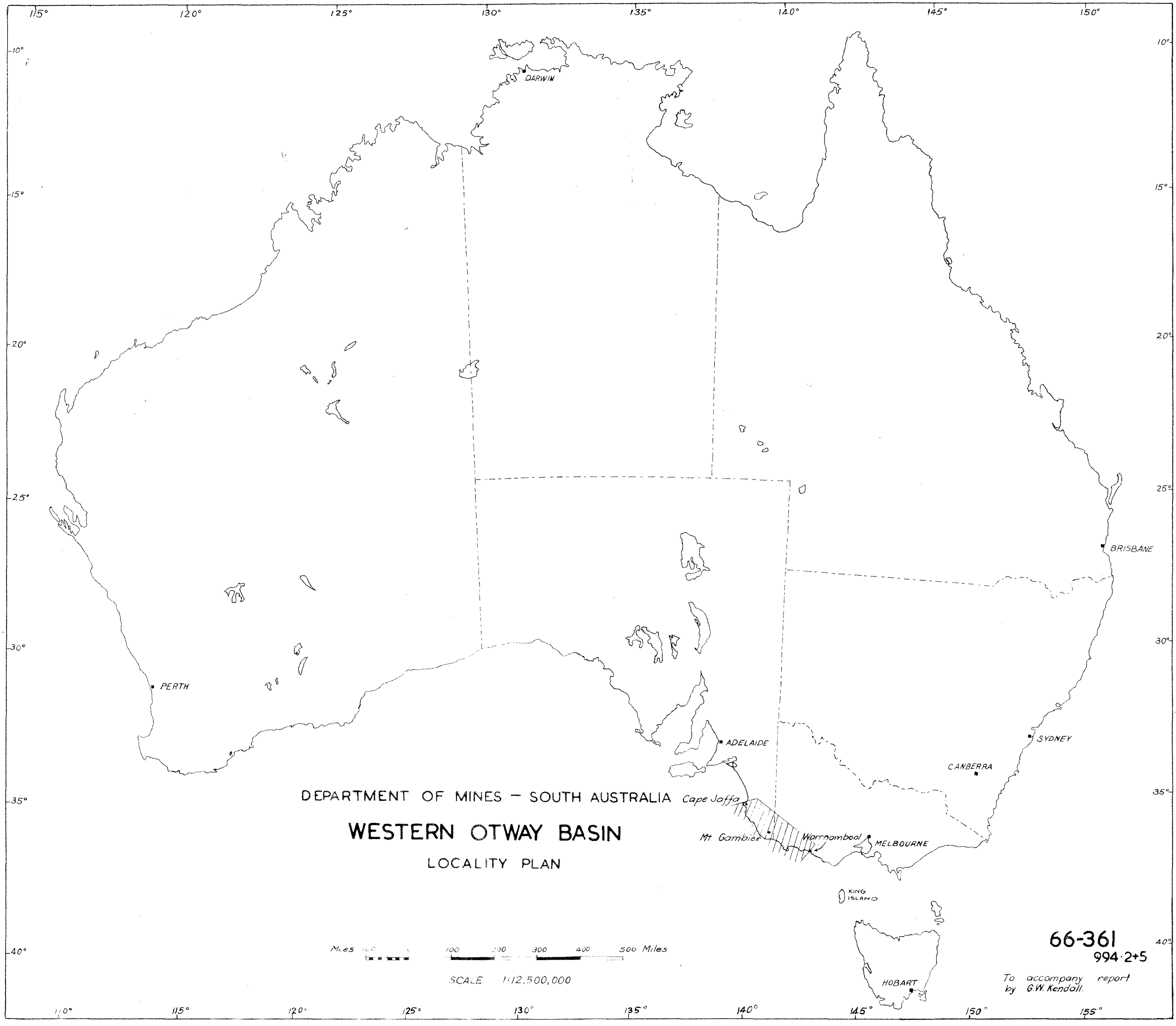
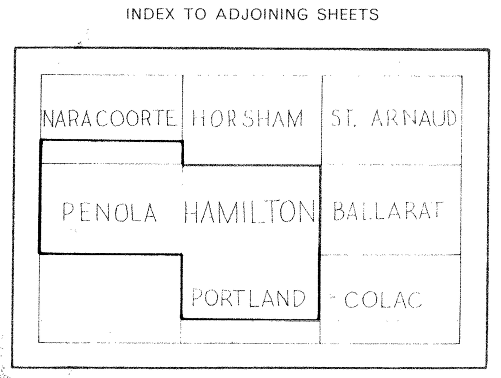

DEPARTMENT OF MINES — SOUTH AUSTRALIA
WESTERN OTWAY BASIN
LOCALITY PLAN
DARWIN
PERTH
ADELAIDE
BRISBANE
SYDNEY
CANBERRA
MELBOURNE
HOBART
Cape Jaffa
Mt. Gambier
Warrnambool
KING ISLAND
Miles
100
200
300
400
500 Miles
SCALE 1:12,500,000
66-361
994·2+5
To accompany report by G.W. Kendall.
115°
120°
125°
130°
135°
140°
145°
150°
155°
110°
10°
15°
20°
25°
30°
35°
40°


INDEX TO ADJOINING SHEETS




SCALE

1:253,440

MILES 2 1 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

# BOUGUER ANOMALY MAP

*Compiled by K.R. Seedsman, Snr. Geophysicist and B.G. Risely, Geophysicist.*
*Geological Survey of South Australia*

Published 1965

*OBSERVED [illegible] DATUM* — *B.M.R. Pendulum Station Mt. Gambier Observed Gravity = 979.99367 gals (from the 1964 B.M.R. Isogal Regional Gravity Survey)*

*ELEVATION DATUM* — *Mean Sea Level.*

*ELEVATION CORRECTION FACTOR* — *0.063 milligals foot.*

LEGEND

Gravity Station:
- S.A. Department of Mines (S.A.) ........ ●
- Alliance Oil Development (S.A.) ......... ○
- Beach Petroleum (S.A.) .................. -○
- Frome Broken Hill (Vic.) ................ ●
- Planet Oil (Vic.) ........................ ×

Bouguer Anomaly Contours (Contour interval = 2 milligals)

Bouguer Anomaly Low ..................................

Roads ................................................

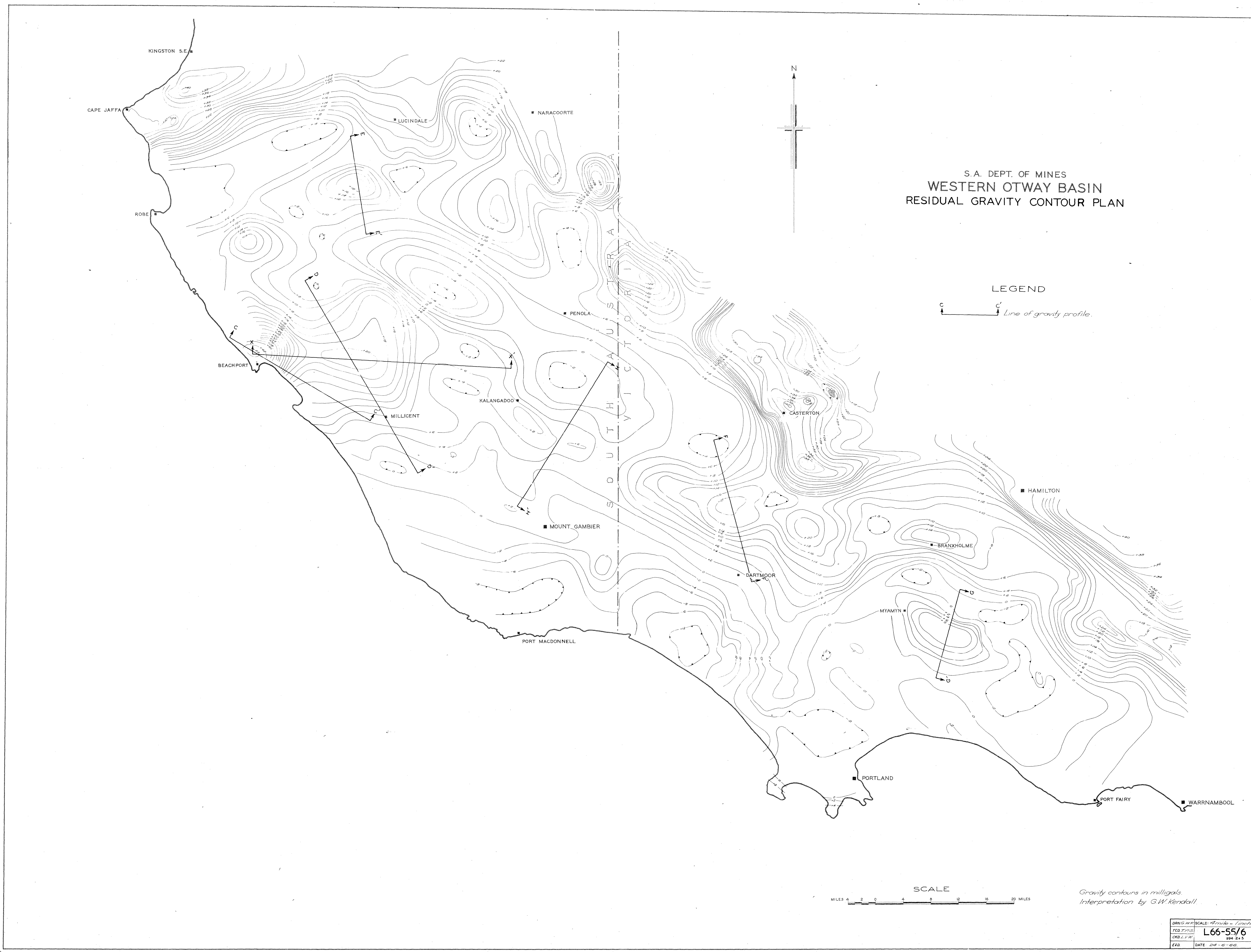
Railways .............................................

*B.E. Milton, M.Sc., Senior Geophysicist.*
*S.A. Dept. of Mines*

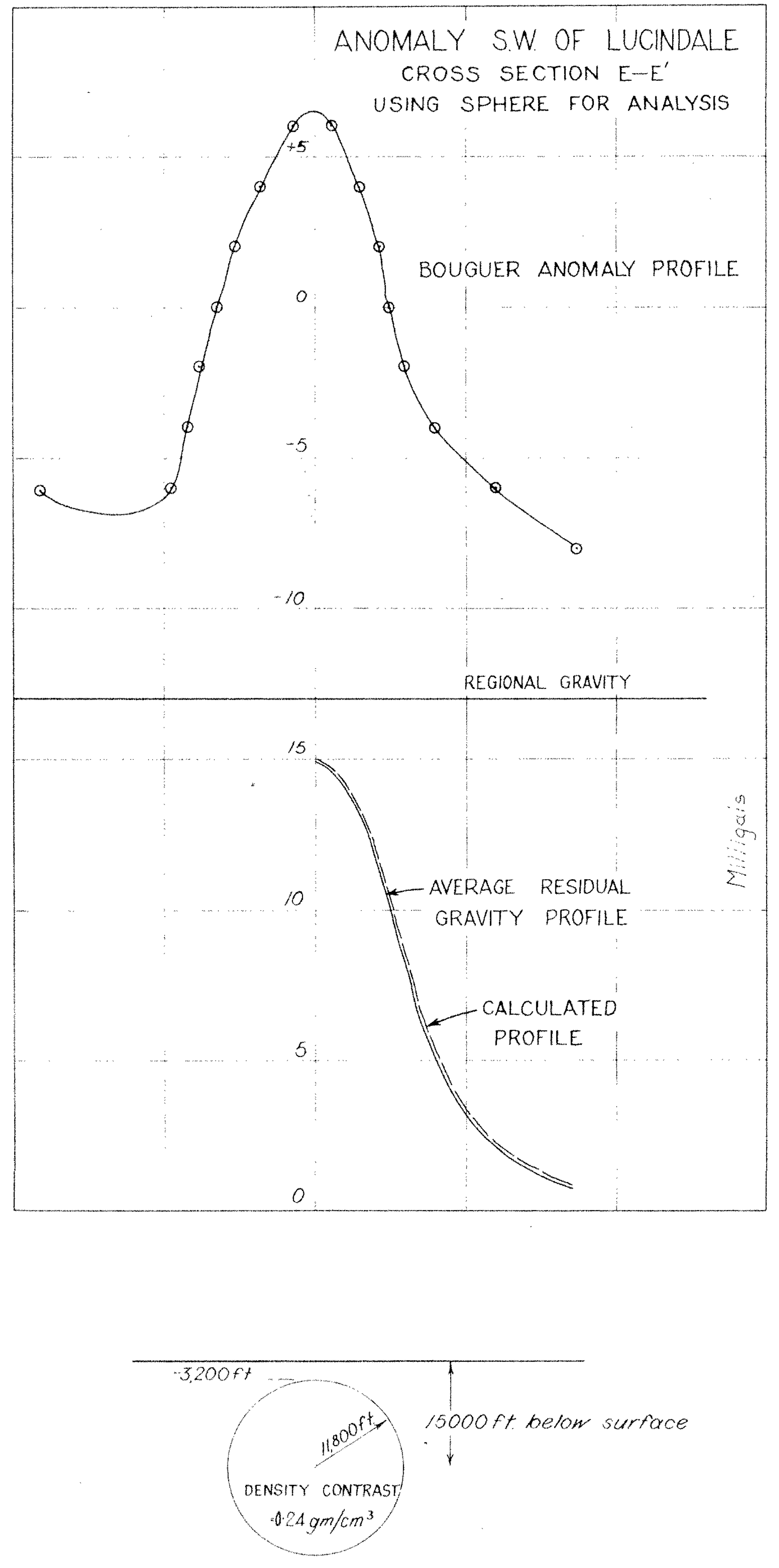
*To accompany report by G.W. Kendall.*

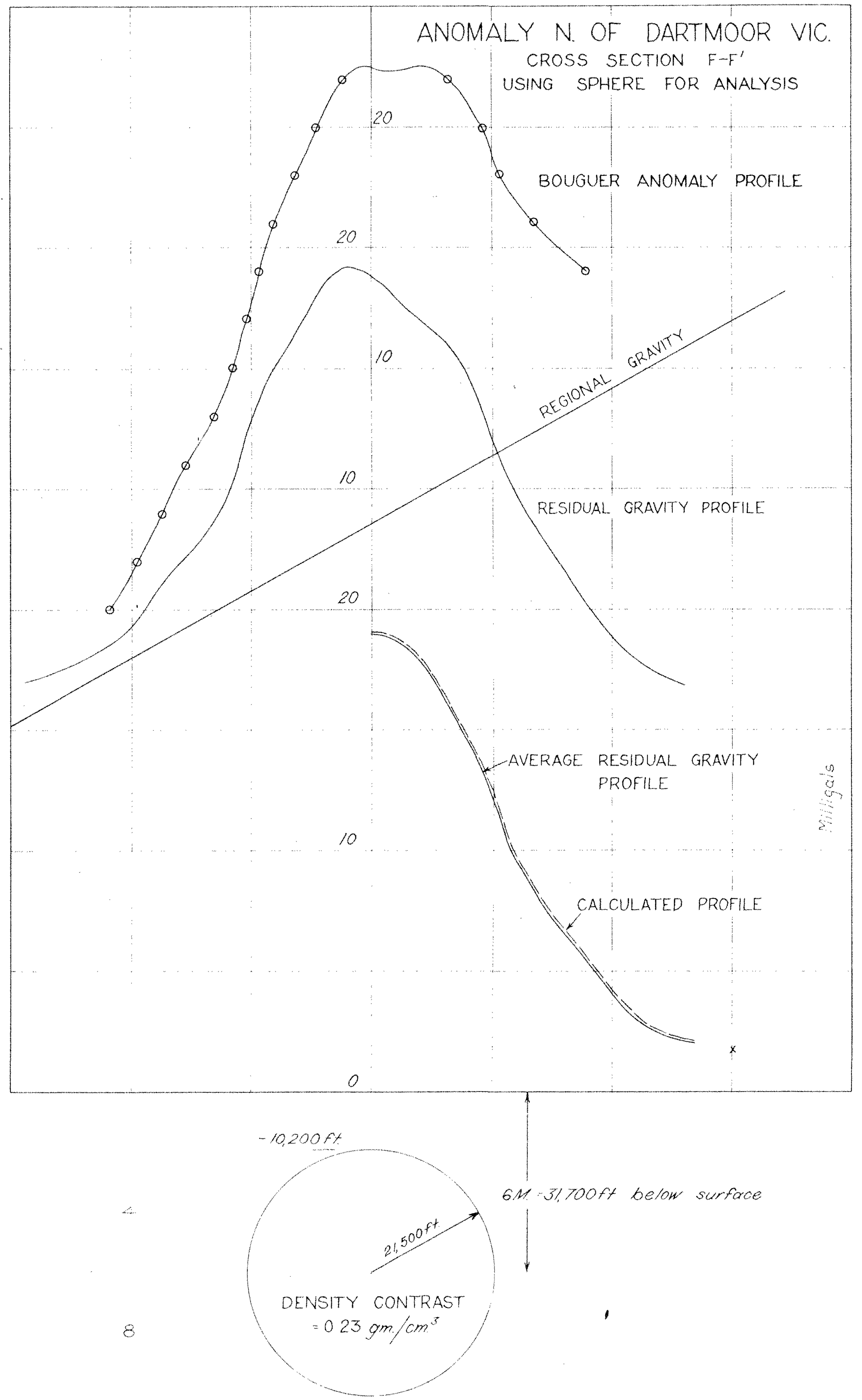
| DEPARTMENT OF MINES — SOUTH AUSTRALIA | | | |
|---|---|---|---|
| WESTERN OTWAY BASIN<br>**BOUGUER ANOMALY MAP** | | | |
| | | DRN. G.W.K. | SCALE: 4 mile = 1 inch. |
| | | TCD. T.P.S. | L66-53/6<br>994.2+5 |
| | | CKD. L.V.W. | |
| DIRECTOR OF MINES | | EXD. | DATE: 20-6-66 |

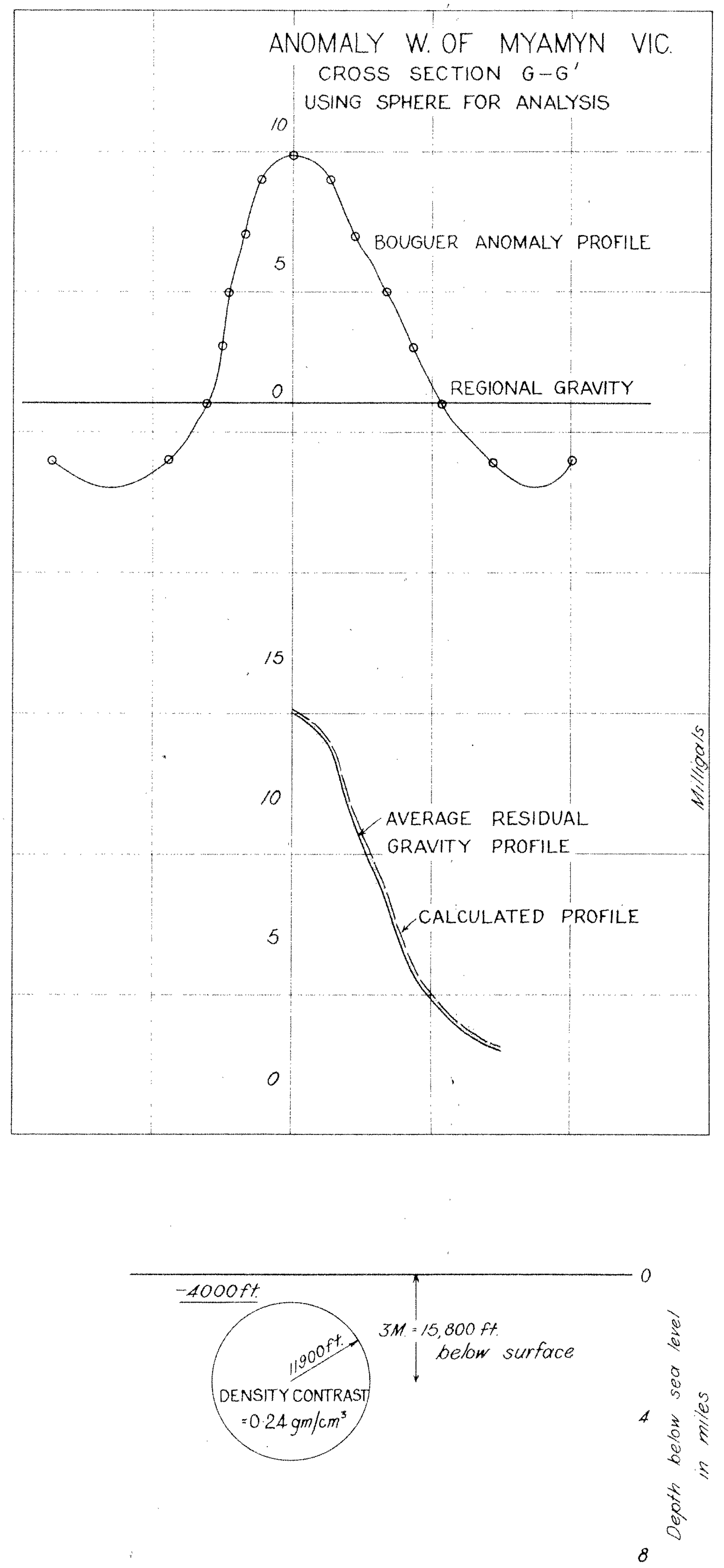
S.A. DEPT. OF MINES
WESTERN OTWAY BASIN
COMPOSITE REGIONAL GRAVITY EFFECT
N
KINGSTON S.E.
CAPE JAFFA
LUCINDALE
NARACOORTE
ROBE
PENOLA
BEACHPORT
KALANGADOO
MILLICENT
CASTERTON
MOUNT GAMBIER
HAMILTON
BRANXHOLME
DARTMOOR
MYAMYN
PORT MACDONNELL
PORTLAND
PORT FAIRY
WARRNAMBOOL
SOUTH AUSTRALIA
VICTORIA
AXIS
INCREASING
SCALE
MILES 4 2 0 4 8 12 16 20 MILES
Gravity contours in milligals
Interpretation by G.W. Kendall.
DRN. G.W.K.
TCD. T.P.S.
CKD. L.V.W.
EXD.
SCALE: 4 mile = 1 inch
L66-54/6
994-2+3
DATE: 24-6-66

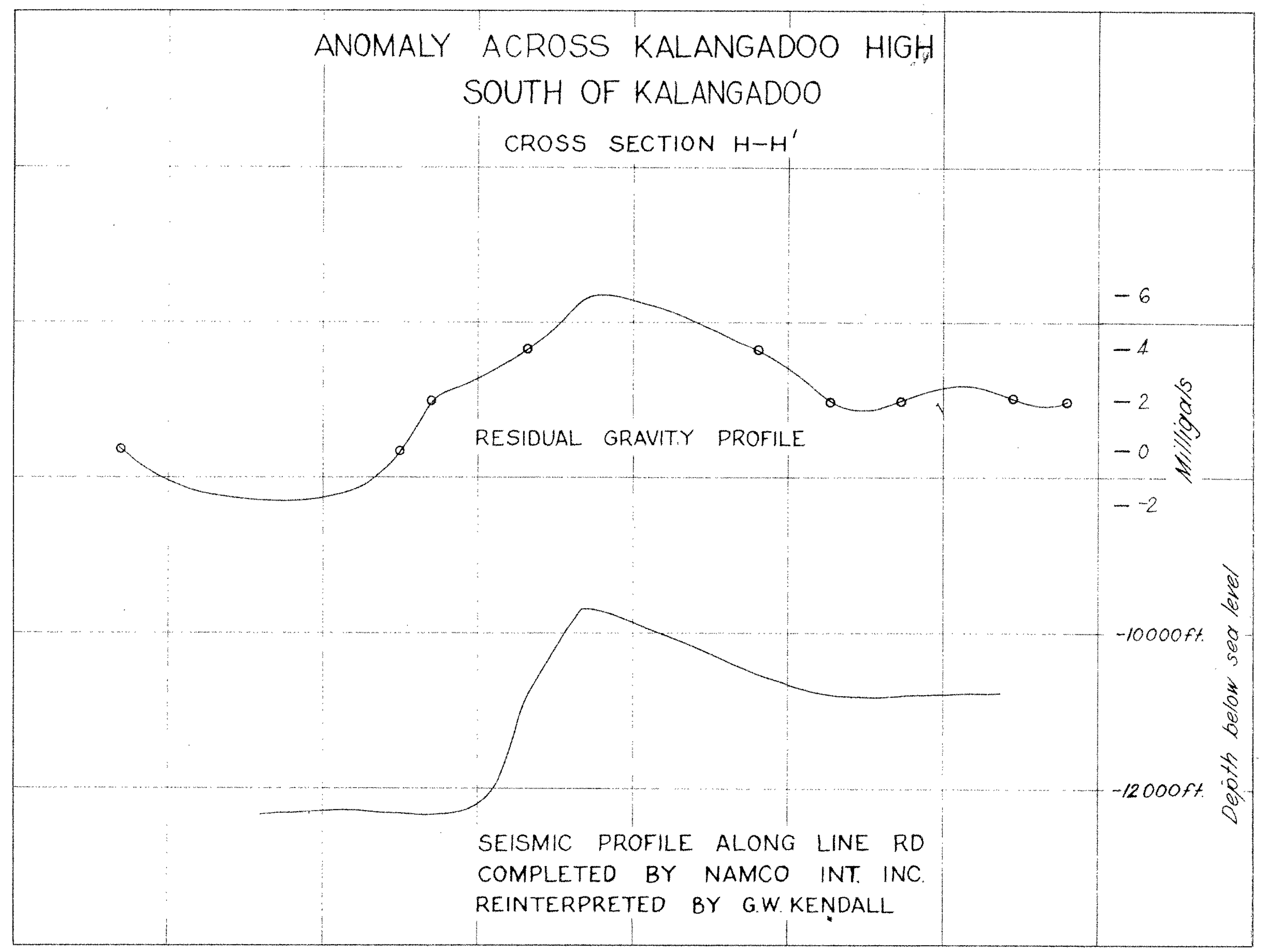

S.A. DEPT. OF MINES
WESTERN OTWAY BASIN
RESIDUAL GRAVITY CONTOUR PLAN
N
LEGEND
C C' Line of gravity profile.
KINGSTON S.E.
CAPE JAFFA
LUCINDALE
NARACOORTE
ROBE
PENOLA
BEACHPORT
KALANGADOO
MILLICENT
MOUNT GAMBIER
PORT MACDONNELL
SOUTH AUSTRALIA
VICTORIA
CASTERTON
HAMILTON
BRANXHOLME
DARTMOOR
MYAMYN
PORTLAND
PORT FAIRY
WARRNAMBOOL
SCALE
MILES 4 2 0 4 8 12 16 20 MILES
Gravity contours in milligals.
Interpretation by G.W. Kendall.
DRN. G.W.K.
SCALE: 4 mile = 1 inch.
TCD. T.P.S.
CKD. L.V.W.
L66-55/6
994 2+5
EXD.
DATE: 24-6-66.

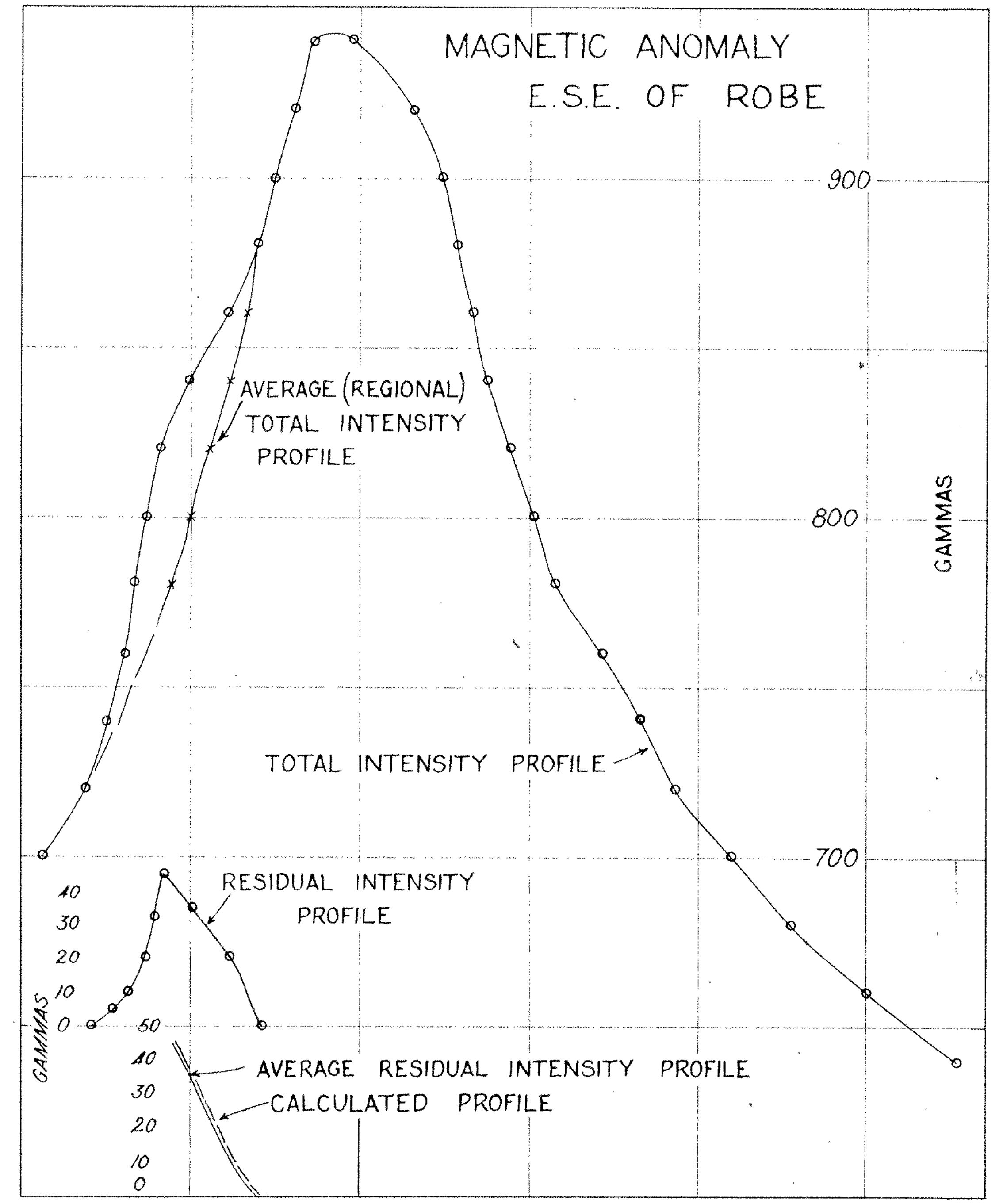
S.A. DEPT. OF MINES
WESTERN OTWAY BASIN
COMPOSITE GRAVITY INTERPRETATION MAP
LEGEND
Haematite Explorations Pty Ltd offshore seismic lines
Dry well, positive value well bottomed above basement, negative value well bottomed in basement.
Contours of basement horizon (below 10,000 feet)
Contours of intra-basement horizon
Masses used for gravity interpretation
Depth in centre indicates depth to top of sphere or cylinder.
Depth on circumference indicates depth to centre of sphere.
SPHERE
CYLINDER
N
PADTHAWAY RIDGE
APPROX. BOUNDARY OF MESOZOIC SEDIMENTS
LUCINDALE HINGE LINE
STRUCTURAL BOUNDARY OF BASIN
INTRA-BASEMENT LINE OF FLEXURE
GRAVITY LOW DUE BASEMENT DENSITY CONTRAST ?
PENOLA TROUGH
FAULT
BEACHPORT-KALANGADOO-DARTMOOR BASEMENT HIGH
HINGE LINE INDICATING SOUTHWARD INCREASE OF UPPER CRETACEOUS SEDIMENTS
LINE OF FLEXURE
NO DEEP REFLECTIONS
DEPTH OF A SEISMIC REFLECTION EVENT
SOUTH AUSTRALIA
VICTORIA
KINGSTON S.E.
CAPE JAFFA
LUCINDALE
NARACOORTE
ROBE
PENOLA
BEACHPORT
KALANGADOO
MILLICENT
MOUNT GAMBIER
PORT MACDONNELL
DARTMOOR
CASTERTON
HAMILTON
BRANXHOLME
MYAMYN
PORTLAND
PORT FAIRY
WARRNAMBOOL
PENOLA Nº1 +4958'
BEACHPORT Nº1 +3953'
KALANGADOO Nº1 +8049'
GELTWOOD BEACH Nº1 +12,301'
MT. SALT Nº1 +10,004'
CASTERTON Nº1 -8000'
PRETTY HILL Nº1 -7692'
INTRA-BASEMENT HIGH -31,700'
BASEMENT HIGH -3200'
BASEMENT HIGH -4000'
A
A'
B
B'
SCALE
MILES
Datum - Mean sea level.
Interpretation by G.W. Kendall.
SCALE: 4 mile = 1 inch
L66-56/6
DATE: 24-6-66




*Interpreted as Basement High*
*Using sphere for analysis*
*Depth to centre of sphere ·9,300 ft (Below flight line)*
*·8,700 ft (Below sea level)*
*Radius of sphere ·5,500 ft*
*Magnetic Susceptibility ·52 × $10^{-6}$ c.g.s*

*NOTE: This coincides with a Gravity Anomaly of the same dimensions as the Gravity Anomaly S.W. of Lucindale*

*Interpretation by G.W. Kendall*

**DEPARTMENT OF MINES — SOUTH AUSTRALIA**

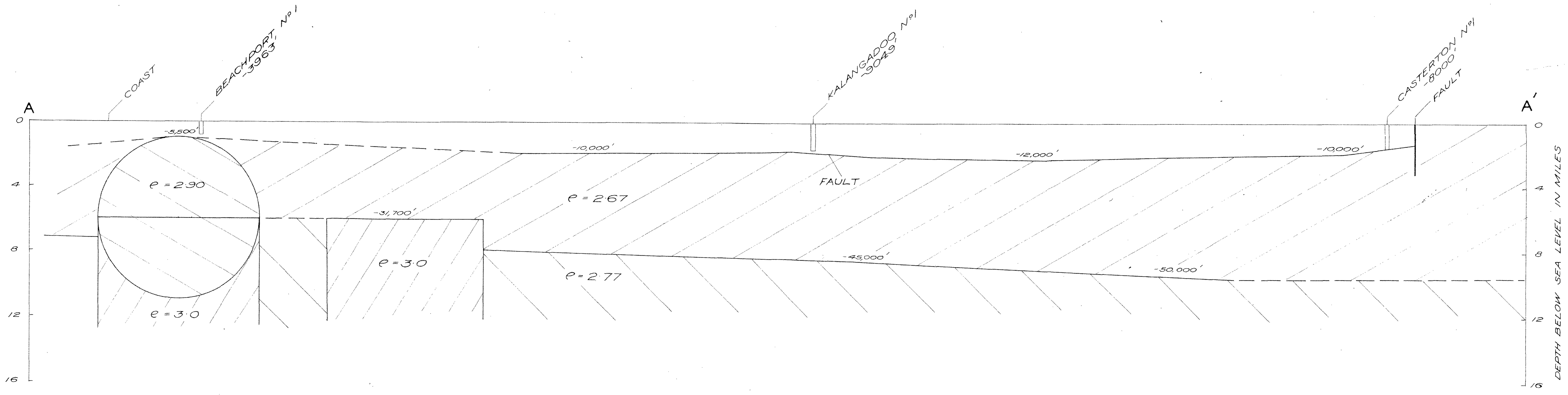
WESTERN OTWAY BASIN

BOUGUER ANOMALY PROFILES & INTERPRETATION

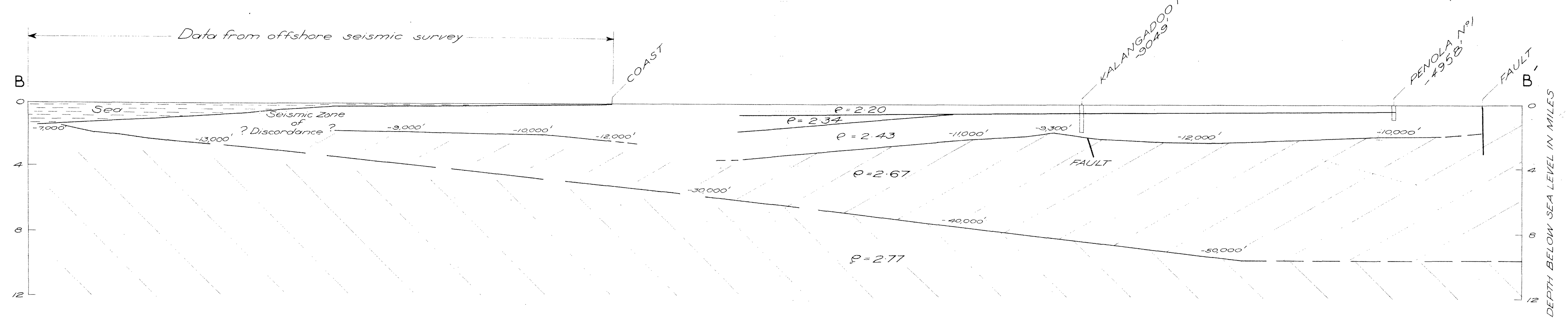
| | |
|---|---|
| Drn. GWK | SCALES: VERT. AS SHOWN HORIZ. 1" – 4 MILES |
| Tcd. R.H. | 66-507 994.2+5 |
| Ckd. L.V.W. | |
| Exd. | DATE: APRIL 1966 |

Director of Mines

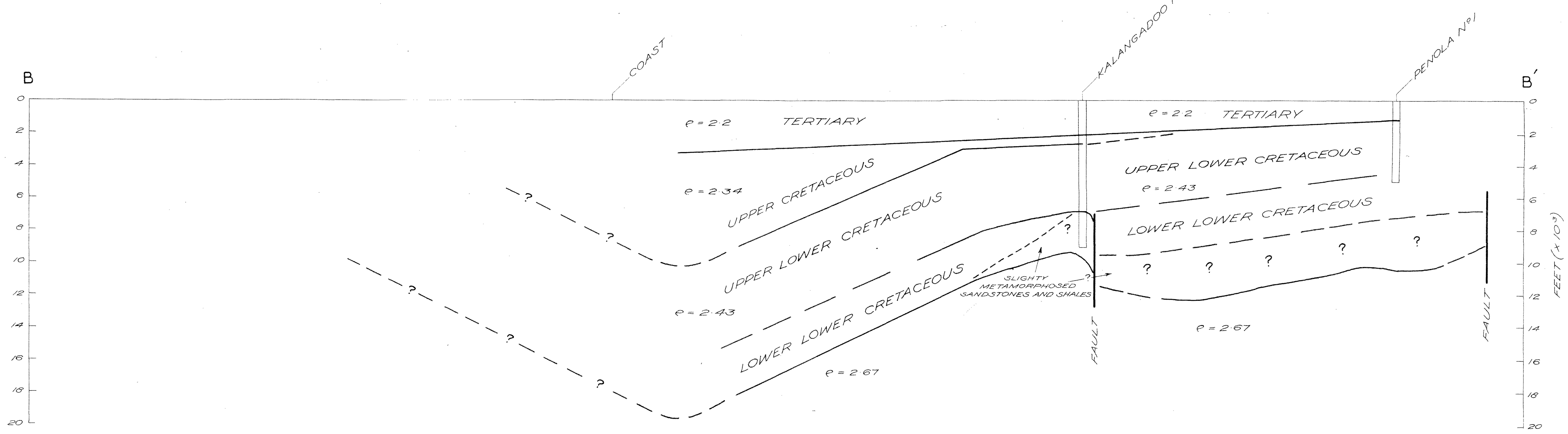
## CROSS SECTION THROUGH A – A′ (BEACHPORT Nº1 — KALANGADOO Nº1 — CASTERTON Nº1)



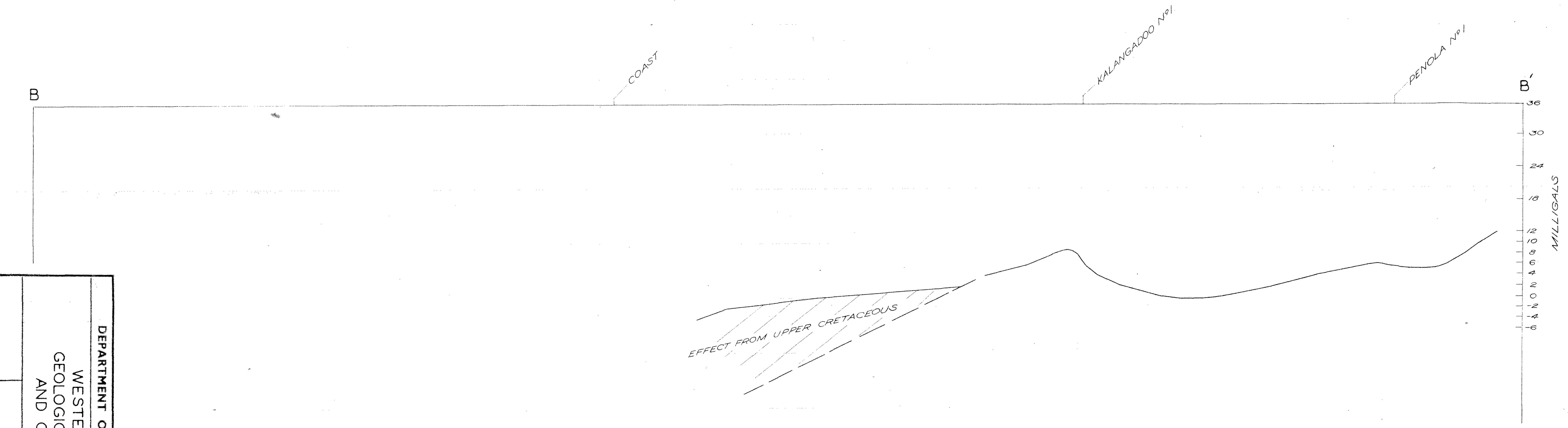

## CROSS SECTION THROUGH B – B (OFFSHORE — KALANGADOO Nº1 — PENOLA Nº1)




## GEOLOGICAL CROSS SECTION




## RESIDUAL GRAVITY PROFILE




Scale – Horizontal : 1 inch = 4 miles
Vertical : As shown.
Density of material ρ in gm/cm³
Interpretation by G.W. Kendall.

| DEPARTMENT OF MINES — SOUTH AUSTRALIA | | |
|---|---|---|
| WESTERN OTWAY BASIN GEOLOGICAL CROSS SECTIONS AND GRAVITY PROFILES | | |
| | Drn. G.W.K. | SCALE: As shown |
| | Tcd. T.P.S. | 66-509 |
| | Ckd. L.V.W. | 994-2+5 |
| Director of Mines | Exd. | DATE: 14-6-66 |